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PART 2/2

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT REPORT

Accompanying the document

Proposal for a Regulation of the European Parliament and Council

on packaging and packaging waste, amending Regulation (EU) 2019/1020, and repealing Directive 94/62/EC

{COM(2022) 677 final} - {SEC(2022) 425 final} - {SWD(2022) 385 final}

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GLOSSARY

Term or acronym	*Meaning or definition*
CBA	Cost-benefit analysis
CEAP	Circular Economy Action Plan
CO_2e	CO_2 equivalent
DRS	Deposit Return System
EPR	Extended Producer Responsibility
EPS	Expanded PolyStyrene
FCM	Food Contact Material
FTE	Full Time Employee

GPP	Green Public Procurement
GNI	Gross National Income
k	1000
LCA	Life cycle analysis
LPCBs	Lightweight plastic carrier bags
PCB	Plastic Carrier Bag
PET	Polyethylene terephthalate
PPWD	Packaging and Packaging Waste Directive
SDGs	Sustainable Development Goals
SUPD	Single-Use Plastics Directive
VLPCBs	Very Lightweight Plastic Carrier Bags

ANNEX 1: PROCEDURAL INFORMATION

1.1. Lead DG, Decide Planning/CWP references

The preparation of this file was led by Directorate–General for Environment (ENV). It was included as the following items in the DECIDE/Agenda Planning database: PLAN/2019/5396.

1.2. Organisation and timing

The initiative is a deliverable under the European Green Deal and was further set out in the **Circular Economy Action Plan**[1] (CEAP.) The **Inception Impact Assessment Roadmap** was published on 11 June 2020 with a feedback period until 6 August 2020[2].

The Inter Service Steering Group (ISSG) for the Impact Assessment included the following DGs and services: Secretariat-General (SG). AGRI (Agriculture), BUDG (Budget), CLIMA (Climate Action), CNECT (Communications Networks, Content and Technology), COMM (Communication), COMP (Competition), DEFIS (Defence Industry and Space), ECFIN (Economic and Financial Affairs), EMPL (Employment, Social Affairs and Inclusion), ENER (Energy), ESTAT (Eurostat), FISMA (Financial Stability, Financial Services and Capital Markets Union), I.D.E.A. (Inspire, Debate, Engage and Accelerate Action), INTPA (International Partnerships), JRC (Joint Research Centre), JUST (Justice and Consumers), MARE (Maritime Affairs and Fisheries), MOVE (Mobility and Transport), OLAF (European Anti-Fraud Office), REGIO (Regional and Urban policy), RTD (Research and Innovation), SANTE (Health and Food Safety), SJ (Legal Service), TAXUD (Taxation and Customs Union), TRADE (Trade) as well as EEAS (European External Action Service). Meetings were organised between Summer 2020 and Summer 2022.

The ISSG discussed the Inception Impact Assessment and the main milestones in the process, in particular the consultation strategy and main stakeholder consultation activities, key deliverables from the support study, and the draft Impact Assessment report before the submission to the Regulatory Scrutiny Board.

1.3. Consultation of the RSB

An informal upstream meeting with the Regulatory Scrutiny Board (RSB) took place on 30 April 2021.

The feedback from this meeting is provided here, but will be deleted and replaced with the opinion after the final discussion with the Inter-Service Group (ISG), a draft of the IA was submitted to the RSB on 13 April 2022 and discussed at a meeting with the RSB on 11 May 2022.

Following the negative opinion of the RSB from 13 May 2022, changes were made to the IA in order to reflect the recommendations of the Board. Table 1-1 presents an overview of the RSB's comments and how these have been addressed, considering changes in the political environment or consultations with the stakeholders and Member States since the initial IA submission.

[1] COM(2020) 98 final
[2] Reducing packaging waste – review of rules (europa.eu)

Table 1: RSB comments to initial IA submission and how they have been addressed

RSB comments	**How the comment has been addressed**
(1) The report is not sufficiently clear about the remaining gap that the initiative aims to address, given related initiatives and policies (notably, Single Use Plastics Directive (SUPD) and the Plastics Own Resource (POR) covering plastic waste). It is not sufficiently clear how full coherence between these initiatives will be ensured.	Section 1.2 of report has been improved to better explain, which of the problems identified are already addressed with the SUPD, the Waste Framework Directive, the proposal for the new Waste Shipment Regulation and the POR Decision. Moreover, the interface between this initiative and existing, linked legal framework has been refined in Annex 5, examining the legal environment of the initiative. Further, a new section 3.3 contains a gap analysis on plastic packaging with respect to the SUPD and POR. Also, the regulatory failure of the SUPD is explained in section 2.3. The complementarity between the measures in this initiative and both, the SUPD and the POR rules, is recognised as the latter pursue one common policy objective with the former for some of the packaging (plastic single-use): in particular, reducing the negative impact of single-use plastic packaging, including on the marine environment as a result of littering, and reducing the generation of residual plastic packaging. The report clarifies that the initiative is compliant with the SUPD and POR, and has on top a much broader scope in terms of plastic packaging types and intervention areas.

RSB comments	How the comment has been addressed
(2) The report does not sufficiently explain how the proposed change of legal instrument to a Regulation fits with the discretion given to Member States in the Plastics Own Resource to define the most suitable policies to reduce plastic waste in line with the principle of subsidiarity.	The regulatory failure of the current Directive to achieve its own objectives is further refined in the respective sections of the problem definition (chapter 2). Overcoming the vague "essential requirements" established in the Directive with clear and strict rules set out in a Regulation will improve enforceability of the legislation and reduce market fragmentation. National measures, taken to transpose generic 'essential requirements' in the Directive related to the design of packaging, or in the absence of harmonising provisions of the EU legislation, for example, on labelling for consumers regarding disposal, have created an uneven regulatory framework, which challenges the integrity of the internal market and results in additional cost for economic operators and the society. These barriers, which have significantly increased over the last few years, can only be removed by detailed, more harmonised rules, including requirements that apply directly and identically to all economic operators (for instance regarding the process for addressing the recyclability of packaging, recycled content, or labelling). A Regulation would ensure that the obligations are implemented at the same time and in the same way in all the Member States. The legal instrument of a Regulation is the key to the creation of an efficient internal market for high quality secondary materials (new section 5.1). At the same time, the report highlights, where the Member States have as a matter of subsidiarity competence and leeway to act on their national levels: For instance on the measure with the waste reduction targets imposed on the Member States, it is clarified what is expected to be achieved with the harmonised EU measures and what complementary actions the Member States might take to meet the targets. Another example are compostable plastics: The measure is designed to let the Member States decide on some specific plastic application, if they require compostability based on the local collection and treatment situation for organic waste. In the batteries sector, which was the first time that the Commission proposed in 2020 to replace a directive by a regulation, this approach has been accepted by the co-legislators in the on-going legislative process. The regulatory objectives and framework for batteries, regulating the full-value-chain, and for the packaging sector are very similar. The logic has also been followed in the recent proposal for the Eco-design for Sustainable Product Regulation.

RSB comments	How the comment has been addressed
(3) The report does not elaborate enough the options regarding the main policy choices for decision makers and the content, functioning and practical feasibility of the specific measures. It is not sufficiently clear which decisions will be taken as part of this initiative, which will be subject to implementing legislation and further evidence gathering.	The core measures with the biggest political sensitivity, also considering the outcome of the recent Conference on the Future of Europe, were better highlighted and presented in the option table (section 5.3). Their descriptions and feasibility, including the considerations due to input from Member States and stakeholders, was explained more in detail together with the other impacts in sections 6.1-6.4. The principal decision to favour high quality recycling over incineration with energy recovery was underpinned by scientific evidence about the resource efficiency and environmental performance of the two alternative waste streams. Generally, the concrete provisions are meant to be laid down in the Articles and annexes of the main act, as appropriate. In case a specific issue is to be subject of implementing legislation, this is explicitly indicated, including the preparatory works necessary for it.
(4) The report does not sufficiently assess the distributional and overall impacts, in particular on consumers and producers. It is not clear to what extent Member States are affected differently.	The new section 6.5 showcases the distributional effects of the measures with the biggest economic impact from the packaging producers to the consumers, including the waste management sector. Further, the very significant overall savings for the consumers are clearer explained and presented. The differentiation of impacts between the Member States, if appropriate, is made in the sub-section of the respective measure in 6.1-6.3 and more in detail in the respective Annex 9 document. The most evident economic impacts are due to the reduction of waste generation. The biggest winners and losers are outlined in section 7.2 and the full list of increased and decreased packaging sales is presented in Annex 9.1

RSB comments	How the comment has been addressed
(5) The report does not present the overall costs and benefits of the option packages. It does not provide a clear comparison of options in terms of effectiveness, efficiency/proportionality and coherence. The choice and proportionality of the preferred option is not sufficiently justified.	The new section 6.6 with a 'Cost benefit analysis of options' has been added. It presents modelled result by intervention area and by measure where available for the different options. This quantitative comparison of the modelled options is the base for the creation of the preferred policy option in chapter 7, in particular as regards selecting the most proportionate policy choice. This process considered thoroughly the decrease of the marginal environmental benefits and increased economic costs of the more ambitious measures. The new modelling of option 1 underpins that, without setting ambitious targets and harmonised product requirements, the EU will miss the opportunity to create a waste value chain with savings for the consumers and fail to achieve the Green Deal objectives. The savings in GHG emissions have been put in context and the reduced need for fossil fuel imports has been further elaborated with respect to the war in Ukraine. Specific effort was undertaken to substantiate effectiveness of the new labelling system: the report contains more evidence underpinning that the consumers are less confused and can sort their waste better with the new labelling scheme. Further, the measure with the labelling of the product packaging has been complemented with a labelling of the waste receptacles with the identical pictograms. The One In One Out analysis (7.6) of the new harmonised labelling underpins that the estimated EUR 10.3 billion costs for businesses will be by far offset by the expected administrative savings as a result of removal of the diverging national labelling systems.

RSB comments	How the comment has been addressed
(6) The report does not present in a systematic and transparent manner the views of stakeholders on the options.	The views of the stakeholders expressed on the inception impact assessment, in the public stakeholder consultation and the specific workshops compiled in Annex 2 were further supplemented. Further, the positions of the stakeholders were more elaborated in the Annex 9 documents containing the detailed measures. Finally, the core elements of the stakeholder positions on the main measures were included in the respective sections 6.1 - 6.4 (impacts). Stakeholders of different categories, including industry and NGOs, have shown strong support for the general and specific objectives of this initiative and the respective measures with stronger EU intervention and greater harmonisation, to reduce different national approaches and promote circular economy. In this sense, all stakeholders prompted the need to change the legal format of the instrument from the Directive to a Regulation. The revised report highlights particularly the strong support from different groups of stakeholders (industry, NGOs, Member States) on the need to reduce packaging waste generation, harmonisation of labelling requirements, design for recycling, harmonisation of EPR fee modulation criteria, minimum requirements for deposit and return systems, recycled content targets in plastic packaging, promotion of reuse through better definition and more inclusive approach to different reuse systems and more clarity regarding compostable packaging. However, certain industry representatives expressed opposition for measures which would imply significant losses of their turn-over (mainly in the intervention area prevention and reuse), while simultaneously challenging the environmental or social benefits of the respective measure. On other measures, such as the product specific recycled content targets in plastics, they raised concerns about the feasibility or proportionality of the measures. The Commission has taken such views into account and refined the measures: for instance, to find a balanced set of targets proposed for reuse in sectors selected based on efficiency criteria, as well as in the reduction of initial number of sectors targeted from 23 to 10 sectors.

The revised Impact Assessment Report and Annexes were resubmitted to the RSB on 12 September 2022 and considered the written comments of the ISG to the draft revised texts received by 31 August 2022. The

RSB issued a positive opinion with reservations on 30 September 2022. Table 1-2 presents an overview of the RSB's comments and how these have been addressed in the newly revised Impact Assessment Report and Annexes.

Table 2: RSB comments to the resubmitted IA and how they have been addressed

RSB comments	**How the comment has been addressed**
(1) The report should more clearly present the challenges related to the internal market and assess them in depth, going beyond the proliferation of national labels. It should better analyse why certain Member States reach their recycling rate targets, while others do not and assess the differences between Member State in terms of packaging waste generation and how this affects fragmentation of the single market. It should better explain and substantiate the scale of the problem of consumer confusion resulting from different packaging labelling across the Member States.	The market failures beyond the mere labelling issue due to the fragmentation of the EU market have been further elaborated in the problem definition and section 7.6. The differences of the waste management and infrastructure in the Member States, which are mainly a consequence of the national implementation of the waste directives, result in the variety of the respective waste generation levels and recycling rates. The link has been further carved out. The enhanced confusion of the consumers to properly separate the waste due to the different national labelling schemes has been explained.

RSB comments	How the comment has been addressed
(2) The report should explain how the expected impacts of related measures (such as the Single Use Plastics Directive and the Plastics Own Resource) are taken into account in the modelling of the baseline. It should better justify the assumption that the Single Use Plastics Directive will have a low impact on the baseline and clarify how the effects of the Plastics Own Resource drive the baseline modelling.	The baseline assumed the full implementation of the SUPD in all Member States by 2030, e.g. as regards recycled content in plastic bottles or measures to reduce certain plastic packaging. This is adequate even if the report mentions in the problem definitions that many Member States had in 2022 timewise and substantial shortcomings in their implementation. As regards the Own Resource Decision, the modelling of the baseline does not consider impacts on plastic packaging waste because potential instruments under the scope of the ORD are fully under the competence of the Member States and until 2022, no Member State decided to opt for such instruments. This is clarified in the report.

RSB comments	How the comment has been addressed
(3) The report should be clearer on some measures and how they have been reflected in the assessment of the (preferred) option(s). It should provide greater clarity on the role and functioning of potential waste reduction targets for 2035 and 2040, what the evidence base for fixing these targets is and whether alternative targets have been considered. It should be clear whether these targets will be set already in the legislative proposal, and if so, what the additional costs and benefits will be. It should be also clear on which measures greater flexibility will be provided to Member States and present the corresponding rationale in the subsidiarity section. It should be clear which measures will be taken via implementing regulation and on the basis of what analytical evidence base. Finally, the report should consider discarding the option on quantitative definition of recyclable packaging (M22c) upfront, given there seems broad stakeholder consensus that it is not feasible.	The mass flow modelling for the waste reduction targets allows for 2030 to quantify, how the various measures contribute to the targets. The modelling calculated 3 different exogenous targets (0%, 5%, 10%) for the 3 options. The preferred option chose 5% (to be established in the legal text) and its cost benefits have been quantified. Furthermore, quantitative projections for the waste generation were done for a reduction target of 10% set for 2035 and of 15% for 2040. The disaggregation of these amounts over the various supporting measures was not possible for these years due to methodological reasons. The report now clearly distinguishes between EU harmonised measures and those that can be implemented by the Member States in line with the subsidiarity principle and internal market rules. Also, the report clarifies, what should be established in primary and what in secondary legislation. The report is now clear on all the measures included in the preferred option. Measure 22c (quantitative definition of recyclable packaging) had been assessed and subsequently discarded, i.e. not included into the preferred option. The respective stakeholder positions have been considered during the assessment.

RSB comments	How the comment has been addressed
(4) The preferred option 2 plus (which is a combination of measures of options 2 and 3) should be identified, assessed, and compared upfront to allow decision makers fully informed decisions based on all costs and benefits of the four options.	The report developed 3 options and compared it with the baseline. After the comprehensive modelling of the 3 options, the preferred option 2+ was designed by integrating one measure of option 3 into the preferred option (M26cc was merged with Ma&b). Further refinements of Option 2 were made with respect to improve enforceability and feasibility, and to apply the subsidiarity principle. These adjustments of Option 2 should not have significant changes to the quantitative outcome of the modelling.
(5) While the revised report is now clearer on the distributional transfers, in particular between single-use packaging producers and consumers, this is not adequately reflected in the cost-benefit analysis (and subsequent comparison of options in terms of effectiveness and efficiency). The analysis and overview tables must be clear how the substantial packaging producer sales revenue losses and the consumer savings have been reflected in the costs and benefits estimates of the economic impact assessment. In presentational terms, the report should present both the costs and benefits in a clear way to allow easy calculation of net benefits or costs (and related benefit-cost ratios).	Tables 7 and 8 have been revised to be clear how the substantial packaging producer sales revenue losses and the consumer savings have been reflected in the costs and benefits estimates of the economic impact assessment. An explanation has been added in section 6.6 and in Annex 4. Cost-benefit ratios have been made explicit in section 6.6
(6) The report should be clearer on the net impact on employment, including by adding further detail on the methodology and providing monetised estimates of expected additional jobs. It should explain how the employment impacts are reflected in the cost- benefit and efficiency analysis.	The methodology for assessing the net impact on employment, and reasons for not providing monetised estimates of expected additional jobs are set out in Annex 4 and in section 6.6

RSB comments	How the comment has been addressed
(7) On the basis of a complete cost-benefit analysis of the four main policy options, the report should further develop the comparison of the policy option section, by being more explicit on how effective the options are in delivering on the three specific objectives and by reviewing some of the efficiency scores. For example, it is not clear why the scoring of efficiency of the (low-cost) option 1 performs less well when compared to efficiency scoring of the more costly and difficult to implement options.	The comparison of options has been revisited and Table 9 revised with more consistent scoring to improve clarity. Explanations have been strengthened
(8) Based on a more complete cost-benefit analysis and a reinforced comparison of options, the report should strengthen the proportionality assessment of options and the choice of the preferred option (including all the measures where the report remains vague on their final inclusion).	The comparison of options has been revisited and Table 9 revised. The composition of the preferred option package has been further explained and all the measures contained in the preferred option package have been listed in section 7.1
(9) The report should provide further clarification of the administrative costs for the One In, One Out approach. It should be clearer on the underlying assumptions and how the costs were calculated.	Further clarification of the administrative costs for the One In, One Out approach have been provided including in section 7.6
(10) The presentation of costs and benefits in [annexes 3 and 9 and the executive summary,] should be fully aligned with the revised cost-benefit analysis, including full reporting of the savings and costs related to the One In, One Out approach.	Clarification and alignment of the costs has been made

1.4. Evidence, sources and quality

To support the analysis of the different options, the European Commission awarded a support contract to external experts - Eunomia (Consortium Lead) with Arcadis, Milieu, and COWI.

These experts worked in close cooperation with the European Commission throughout the different phases of the study.

ANNEX 2: STAKEHOLDER CONSULTATION

The Impact Assessment accompanying the Packaging and Packaging Waste Directive 94/62/EC was subject to a thorough consultation of stakeholders to ensure that views from different organisation were presented and considered.

In total, over 800 unique organisations were engaged with more than 1,800 contact points. Stakeholders were consulted through a combination of both public and targeted methods: inception feedback, public questionnaire, Member State questionnaire, online workshops and webinars, and one-to-one interviews.

These activities included a period during which it was possible to provide feedback on an Inception Impact Assessment (110 responses) and an Open Public Consultation[3] (425 responses). In addition, a targeted consultation exercise was carried out to further enhance the evidence base through the collection of more specialized feedback from targeted stakeholder groups. This was done, among others, *via* the organisation of several stakeholder workshops throughout the process. In June 2021, 6 stakeholder webinars took place presenting interim results of the study followed by the possibility to send feedback. More than 950 persons (250 organisations) participated in these webinars and almost 100 organisations provided detailed feedback and position papers. An additional workshop took place on 30th May 2022 with 517 attendees and 50 stakeholders intervened. In addition, both the consultant and the Commission services have carried out further targeted consultations with Member State experts, stakeholders, NGOs and consumers' associations.

This synopsis report presents a summary of these consultation activities and their results.

2.1. Feedback on the inception impact assessment

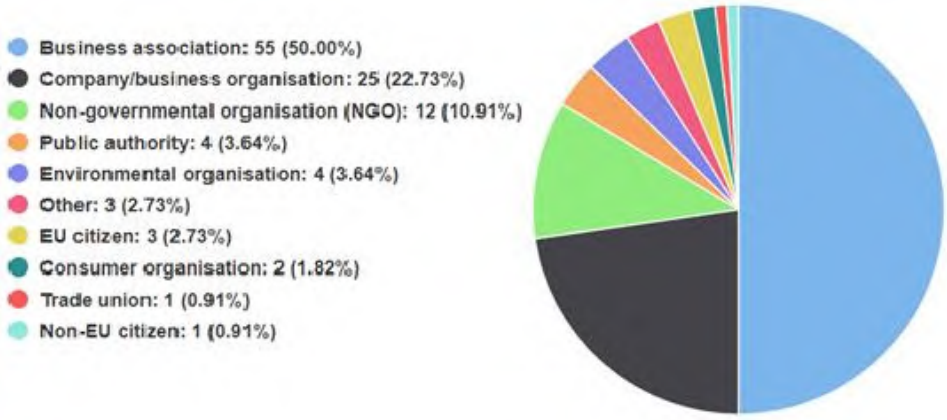
In the context of the preparation of the Impact Assessment, an open public consultation was accessible to the public for 12 weeks from 11 June 2020 to 06 August 2020. During this time, the survey received 110 responses.

As outlined in the Inception Impact Assessment, the project roadmap was published on the Commission's website[4]. For each section, a brief overview was provided to inform citizens and stakeholders of the planned impact assessment and to allow them to provide feedback at an early stage. Of the 110 respondents, 80 (73%) were business associations or company/business organisations, 12 (11%) were non-governmental organisations (NGOs), and the remaining 16% was made up of a variety of stakeholder groups including public authorities, EU citizens, and consumer organisations (Figure 1).

Figure 1: Valid feedback instances by stakeholder group

[3] Reducing packaging waste – public consultation https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12263-Reducing-packaging-waste-review-of-rules/public-consultation_en

[4] Reducing packaging waste – review of rules, European Commission website https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12263-Reducing-packaging-waste-review-of-rules/feedback_en?p_id=8007911



Looking at the countries of the respondents, Belgium had by far the biggest share with 34 (31%). They were followed by Germany with 19 (17%) and Netherlands with 11 (10%). In total, 19 countries responded to the IIA, of which 17 were in the EU and the remaining 2 were the UK and the US.

Summary of responses to the survey:

2.1.1. **Prevention**

Stakeholders mostly agreed on the need to introduce new measures to prevent packaging waste, to ensure that packaging is only used when strictly necessary and to reduce the use of secondary packaging.

NGOs were the most active on these prevention issues saying that it it was important to minimise the use of plastics in packaging, while plastics representative asked not to compromise the functionality of the packaging as changes in packaging could affect its quality and safety.

A general support was expressed on the need to set waste prevention and reduction targets with targets that respect the waste hierarchy. A difference of position within the industry was noted on the question if targets should be based on the total number of single-use units (and/or kg of packaging per person per year) or if specific targets should be set for major materials, product groups or sectors. Industry expressed expectation that the targets are not overly prescriptive on the means and inhibit innovation and do not lead to the replacement of certain materials with others that have a higher environmental impact. Industry also expressed concern about life cycle analyses and the need to assess any packaging reduction targets or measures with possible increase of food waste.

A broad support was expressed on the necessity to clearly define - with established criteria - the concepts of "*underpackaging*" and "*overpackaging*".

2.1.2. **Reuse**

If most stakeholders supported to increase reusable packaging systems, industry emphasised that reuse should only be introduced when environmentally and economically feasible and highlighted the role of consumer engagement. They also called for a "transition phase" to adapt and respect existing complexities in supply chains.

Representative of food packaging users raised concerns on food hygiene and safety risks, correlation with food waste, need to take into account that under some circumstances recyclable packaging is environmentally preferable to reusable packaging, setting reuse targets for "transport packaging" that would risk including packaging, which is already highly recycled, and overly stringent requirements for cosmetic products.

2.1.3. **Recyclability**

Overall, there was a strong support for all packaging to be reusable or recyclable. The main issues raised were R&D, labelling, and minimum quality standards.

Most stakeholders called for packaging design obligations, design for recycling (DfR) guidelines and incentives through eco-modulation of EPR fees. Representative of downstream value chain called for a reduction in the complexity of packaging materials and the use of standardized packaging to improve recyclability. Packaging designers and users also spoke of the need to harmonise collection systems and increase collection rates to improve the quality of recyclates. Many stakeholders – notably NGOS- pointed out that deposit-refund systems (DRS) were an effective way to achieve this ambition.

A broad support was expressed for a clear and harmonised definition of "recyclable packaging" (but any definition should be reviewed regularly to reflect technological change) and the use of appropriate labelling measures to improve the recyclability of packaging. The introduction of minimum quality standards for recyclates has been quite widely supported.

Concerns has been raised by industry about possible trade-offs such as increased packaging waste generation, increase in food waste, impact on the health and safety and packaging functionality, and the cost of manufacturing of new (less complex) packaging.

2.1.4. **Compostability**

The increased use of compostable packaging has been widely supported, but it needs to be assessed in terms of its carbon footprint and circularity potential. It also needs to be accompanied by clear, standardised and technology-neutral definitions of biodegradability and compostability of packaging.

Most stakeholders requested that a clear distinction be made between biobased plastics and biodegradable plastics, and between biodegradability and compostability, noting that some biobased plastics do not biodegrade in biowaste treatment plants and none biodegrade completely in the natural environment.

2.1.5. **Recycled Content**

Stakeholders broadly supported the need to increase recycled content in packaging, but expressed differing views on how to achieve this and the extent of government intervention required. Discussions focused on whether a voluntary approach or mandatory requirements should be used, and whether/which chemically recycled raw materials should be included in the recycled content. There was also a call for increased support for recycled plastics when virgin material prices are low due to the collapse in crude oil prices. Stakeholders recognized that the price of food grade r-PET should be decoupled from oil prices by setting clear targets for recycled content in new products

Stakeholders involved in food and beverage expressed the need to modify food contact provisions (i.e. this should facilitate the increase of secondary materials while maintaining consumer safety) and to take into account the safety requirements of certain categories of consumer goods (*e.g.*, cosmetics) as well as the availability of secondary materials when setting any recycled content targets.

2.1.7. **Green Public Procurement**

A number of stakeholders highlighted GPP as an important method for improving demand for sustainable packaging and creating a new market for recycled plastics. GPP can play an important role in stimulating markets for secondary raw materials and help accelerate the use of sustainable packaging.

2.1.8. **Data, Reporting and Implementation**

Most stakeholders supported harmonised approaches and stressed the importance of not restricting the smooth functioning of the single market as national legislation can have distorting effects. Stakeholders also called for the free movement of packaging across borders, the removal of barriers and the prevention of fragmentation of the single market, and the establishment of harmonised rules.

A large majority of stakeholders called for further harmonisation of EPR systems at EU level, improved control of packaging as well as increased sharing of information on best practices between Member States. Stakeholders also stressed the importance of setting clear targets and deadlines for implementation. The industry argued that targets and goals should avoid being overly prescriptive as to how they are to be achieved, and that appropriate transition periods should be set for any new measures. Finally, effective and harmonised "end-of-waste" criteria are needed to provide reassurance about the use of recyclates.

2.1.9. **Hazardousness**

Stakeholders widely agreed that reducing and eliminating the hazardousness and toxicity of packaging is a key priority.

One participant from the industry stated that the long-term policy goal should be to achieve toxic-free material cycles, starting with the product design phase, and called for chemical traceability of plastic packaging, with clear rules and better information for waste management operators on the chemicals in products. An NGO called for stricter standards on the presence of hazardous chemicals in the recycling process, for the creation of a safe framework for the packaging of dangerous goods, including an EU-wide uniform procedure (quality standards) and for a reduction of the use of fluorinated chemicals in the PPWD or in the next revision of the Food Contact Materials Regulation.

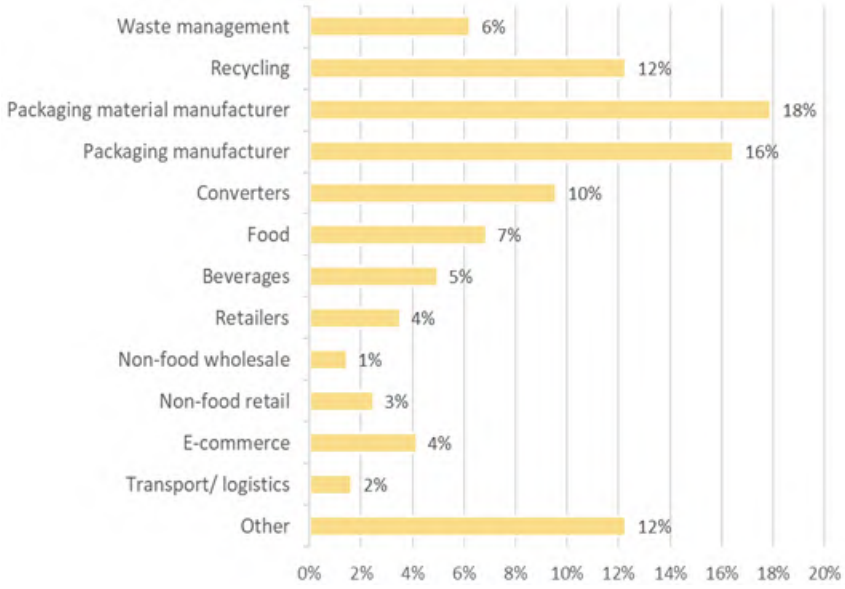
2.2. Open public consultation

Published on the Commission's website, the questionnaire received 425 responses. The responses were generally positive. Comments expressed support for efforts to tackle the problems of packaging and packaging waste (Figure 2).

Participants responded mainly on behalf of a company (31%) and trade association (27%), as a European citizen (28%), and then on behalf of an academic/research institution, environmental/non-governmental consumer organisation, public authority (15%). With regard to the sector of activity, packaging material manufacturers and packaging manufacturers represent 18% and 16% of participants, followed by the recycling sector (12%). 33% and 30% of participants represented micro (1-9 employees) and large (+250) organisations, followed by 21% for small (10-49 employees) and 16% for medium (50-259 employees) organisations. 33 countries were represented, including 24 Member States (except Croatia, Cyprus and Malta). Germany (20%) and Belgium (19.1%) were particularly well represented, ahead of Italy (9.6%), France (6.4%) and Austria (5.4%).

Figure 2: Summary of responses to the questionnaire by intervention area and questions asked

Question: What is your area of activity/what is the sector whose interests you represent when responding to the questionnaire?



Question: I am giving my contribution

Answering options	No.	%
Academic/research institution	6	1.4%
Business association	112	26.4%
Company/business organisation	130	30.6%
Consumer organisation	4	0.9%
EU citizen	119	28%
Environmental organisation	6	1.4%
Non-EU citizen	0	0%
Non-governmental organisation	25	5.9%
Public authority	13	3.1%
Trade union	0	0%
Other	10	2.4%

2.2.1. Waste Prevention

Overall, many participants – especially NGOs - stressed that packaging waste prevention should not be compromised for the sake of weight reduction. Industry recalled that packaging is used for protection, communication, health and safety and called for clear guidance on packaging reduction and for definitions of "excessive" packaging before introducing bans and targets.

On "Definitions," most participants suggested the need for clear definitions of "*overpackaging*" and "*underpackaging*."

Considering "Avoidable Packaging", many participants supported a ban on products with non-functional and avoidable packaging, believing that too much packaging is used in the EU (68% of respondents). Blister packs, containers designed not to be filled and some food packaging were cited as examples. Products considered to have (way) too much packaging are electronic products (81%) children's toys (79%) and cosmetics (76%). 82% of participants believe that there is too much packaging used for online shopping.

Regarding "Restrictions and bans", 55% of participants agree that there should be EU-wide bans on packaging that is not necessary to protect the product or ensure hygiene. In addition, 69% believe that there should be EU-wide targets for Member States to reduce or limit the production of packaging waste. Several brands have put forward internal targets to reduce excessive packaging in the short term.

On "Dimensional limits and fixed ratios," 68% of participants felt that there should be such dimensional limits for packaging used for online delivery of goods to minimise unnecessary space. 65% agreed that they would be an effective way to reduce packaging waste and 73% felt that it would improve packaging design. Outside of e-commerce, fixed ratios for other applications were widely seen as an inappropriate solution for reducing packaging.

2.2.2. **Reuse**

Most stakeholders agree on the need to harmonise definitions, standards, and guidance for reuse. In line with the waste hierarchy, NGOs stressed that reuse should always be the first option. Industry (e.g. paper/cardboard packaging representatives) expressed concern that reusable products in some cases resulted in higher overall environmental impacts.

As regards the "Attitudes toward reuse", 60% of respondents currently use reusable packaging. The most popular reusable product is the refillable water bottle, used daily by 58% of respondents. 68% agreed that they would be willing to bring their own reusable packaging to the store. Several participants also noted that reusable packaging is not always optimal, that it needs to be convenient and that consumers need more information about reuse systems. Participants expressed concerns about health and safety, lack of access to stores that accept reusable packaging, and disadvantages compared to single-use solutions.

Considering the "Future Use of Reusable Packaging," 76% of stakeholders agreed that reusable packaging should be promoted wherever logistically possible. 87% agreed that there should be a requirement for clear labeling of all reusable packaging. Standardisation of reusable packaging formats, the introduction of quantitative reuse targets at national and international level, and support for reusable packaging through tax relief were measures recommended in the comments. Participants also stressed the need to support any decision to use reusable packaging with life cycle analysis data.

2.2.3. **Recyclability**

There was broad support for increasing the recyclability of packaging, including the need for harmonised definitions and complementary approaches to increase recycling rates (*e.g.,* simplified packaging, innovative technologies, consumer education. There was strong support for all packaging to be recyclable. 97% agreed or strongly agreed with the goal of increasing the recyclability of packaging.

Many participants mentioned the need to harmonise definitions of what constitutes recyclable packaging across the EU, and that these definitions should be technology neutral to avoid favoring or excluding certain processes.

Opinions expressed on "packaging complexity" raised the topic of reducing the number of polymers in packaging and/or simplifying designs to increase recycling. Responses were mixed, with some participants supporting this concept and others from the plastic industry raising issues with seeking to limit the number of polymers.

With regard to "recyclate", a few participants noted a need for clarity in the difference between recycling technologies that can maintain the value of the material and those that result in downgrading.

Responses on "labelling" broadly stressed the need for its harmonisation across the EU to help increase collection/sorting. 85% of the responses agreed or strongly agreed with the need to require that all recyclable packaging be clearly labelled as recyclable. 84% stated that recyclability labelling could improve packaging design and/or reduce negative environmental impacts while maintaining acceptable costs. Because waste management practices differ among member states, participants noted that recycling rates may not increase across Europe even if labelling were harmonised.

On the issue of "consumer influence," it was emphasised that recyclability depends on the ability of consumers to correctly identify recyclable materials, separate them, and sort them into the appropriate waste streams.

2.2.4. **Compostability**

The need to update the compostable material standards was identified to take into account composting conditions. Opinions were very divided, with a number of bioplastics producers campaigning to prevent blanket bans;

Most of the opinions expressed on compostable packaging were split between compostable product manufacturers supporting their use and waste treatment companies expressing concern. When asked to express whether they felt that biodegradable/compostable plastic packaging was better for the environment than buying packaging made from conventional plastic (question 4), 47% of stakeholders disagreed, versus 33% who agreed.

Many stressed the need for compostability standards. One stakeholder suggested that the existing EN 13432 standard be revised. Nearly 90% of participants felt that updating EN13452 to further specify criteria for compostable and biodegradable packaging, including composting conditions, would be an efficient and

effective way to improve packaging design. 97% of stakeholders agreed with the objective of developing definitions for biodegradable and compostable packaging and harmonising the labelling of biodegradable and compostable packaging.

Stakeholders considered applications where the packaging could end up in food waste (*e.g.* tea bags) and those that could facilitate organic waste collection (*e.g.* disposable coffee pods) to be the most efficient and effective. One participant representative of the packaging industry added that organic waste accounts for over 50% of municipal solid waste and that compostable packaging can be collected together and processed accordingly.

A number of stakeholders – notably the recycling industry - indicated that biodegradable/compostable packaging can be a good choice when end-of-life conditions are met and that "compostable" materials were rarely compostable at home (i.e. it requires specific processing conditions). Participants drew attention to the composting infrastructure in Italy, suggesting that compostable packaging could be a good choice if similar processes were introduced in the rest of the EU. Some participants raised the point that some biodegradable and compostable materials can have a negative effect on biowaste by misleading consumers and unintentionally encouraging littering since they are not recyclable.

2.2.5. **Recycled content**

Responses were largely in favour of increasing the recycled content of packaging. Despite this, a number of stakeholders expressed concern about increasing the use of recyclate. 73% of participants agreed or strongly agreed that the packaging with the highest recycled content should be chosen when a product has multiple packaging options. 80% agreed or strongly agreed with the objective of increasing the level of recycled content in packaging.

However, several stakeholders – mainly the food and beverage industry - expressed concern about the introduction of minimum recycled content targets. Several participants from the plastic industry pointed out that food contact applications could not use most recycled polymers, and that mandatory targets could favour some industries over others and distort the market. It was suggested that some products should be exempt from using recycled content if safety could be compromised (*e.g.* food or pharmaceuticals).

As for additional measures at the EU level to help increase the recycled content of packaging, suggestions included incentivizing recycled content rather than making its use mandatory, setting ambitious minimum recycled content targets for packaging, and establishing European standards for recycled plastic.

2.2.6. **Data and implementation**

Most of the suggestions concerned the introduction of taxes for those who do not comply with mandatory targets or bans. Almost all stakeholders agreed that enforcement mechanisms should be effective, but should also minimise the administrative burden.

Responses regarding "single-use packaging taxes" were particularly polarised. 45% of participants agreed with introducing such taxes in their country, and 45% were opposed. Comments suggested that tax breaks should encourage the more sustainable option rather than penalize the less sustainable. It was also suggested

that taxes and fees collected for unsustainable packaging should be used to build better recycling and reuse infrastructure.

On "bans and targets", 69% of participants agreed that the EU should set targets for member states to reduce or limit the production of packaging waste. 55% agreed that the EU should impose restrictions or bans on packaging when it is not necessary to protect the product or ensure hygiene.

The appropriateness of implementing "*National Packaging registries* " revealed different viewsas such registries are considered to be an appropriate and effective method of controlling packaging use but concerned were also expressed that it might disclose confidential information. Some participants insisted that any new packaging register at EU level should be compatible with existing registers.

On the issue of "Extended Producer Responsibility", it was pointed out that the administrative costs associated with proper membership of an EPR system and product registration can far exceed the cost of end-of-life treatment for small businesses.

2.2.7. **Green Public Procurement (GPP)**

The introduction of mandatory GPP criteria related to minimum levels of recycled content in packaging was deemed an effective and efficient method by 71% of stakeholders.

Similarly, the introduction of mandatory GPP criteria to require the use of reusable options for specific purposes in the public sector (*e.g*. drinking water) was viewed positively by 69%. It was emphasised that the criteria must be feasible and harmonised across the EU, considering that it would be impossible for manufacturers to comply if the criteria varied from one member state to another. It was also suggested that the use of bio-based and/or compostable packaging should be included in green public procurement.

2.3. Stakeholder workshops

Between 15 and 24 June 2021, six dedicated workshops were organised on different topics. A seventh workshop dedicated to Member States took place on 30 July 2021. An additional workshop took place on 30th May 2022.

The workshops were widely attended by participants from a number of different stakeholder groups, including business associations, company/business organisation representatives, academics, NGOs, environmental and social organisations, as well as Member State representatives. A summary of each workshops/intervention areas is provided below, knowing that the discussions dedicated to GPP, enforcement, hazardous substances was organised during the same workshop.

2.2.8. **Workshop of June 2021**

Summary of discussions by proposed measures in each intervention area:

Waste prevention

Clear definitions of over-packaging and under-packaging were requested as a matter of priority in Measure 1 (Update of Essential Requirements to minimize over-packaging).

Regarding the setting of targets (Mandatory target of 19% reduction of packaging waste per capita in 2030 - Measure 2), opinions are very diverse: some stakeholders consider them too high and others too low. There are also different views on materials and whether the target should be increased for materials that are difficult to collect and recycle, such as plastics. Stakeholders are concerned that Member States will differ in the setting of their targets and/or in the measures to achieve them, which would create tensions in the single market. Industry felt that voluntary actions should be considered instead.

Several stakeholders supported *weight limits* (Measure 3 Banning by 2030 of heaviest packaging for selected items based on existing lighter alternatives) and some even said that it could be extended to other major types of packaging. Others stressed the need for clear definition of categories.

Some stakeholders support the measure on *empty space in packaging* (Measure 5). Others oppose it because it might require customised packaging, which could disproportionately target small businesses. Some participants felt that EPR fees are the most cost-effective way to combat over-packaging, and that additional measures should be taken to ensure that all e-commerce organisations participate in EPR programmes. Industry was concerned about a potential lack of support for SMEs to adapt to these measures.

Reuse

Most stakeholders were in favour of some form of bottom-up reuse target (Measure 8 - Mandatory reuse targets for selected packaging groups for 2030/2040 in selected sectors). A few participants from the industry preferred voluntary targets while reuse systems are still being developed and more research is being carried out on appropriate formats, infrastructure and investment needs. A larger number – supported by NGO - argued for mandatory targets, in order to ensure security of investment and to avoid undermining the single market through heterogeneous national implementation. Many industry stakeholders expressed the need for more research and data collection before making targets mandatory, ideally on a case-by-case basis for each product category. In addition, food and drink industry stakeholders are very concerned that the specificity of their sector's products has not been sufficiently taken into account.

Many stakeholders are concerned that top-down national reduction targets (Measure 9) are too general. Any such measure would require harmonisation and should go hand in hand with recyclability and recycled content requirements for reusable packaging.

The standardisation of reusable packaging (Measure 10 - Revision of CEN standard for defining reusable packaging) is widely supported, provided that it takes into account current standards (*e.g.* for safety and hygiene) and reusable formats already in use, and that it allows for regional variability according to consumer preferences. While industry stakeholders do not want a standard that is too prescriptive to allow for innovation and competition, NGOs argue for a detailed standard that aims to standardise and simplify

packaging and harmonise systems between operators. Two criteria stand out as important: the recyclability of reusable packaging and the minimum number of rotations required. Standardisation of sizes was the most controversial proposal, particularly for the food and drink industry, which feared it would reduce the variety of packaging needed to meet the quality and performance requirements of their products. There was general agreement that such standards should be considered on a case-by-case basis, depending on the sector and the type of reuse. However, stakeholders from Member States pointed out that standards on reusable packaging for food and beverages are already being developed (e.g. France and Germany). Standardisation of reuse systems is rather supported by representatives of the reusable transport packaging industry as it would give legal certainty and confidence to invest in such systems.

There was broad support for the creation of a *Business Advisory Body* (Measure 11), but opinions were divided on the role of such a body. The consensus was that it should serve to coordinate the development of reusable packaging systems, share best practice, monitor and report on reuse, and provide strategic guidance. Several stakeholders stressed that it should not create an additional administrative burden for businesses and that its financing should be carefully considered. There were different views on whether it should operate at national or European level. It should be fully independent and include representatives from all sectors: packaging and materials industry, national authorities and PROs, consumer representatives and retailers.

The idea of harmonised labelling for reusable packaging (measure 12) is generally supported but should be kept simple so as not to overload packaging with information and confuse consumers. Opinions are divided on the criteria to be included in the labelling. The dematerialisation of information is particularly supported. Transferring most of the information online and off the label (*e.g. via* QR codes) could be a good way to cope with the amount of information to be transmitted. Any standardisation of labelling would need to take into account labelling initiatives already underway (*e.g.* in France and Germany, or Nestlé's eco-labelling trial from autumn 2021). And it will require extensive awareness campaigns and consumer engagement.

Recyclability

Stakeholders broadly support the updates to the Essential Requirements (Measure 21), although there is some debate about the scope of what is included in recycling (*i.e.* chemicals or compostables as organic recycling). There was broad support for the removal of 'energy recovery', but some fear unintended consequences, such as increased landfill. The wood sector also indicated that the "best" end-of-life for wood could be energy recovery. Some packaging producers argued that non-recyclable reusable packaging should be allowed on the market provided that reuse is proven and the environmental impacts are lower than for single-use packaging. The qualitative definition was widely supported over the quantitative definition. Many questioned where the key terms should be defined (*i.e.* in the legislation or in the implementing act). Some representatives of the chemical recycling argued for technological "neutrality" to give chemical recycling the same status as mechanical recycling.. The need for a system for a proper review of these guidelines, a pan-European body, was also stressed. There were differing views on how often they should be reviewed - some said annually. Finally, there was a call to ensure that the DfR promotes existing recycling technologies.

A broad consensus was expressed on the usefulness of harmonising EPR fee modulation criteria in an implementing act (Measure 23), with the exception of the pharmaceutical industry that fears being penalised.

The harmonisation of labelling requirements (Measure 27) was also strongly supported, particularly on sorting instructions to strengthen the functioning of the single market and reduce consumer confusion. However, most of stakeholders recognise the lack of harmonisation of collection systems between and within Member States, and therefore propose a digital label referring to local instructions. In all cases, the

digitalisation of information was clearly supported, as well as the desire for a language-neutral system: logos, pictograms or codes for material components.

Compostable packaging

A strong support for an updated and harmonised definition of compostable and biodegradable (updates to standard EN13432 - Measure 28) was expressed. Most stakeholders agreed with a revision of the standard that takes into account the latest technological developments and best practices. They mentioned the problem of cross-contamination and consumer confusion.

Some stakeholders support the measure (criteria for compostable packaging - Measure 29) as they believe it will lead to a higher quality compostable material stream and less contamination by conventional plastics. Many opposed it for several reasons, considering it discriminatory and disproportionate, or that the exceptions would confuse customers who should instead have alternatives for reuse.

Strong support was expressed for harmonised labelling for compostable packaging (Measure 30), but it should be specifically mentioned whether the packaging is suitable for industrial or domestic composting given the current confusion and divergent practices. In addition, it was requested to specify that the packaging is not suitable for plastic recycling, in order to avoid contamination. Several stakeholders agreed with the message "*do not litter*" to avoid confusion among consumers. Some stakeholders expressed their recommendations for digital watermarking solutions and/or any type of technological solutions. Some expressed concerns about the availability of space on labels to include additional messages. Opinions differed on the question "*is composting recycling or is recycling superior than composting*". Some stakeholders felt that composting should be considered organic recycling and be placed at the same level as mechanical recycling in the waste hierarchy.

Hazardous substances

In general, many stakeholders believe that issues relating to hazardous substances in packaging should be addressed through REACH, the EU Chemicals Strategy for Sustainability and the Food Contact Materials (FCM) Regulations. They consider that there is a risk of duplication of policies if they are addressed through the PPWD and argue that the PPWD is not the appropriate legislative tool in this area. Some stakeholders asked for a clear reference to the Food Contact Materials (FCM) legislation, with some even suggesting that it should be clear that the FCM takes precedence over the PPWD.

Several stakeholders agree that the definition of PPWD should be aligned with REACH to facilitate compliance (Update of definitions concerning hazardous substance - Measure 31). One notable exception is that PPWD should only refer to substances in packaging and not to general lists of substances not fully applicable to packaging.

The majority of stakeholders are in favour of expanding the information base on substance of concern in packaging (Measure 32), but strongly oppose restrictions under the reviewed PPWD and ask to leave this task to ECHA (restriction of substances in packaging under the PPWD - Measure 33).

Recycled content

With regard to the proposal for a new Essential Requirement for recycled content (Measure 34), there are concerns about the availability of quality recycled materials on the market. Adequate investments need to be made to ensure that the quantity and quality of recycled materials available are sufficient. In addition, the quality of the product itself should not be affected by the use of recycled materials. It is suggested that for certain applications with strict requirements (food or pharmaceutical sector), recycled content targets should be lower, not mandatory, or products should be exempted altogether. A stakeholder suggested that bio-based alternatives should be considered as a substitute for recycled content, as mechanical recycling of plastics can rarely meet the requirements. It was also suggested that the targets should take into account new technologies such as chemical recycling, including clarifying the regulations on whether chemical recycling can be counted towards the targets. It was discussed that the complexity of supply chains varies from material to material. The issue of specific EPR systems that do not exist in most countries for packaging was raised. Adequate waste collection and sorting infrastructure is also needed in all countries. Some stakeholders are concerned that targets as an essential requirement could lead to the banning of certain products.

Regarding recycled content targets - (Measure 35 - Broad targets for recycled content in plastic packaging based on contact-sensitivity for 2030 and 2040), there is more support for bottom-up targets than top-down targets, but many stakeholders have identified problems with both methods. For top-down targets, there is concern that they could disadvantage producers of specialised materials such as food contact or pharmaceutical applications. For bottom-up targets, there is concern about the demand for quality recycled materials. Secondary raw materials should also be more expensive where the infrastructure is underdeveloped and there is not enough to meet demand. SMEs that only produce food packaging may suffer, as they will not be able to make up their quota with non-food applications (which have less stringent quality and functionality requirements). Some stakeholders of medical or pharmaceutical sectors have raised similar issues for their packaging, where there are also strict quality and safety requirements. More recycling capacity and investment is considered to be needed. Stakeholders also indicated that it was important to define whether pre- and post-consumer waste would be included in the definition of "recyclates". Some participants from the plastic industry argued that recycled content targets targeting only plastics would be discriminatory and should also be set in other material categories. Others (e.g. representative of glass or paper/cardboard) are satisfied that the recycled content target does not extend to other material categories, in particular glass (because the increase in average recycled content is directly linked to the availability of more and better recycled glass) and paper/cardboard (because the paper recycling market is working well and the introduction of mandatory requirements could cause disruption).

Stakeholders strongly supported measure 37 (EPR fee modulation in recycled content), arguing that a harmonised definition and calculation is essential to create a level playing field and avoid fragmentation of the single market. The inclusion of chemical recycling was hotly debated. The industry stated that recycled content targets could not be determined until the methodology was defined. Finally, while some stakeholders were in favour of the implementing act, others felt that all definitions should be included in the Directive.

Green Public Procurement

Many stakeholders supported mandatory minimum packaging criteria in GPP (Measure 40)but stressing the need for certain exceptions, so as not to restrict the ability to set more ambitious sustainability requirements where they so wish.

There was general agreement that any *environmental award criteria* (Measure 41) should address the whole life cycle of the product (not just waste) and must be aligned with existing standards/labels that demonstrate environmental performance (*e.g*. eco-labelling schemes).

Data and implementation

The harmonisation of EPR reporting between Member States *via* a database (Measure 42) is almost unanimously supported, provided that it does not lead to a disproportionate increase in administrative burden.

The reinforcement of the role of the Market Surveillance Authorities to ensure enforcement of internal market packaging "product" rules (Measure 45) received unanimous support from stakeholders, who also called for adequate resources to be made available to Member States' enforcement authorities. Several comments were made on the implementation of the legislation by the Member States. Particular attention was given to imports, which should be subject to the same measures.

2.2.9. **Workshop of May 2022**

The workshop took place on Monday, 30th May. A total of 50 stakeholders intervened and were mostly EU-wide organisations, with 5 stakeholders representing national or regional organisations: France, Benelux, 2 x Germany, Benelux and Portugal

Recyclability

While NGOs have expressed support that investment in recycling capacity will help meet the targets, many industry stakeholders have expressed concern that the 95% recyclability threshold is unattainable. It is suggested that the 95% threshold be assessed by reference to best available techniques for collection, sorting and recycling (and to ensure that they are available throughout the EU).

A balance between weight and recycled content and recyclability was also particularly requested.

On the qualitative and functional definition of recyclability, support was given to a qualitative and functional definition of recyclability per unit of packaging, as well as specific and material neutral.

Industry was concerned that the negative list would contradict sectoral guidance, as some materials are recyclable with specific processes but not with standard processes.

There was clear support for clear limits for hazardous chemicals or a general ban on substances of very high concern, but there should be a distinction between chemicals that are hazardous but transformed into non-hazardous substances during manufacturing and hazardous chemicals in packaging.

There was strong support for mandatory collection to promote recyclability at scale and closed-loop circular economy systems.

Legislation

There is broad support for translating the directive into a regulation to promote harmonization.

A consistent approach to packaging legislation with other legislation (e.g. SUPD, Food Contact Directive, Waste Shipment Regulation...) and products from third countries is requested.

Industry stressed that it is very likely that Member States cannot implement higher individual reduction targets.

Reuse

A broad definition of reuse was supported to promote innovation and incentivize reduction.

NGOs supported a strong definition of reuse that would include definitions of measures for waste prevention and packaging reuse, such as reduction, a broad scope including disposable cups, collection infrastructure, reverse logistics, incentives to return packaging, and minimum rotations and requirements for a well managed system.

Some industry representatives, such as cosmetics, supported reuse targets by product and not by sector. In case of a sector-specific target, it was requested to rigorously target the sectors that would be affected.

Industry strongly supported a life cycle assessment (LCA) to evaluate reuse targets and ensure that there is no increased environmental, financial or administrative burden.

Some stakeholders - including NGOs - have argued that countries should have the freedom to set higher targets to allow for future changes in legislation and for promotion of consumer awareness to ensure the sustainability of reuse systems.

Recycled content

Several food industry stakeholders expressed concern about the availability of sufficient recycled content that meets food contact requirements to meet the targets. The industry also expressed concern that investment will be reduced if it does not make sense to invest in a packaging sector if there is uncertainty that the necessary recycled content will be available and that this could lead to a switch to other packaging that may be more environmentally damaging. But several stakeholders expressed support for equal access to recycled content (as part of the mandatory target) so that no product or sector is discriminated against. NGOs, on the other hand, supported the targets, disagreeing that there is not enough recycled content.

The chemical recycling industry called for support for these technologies (believing that chemical recycling of PET has high recovery rates of over 90%, unlike pyrolysis) as they can help produce enough recycled content to meet the targets.

Finally, a request was made for a review by the Commission of imported goods that claim to have recycled content.

DRS & right of first refusal

There was broad support for priority access through right of first refusal (or other mechanisms) for what is placed on the market as this could help SMEs that may have difficulty accessing recycled content due to price, but it was also pointed out that priority access for specific sectors could create a closed market.

While there was not a perfect consensus on mandatory DRS (e.g. fear of increased emissions due to collection), it was recognized that it could be useful for specific waste streams. Mandatory separate collection was supported to allow closed loop recycling if accompanied by a collection target (e.g. 90%) for all beverage packaging.

Stakeholders representing EPR systems expressed support for exemptions from minimum requirements for existing EPR and DRS programs, which could be evaluated based on collection rates.

Sector-specific topics

More specific definitions and reuse targets for food and beverage packaging were requested. Some industry stakeholders supported an exemption from the recycled content targets for reused food packaging to avoid a potential shift to single-use packaging to achieve them.

Similarly for the medical technology sector, whose representatives requested an exemption from the reuse and recycled content targets. The highly regulated industry such as cosmetics, medical technology and pharmaceuticals expressed that any legislation mandating changes in packaging materials and design must align with existing consumer safety regulations, stating, for example, that not all cosmetics packaging can be reused for hygiene reasons and that recycled content is currently not of sufficient quality to be used for contact-sensitive pharmaceutical and medical technology packaging. Also, some medical and pharmaceutical technology packaging may come into contact with chemical or biological reagents that are considered hazardous and therefore are not recyclable. And creating packaging that complies with existing regulations will not meet the 2025-30 deadline for the medical technology and pharmaceutical sector.

Finally, the use of bio-based materials in place of recycled content is recognized as welcome, but will still need to go through a lengthy regulatory process.

Waste prevention

Industry expressed that material-specific targets would better ensure that all producers reduce waste for their own material and do not switch to another material as a means of waste prevention.

Strong support was expressed for establishing clear and enforceable rules to define measurable and quantitative criteria to combat excessive packaging. It was added that defining fit for purpose requirement packaging could solve the excessive packaging issue and prevent the need to have additional requirements. The lightweighting of packaging is more discussed as some manufacturers consider that the complexity of lighter packaging could make it less recyclable.

Labelling

The issue of harmonizing collection systems as well as labeling requirements to improve collection was widely discussed. Also, it was pointed out that highly regulated products that are specified by sectoral regulations may conflict with the labeling requirements of the packaging legislation.

Other topics

There was particular support from industry for all thresholds and targets to be material specific.

NGOs clearly called for recognition of greenwashing, supporting the need for the Commission to examine and address this issue.

Industry - particularly representatives of packaging producers - stakeholder is in favor of all measures being assessed on the basis of life cycle analyses.

ANNEX 3: WHO IS AFFECTED AND HOW?

3.1. Introduction

This annex sets out the practical implications of the preferred policy package for the stakeholders. It describes the actions that might need to be taken to comply with the obligations under the revised legislation and indicates the likely costs and benefits.

3.2. Practical implications of the initiative

The preferred option will lead to a significant reduction in packaging waste, 19% compared to the baseline in 2030. The measures to deliver this are varied, but will have implications for all actors in the value chain. It will become easier to ensure high quality recycling, harder to justify and continue with excessive packaging and normal to look for way to minimise environmental impacts and manage packaging a part of the circular economy. The following section sets out the main impacts.

The following table provides the summary of costs and benefits per problem area for the options included in the preferred policy package (Option 2). Note that cost and benefits are presented at the level of the preferred policy package which may differ from this for individual measures. The impacts are not additive, their combination can lead to smaller or larger overall costs and benefits to avoid double counting.

As discussed in the main report, the benefits and costs associated with Measure 2b are an indication of the overall package, as all other measures will contribute to its delivery. The analysis for individual measures, set out in Section 6 of the main report and in Annexes 9, consider those measures in isolation.

I. Overview of Benefits (total for all provisions) – Preferred Option (*Estimates are relative to the baseline as a whole, i.e. the impact of individual actions/obligations of the preferred option are aggregated together)*

Description	***Amount***	***Comments***
Waste management costs	Saving of EUR 4.2 billion in 2030	Significant reduction in waste management costs associated with improvements in efficiency, and reduced volumes of waste.
Material savings	Saving of EUR 10.2 billion in 2030	

Biowaste contamination	Saving of EUR 122 million in 2030	
Reduction in packaging consumption	Saving of EUR 47.5 billion in 2030	Calculated through reduction in unit consumption and including material savings and waste management savings. Assumption that costs (savings) for producers, will be passed on to consumers (who will though face some offsetting hassle costs).
Reduction in GHG emissions and air pollutants	23 million tonnes CO_2e in 2030, plus reduction in air pollutants. The estimated value of externalities reduction is EUR 6.4 billion in 2030	
Reduction in packaging waste	Reduction of 19% compared to the baseline	
Reduction in financial costs associated with packaging and packaging waste	The net financial impacts are a saving of EUR 47.2 billion in 2030.	As part of this will be reduced through consumer changes in behaviour, there could be some offsetting inconvenience (not costed). Other changes will not have offsetting effects (eg reduction in over packaging).

II. Overview of costs – Preferred option			
	Citizens/Consumers	**Businesses**	**Administrations**

		One-off	Recurrent	One-off	Recurrent	One-off	Recurrent
Action	Direct adjustment costs				EUR 4 billion (for reuse schemes) EUR 523 million (for DRS schemes)		
	Direct administrative costs			EUR 30 million	EUR 1.26 billion	EUR 817.000 (spread over 3 years)	
	Direct regulatory fees and charges						
	Direct enforcement costs						
	Indirect costs						
Costs related to the 'one in, one out' approach							
Actions	Measure 10 - standardisation of reusable packaging formats and effective reuse systems with the aim of optimising				Negligible admin costs for participation in the standardisati		

	reusable packaging relative to function and environmental performance				on process		
	Measure 2b: Mandatory 5% absolute 'intensity' reduction in 2030		Unclear – will depend on MS implementation choices, but could include monitoring and reporting		Unclear – will depend on MS implementation choices, but could include monitoring and reporting		
	Measure 8b: Mandatory targets to increase the reuse of packaging – high level				The economic operators will face the administrative burden of reporting their progress presumably by sharing data/information on sales/trips for their multiple use items with the Member States.		Costs incurred for meeting legal obligations to provide information, for this measure are expected to derive from monitoring and reporting the progress with respect to the targets
	Measure 21 and 28: Update of Essential Requirements and recyclability definition				Negligible admin costs for participation in the standardisati		

					on process		
	M22b: definition of recyclable packaging				certification of recyclability, administrative costs for the packaging producers of EUR 1.14 billion		
	Measure 23: Harmonisation of EPR Fee Modulation Criteria				Negligible, as EPR fees are already set		
	Measure 29d: Compostability for plastics packaging				Small reduction as reduced assessment requirements		
	Measure 35em/h: Broad targets for plastic packaging – certification scheme and audit			EUR 30 million	Certification of plastic packaging EUR 120 million		
	Mx Update of current material-based labelling				Savings from simplification, reduced labels		

	Measure 32b – Notification of substances of concern in packaging				Minimal costs associated with notification		
	Measure 42b: Harmonization of extended producer responsibility reporting				Possible negligible costs if increased data required but reporting already in place		
	Measure 27c-y: Labelling criteria to facilitate consumers´ sorting and Measure Mk: Restrictions on use of confusing labels			EUR 10.3 billion (spread over 4 years) but more than offset by administrative savings so assumed net zero			
	Measure 38-j: Labelling criteria for Recycled Content				No additional costs		
	Measure 40b: Mandatory minimum Green Public Procurement				Small savings from harmonisatio		

	criteria				n		
	Measure PCB1: Reporting obligation on plastic carrier bags (PCB)				Possible negligible costs		

III. Overview of relevant Sustainable Development Goals – Preferred Option		
Relevant SDG	**Expected progress towards the Goal**	**Comments**
SDG 12 - responsible consumption and production, and specifically 12.5 to reduce waste	The proposal will lead to significant reductions in packaging waste, in particular there will be a target of 5% reduction in packaging waste measured in kg per capita compared to the 2018 waste generation	

ANNEX 4: ANALYTICAL METHODS

The Impact Assessment takes advantage of a variety of qualitative and quantitative approaches. Most Policy Options likely induce a multitude of effects on businesses, consumers and public bodies, which are quantified where possible.

The analysis is proportionate to the impacts that will result (economic, environmental and social) and the nature of the proposal. Confidence in the overall magnitude of results is reasonably high, whilst for individual Member States the results are also considerable reasonable but with a lower degree of confidence.

4.1. The methodological framework

This section outlines the approach to considering the impact of the preferred option in each of the 27 Member states and/or among the lifecycle stages of packaging.

4.1.1. **Economic impacts**

A cost-benefit analysis (CBA) model is used to quantify financial costs and benefits, where data and an appropriate methodology consistent with a 'proportionate evaluation' are available.[5] _All non-quantified costs are discussed in qualitative terms. Financial costs and benefit are, by their nature, concentrated on a specific and defined group of stakeholders. Furthermore, additional costs to one actor can often result in a benefit to other, related stakeholders (e.g. buyers and sellers). Cost impacts are borne by various types of economic stakeholders, and impacts passed on indirectly via supply chains.

- For waste management, a reduction in the growth of waste packaging leads to significant savings on EPR fees and one-way DRS relative to the baseline. These savings accrue to producers, via reduced EPR fees and producer fees for one-way DRSs, however these are potentially passed on down the supply chain (i.e. to wholesalers, fillers, retailers, and finally consumers) through a reduction in the selling price of packaging.

- For the reusable packaging that replaces single-use packaging, the **annualised capital and operational costs of running reuse schemes** are calculated relative to the baseline. Ultimately, whether these costs are paid directly by retailers or producers, these are also likely to be passed on to consumers. These costs however may also be viewed as the basis of revenue for reusable packaging operators and reconditioners, as this amount represents a service sold.

- The implementation of the **compostability measures** leads to a reduction in contamination from food waste in the conventional plastic recycling stream, giving rise to savings.

- For **packaging producers,** there can be significant changes in turnover. This largely reflects a decrease in the sales of single-use packaging and a smaller increase in sales for reusable packaging

[5] See Better Regulation Toolbox #45: https://ec.europa.eu/info/sites/default/files/file_import/better-regulation-toolbox-45_en_0.pdf

(the first time it is placed on the market, and not for subsequent rotations). This is turnover, rather than profit. To put this in context, a recent market report estimates the current size of the European packaging market to be EUR195 billion, although this would grow considerably under the baseline.[6] This reduction in turnover also represents, to an extent, the cost saving to reusable packaging users from not having to buy single use packaging on an ongoing basis. This net reduction in turnover includes minor gains in turnover under the recyclable packaging and compostable packaging theme. Increased turnover is due to switches to packaging with a higher sales price, which is the general trend observed from modelled switches to more recyclable packaging types (under the recyclability measures) and from specific conventional packaging types to compostables.

- **Material costs** are forecast to reduce (i.e. a saving) and represent the value of raw material that is no longer utilized as a result of reduction in packaging manufacture. For measures where packaging is light-weighted this is a saving that accrues to packaging producers. However for switches to reuse, the benefit of this avoided cost is not captured by packaging producers, but instead is countered by the value that reusable packaging owners can generate from selling packaging multiple times as a service (accruing to reuse system operators), or the cost saving from not having to buy single use packaging on an ongoing basis (which accrues to reuse system users such as packer-fillers or consumers, depending on the reuse system in question). In both cases, material savings represent a loss to economic actors who produce and trade primary materials.

The preferred option is modelled via the CBA (cost-benefit analysis) where the interplay between measures has been considered. So, the impact of the individual measures are not equal to the sum of the impacts of each measure.

One of the significant impacts is the reduction in consumption of packaging. This has been calculated through an examination of turnover from the packaging producers: producers sell, for example, 100 Euros less of packaging, so consumers buy 100 Euros less of packaging, producers receive 100 Euros less of income (ie turnover falls) and their expenditure on raw materials, labour etc falls along with their profits. However, that 100 Euros is a benefit from the point of view of society. This assumes full pass through of savings which is reasonable in a competitive market.

With regards to the baseline scenario, it only calculates the mass flows; the environmental and financial impacts are calculated relative to the baseline, but the model does not calculate overall baseline costs.

4.1.2. **Environmental Impacts**

This section sets out the assumptions and sources used to calculate the environmental impacts (GHG emissions and water consumption) and damage costs (from GHG and air quality, AQ, pollutant emissions). The net impact of the preferred option is to decrease tonnages of waste going to all final destinations (driven by the overall reduction in waste generation). This includes recycling tonnages, which decrease in the preferred option despite gains in recycling rates. Reductions in residual disposal (landfill and incineration) lead to GHG savings (as these activities are net emitters of GHGs). The reduction in recycling has the opposite impact – resulting in a net gain in GHG emissions, as reduced recycling leads to a decrease in avoided GHG emissions (i.e., recycling activities would have led to negative emissions had they taken place,

[6] Under the baseline Packaging Waste Generation is forecast to rise from 77.8 Million Tonnes in 2018 to 92.4 in 2030 and 106.6 in 2040. Turnover would rise in parallel.

via the reduced use of raw materials in subsequent manufacturing). Increased deployment of reuse programmes also leads to increased GHG emissions, mainly due to the transportation of reusable packaging. Similarly to the GHG emissions, there are savings at some stages to the packaging lifecycle (manufacturing, residual treatment) while other stages (recycling and reuse) create more impacts. Transport, collection and sorting have not been included.

Modelling of environmental impacts includes the following types of emissions:

1. **Manufacturing** – direct emissions and energy use from manufacturing. The model also accounts for reduced emissions when using manufacturing with a higher recycled (secondary) material content
2. **Transport** – transport emissions from manufacture to retailer, and from waste collection depot to final waste destinations
3. **Collection** – transport emissions from waste collection activities
4. **Sorting** – emissions produced by mixed waste sorting processes
5. **Recycling** – direct emissions from recycling process, and avoided GHG emissions through reduced use of raw materials in subsequent manufacturing
6. **Incineration** – direct emissions and GHG avoided through energy generation
7. **Landfill** – direct emissions and GHGs avoided through energy generation
8. **Reuse** – emissions from transport and washing in reuse schemes

Monetisation of greenhouse gas emissions and air quality impacts

In relation to the monetisation of greenhouse gas emissions, a cost of carbon is used[7] for the preferred policy options. Figures underpinning the analysis are below, with the central value used (as most consistent with the climate commitments) and the 2030 value used of 100 EUR per t CO2eq.

*Table 1**: Values in current Euros per t CO2eq**.*

	Low	Central	High
Up to 2030	60	100	189
Post 2030	156	269	498

The damage costs associated with the air quality emissions from production, recycling, incineration and landfill were also modelled for each Member State. The analysis included monetary values for NH_3, NO_x $PM_{2.5}$, PM_{10}, SO2, and VOCs, the 'pollutants'[8].

[7] Handbook on the external costs of transport - Publications Office of the EU (europa.eu)

4.1.3. **Social Impacts**

There are estimates of the impacts in employment across the packaging lifecycle, with job losses in manufacturing, recycling and residual treatment, and job gains in reuse.

Estimates for employment come from the mass flow model, and are based on direct impacts on employment. Effectively, this relates to the labour intensity of the changes in cost and expenditure in the different elements of the market. Such an analysis is partial, in the sense that it does not identify knock-on effects. The analysis recognises that impacts on the level of employment can be expected as demand for labour is changed as eg producers employ more people due to increase in demand for packaging. However, this could raise wages which would have a complex net effect on employment levels, with increases in employment in one sector being compensated for by decreases elsewhere in the economy. The nature of the net effect will also be determined by location, skill category and the level of involuntary non-employment in the economy. As such, the estimates are partial and it would be inappropriate to include monetised estimates of expected additional jobs in the cost-benefit analysis.

4.2. Description of the model

4.1.4. **The baseline in the model**

The model provides a baseline for packaging consumption, waste generation and management for the EU-27[9], against which the impacts of policy options will be assessed.

The model uses historical data from 2006 to 2018 with projections for the years 2018 to 2050. 2006 is the first year of modelling as this is the first year in which detailed market data is available, which is used in the methodology to supplement Eurostat statistics. Projections are generally reported out to 2040 only, as beyond this date the modelled trends are particularly speculative. Projections to 2050 are only used for the purposes of understanding potential contributions towards 2050 net zero greenhouse gas emission targets.

Modelling of future trends includes relevant EU-level and national policies and measures, which are assumed to continue in force. Future trends also include the modelled impact of socio-economic developments (population growth, GDP growth etc.). The methodology used for modelling the baseline is described in full in the support study's Appendix B.

4.1.5. **Scope/data used**

Data inputs to the model consist of links to the baseline mass flows (e.g. placed on market tonnages, waste destinations, recycled content etc.). The preparation of a baseline of historic and projected packaging flows in Europe required the design of an appropriate method to compile and cross-compare data from existing datasets on packaging consumption and waste management.

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[8] IEEP (2020), *Mapping Objectives in the Field of Environmental Taxation and Budgetary Reform: Internalisation of Environmental External Costs*

[9] The United Kingdom is not included in this study, and has been excluded from all datasets used in the model.

Projections are based on a "no policy change" scenario, i.e. modelling of future trends will include all relevant EU-level and national policies and measures, which are assumed to continue in force. Future trends also include the modelled impact of socio-economic developments (population growth, GDP growth etc.).

The scope of this analysis includes all major packaging types, that is:

- Household, commercial and industrial;
- Primary, secondary and tertiary;
- All major packaging materials – glass, steel, aluminium, plastic, paper/board, wood and material designated as 'other' (in Eurostat);
- Single-use and multi-use (reusable) packaging.

Regarding the terms used here, packaging waste *generation* refers to the number of units/tonnage of packaging at the end-of-life i.e. when the packaging becomes waste. Packaging *consumption* relates to the number of units/tonnage of packaging placed on the market i.e. the number used by the user. For single-use packaging, packaging consumption is in nearly all cases equivalent to waste generation. For example, a single use beverage bottle is bought, used and then discarded. The situation is different for multi-use packaging, in this case a single unit of packaging is used/consumed multiple times (and, in the case of open-loop reuse, also placed on the market multiple times, see support study Appendix B). The number of uses of packaging before it becomes waste is therefore an important variable to understand in determining the relationship between consumption and waste.

Primary, secondary and tertiary packaging refers to the terms as defined in the PPWD:

- **Primary Packaging** (or sales packaging) - packaging conceived so as to constitute a sales unit to the final user or consumer at the point of purchase;

- **Secondary Packaging** (or grouped packaging) - packaging conceived so as to constitute at the point of purchase a grouping of a certain number of sales units whether the latter is sold as such to the final user or consumer or whether it serves only as a means to replenish the shelves at the point of sale; it can be removed from the product without affecting its characteristics;

It was not possible to clearly delineate secondary packaging from primary packaging, and therefore secondary packaging is included in primary packaging in the baseline.

› **Tertiary Packaging (**or transport packaging) - packaging conceived so as to facilitate handling and transport of a number of sales units or grouped packaging in order to prevent physical handling and transport damage. Transport packaging does not include road, rail, ship and air containers;

Packaging waste management refers to the final destination of packaging waste: recycling, incineration, landfill, and litter left in the terrestrial and marine environment (i.e. that is not collected). Reuse is not included as a waste destination, and the impact of reuse in the model is to decrease the quantity of new packaging that is placed on the market (and that subsequently becomes waste).

The output of waste generated by packaging type is the result of the merger, collation and cross-comparison of multiple datasets/sources with varying degrees of accuracy and data gaps and tuned to high-level packaging waste statistics as reported to Eurostat. These tonnages (and any data presented at the packaging type level) are a 'model' of the real-world, which provides the best-possible representation of packaging flows in Europe within the constraints of the data and resources available. The results are presented for the EU27 and are the aggregation of underlying data which is calculated separately for each Member State.

Whilst the support study presents a more detailed overview of the model used, it is useful to note the assumptions about the policy drivers in the modelling.

Table 2: Drivers considered for baseline model

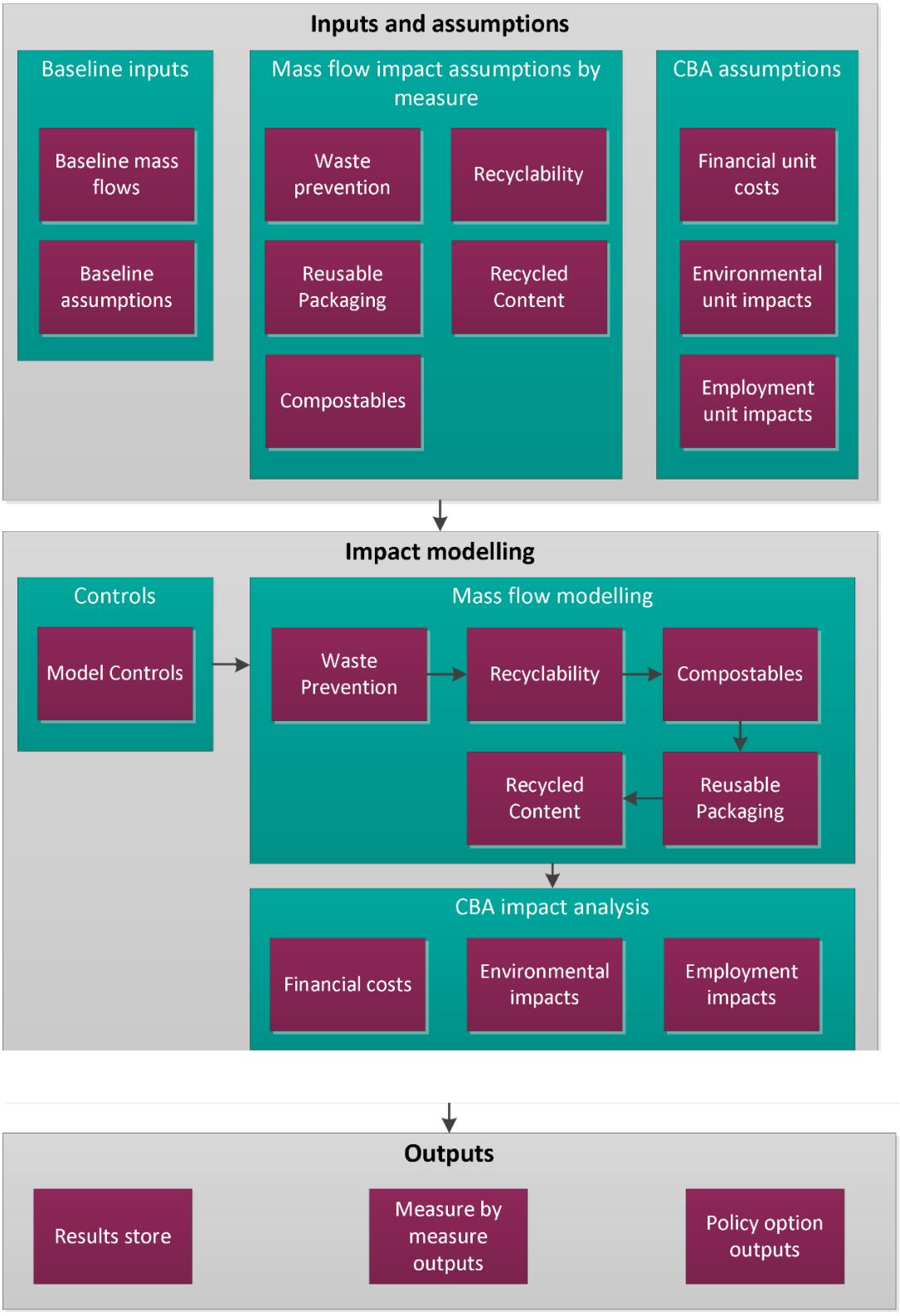
Driver	Impact	Rationale
PPWD targets	High	The targets will drive changes but will not be met.
Waste Framework Directive – Compostables	High	There is a significant possibility that the market for bioplastics will increase in future years.
Single Use Plastics Directive	Low	The method that Member States will choose to achieve the SUPD targets is not clear, and it is not apparent if this will shift behaviour to reusable alternatives.
Modulated EPR Fees	Low	Modulated fees are still in their infancy and the relative fees are not yet known for most Member States. A conservative assumption has been made that significant switches between packaging types will not occur.
Deposit Refund Schemes	Low	We have assumed that DRS schemes are implemented for plastic bottles only, driven by the collection targets set out in the SUPD. Whilst, in reality, other materials are likely to be included in any DRSs implemented, there is no explicit policy driver for this to take place.

Driver	Impact	Rationale
EU Budget Contribution	Low	Member States do not choose to share the burden of the contribution with industry through taxation on virgin materials/ unrecycled packaging, or choose to do so, but to a limited extent that is insufficient to incentivise switches to recyclable packaging design/ types – minimal impact on recycling rates.
Landfill Directive **Waste Framework Directive – Incineration of Recyclables** **Green Claims** **Food Contact Material Rules** **Circular Plastics Alliance** **Sustainable Products Initiative**	Not Included	These changes are not defined in the model – as the model is calibrated based on the overall assumption of meeting recycling targets.

4.1.6. **Impact assessment methodology**

The cost-benefit analysis (CBA) model has been built to quantify the impacts of the measures relative to the baseline (Figure 3). A full description of the impact modelling methodology and assumptions is available in Appendix D of the support study.

Figure 3: Flow diagram of CBA model



Specific modules have been designed for each of the intervention areas, each with the calculations required to model the specific processes that are modified by the measures. The impacts of the measures / combinations of measures for each of the measures have been modelled in a two-stage process.

- Firstly, the impacts on **mass flows** of the measures are modelled, including the consumption, waste generation, and waste management routes for each packaging type, as well as additional data such as recycled content.

- The second modelling stage is to calculate the impacts, including **financial, environmental and social impacts**. Impacts are calculated by applying unit impact factors. These factors are defined in terms of the impacts per tonne, both in financial terms (EUR per tonne), or impacts related to other environmental and social factors (e.g. greenhouse gas emissions, or employment impacts). These are calculated either within the model or sourced from existing data. A program of research will be required to obtain the parameters we need for these unit factors, including literature reviews and surveys with relevant stakeholders.

All impacts show the change driven by the measures relative to the baseline scenario i.e**. impacts relate to the marginal chang**e in GHG emissions, financial costs etc. Where relevant, a selection of outputs is also reported in absolute terms (e.g. the recycling rate before and after the implementation of the measure) in addition to reporting the 'marginal' impact (e.g. the change in recycling rate).

The impact modelling is conducted over the relevant time period for each measure – most measures are assumed to be implemented in 2023, and for the magnitude of impacts to incrementally increase until the policy reaches its 'maximum' level of impact (generally in 2030). Where different timescales are specified in the measure, these timeframes are included in the modelling. In general, 2030 is the most relevant year for comparison with the baseline, with 2040 also providing a useful reference point.

Many of the policy measures have the potential for far-reaching and relatively complex impacts (e.g. across thousands of different packaging types). Furthermore, there are data gaps, for example the commercially confidential nature of much of the cost data required for modelling, and the lack of cost data on emerging technologies. Impacts have therefore been quantified only where there is data available to do so and a suitable methodology can be designed which is consistent with a 'proportionate evaluation'.[10] Where impacts are not quantified, a qualitative approach has been applied to include these in the analysis.

Mass Flow Model- Crossover Impacts

The impacts of the measures on mass flows include a range of impacts, for example, switches from one packaging type to another, changes in recycling rate, uplift in recycled content etc.

The model is set up so that measures can be modelled in isolation ('measure by measure') and also in combination, for the purpose of modelling policy 'options'. It is worth noticing that the measure by measure' analysis does not give a full picture of the impacts since the cumulative impact of the measures cannot be assessed. There is significant crossover in terms of the impacts of the measures which highlights the importance of considering measures in combination. In other words, when multiple measures are modelled simultaneously, the impact of any one measure will not be the same as when this measure is modelled in isolation.

When designing the model, it was therefore necessary to set a 'logical order' for the mass flow calculation modules for each intervention area in a sensible order. Any outputs from calculation modules applied earlier in this calculation chain become inputs for those modules later in the chain. The order of calculation modules is follows:

[10] See Better Regulation Toolbox #45: https://ec.europa.eu/info/sites/default/files/file_import/better-regulation-toolbox-45_en_0.pdf

- Waste Prevention
- Recyclability
- Compostable Packaging
- Reusable Packaging
- Recycled Content

Modelling in this way therefore ensures that modelling of policy options is not just done by simply adding up the impacts of individual measures, but by accurately taking into account the overlaps and crossovers between measures, and their implications.

Waste Prevention and reuse

There is a strong link between the waste prevention and reuse measures, which is particularly evident for measure 2 "Mandatory MS level reduction targets". Table 8 sets out the general specification of this measure, and the modelled 'measures' to achieve reduction targets. Cross-sectoral targets are defined in different terms to the sector by sector targets for reuse and for other waste prevention measures. As can be seen, it is assumed that each intervention area – waste prevention and reuse – provides an equal (50/50) contribution to achieve the targets.

Table 3: Modelling Specification for Measure 2

	Waste Prevention	**Reuse**
Overall reduction target (waste generation per capita by 2030 as a % of 2018 levels)	Measure 2b – 5% Measure 2c – 10%	
Contribution from each intervention area to meeting target	50%	50%
'Measures' modelled to achieve reduction targets	Measure 7 – phase out of unavoidable unnecessary packaging (and subsequent switch to reuse) Measure 5 – Void space limit thresholds Also includes more general reductions in unit weight	Assumes the distribution of increases in reusable packaging is similar to that determined by Measure 8 (reuse targets)

Switches to reuse are modelled using predetermined magnitudes of switches from single-use to multi-use packaging / product types. The model recalculates the degree of substitution needed to increase the number of consumer activities that use multiple-use (rather than single-use) packaging and, therefore, result in a net reduction in waste generation equivalent to the defined targets. As an example, it has been assumed that single-use primary plastic rigid food packaging (e.g. pots, tubs and trays) would switch to multi-use plastic packaging food refill scheme boxes (e.g. Loop): 50% plastic packaging and 50% steel packaging. The complete list of assumptions can be found in the Support study, Appendix D – Impact modelling methodology. The model assumes that the types of changes that will take place (i.e. which packaging /

product types are switched to reusable alternatives more) are broadly similar for both the sector by sector (M8) and cross-sectoral (M9) targets.

Recyclability

An initial review was conducted to determine, for each packaging type, the extent to which:

- The packaging is currently recycled at scale; and
- The packaging could be recycled at scale in the future using existing recycling technology

The first of these criteria aims to define the recyclability of packaging in terms of the qualitative statements put forward by a range of stakeholders. These definitions focus on the ability for a package to be collected, sorted, and recycled, in practise and at scale. Recycling 'at scale' implicitly requires a significant quantity (or proportion) of material placed on the market to be recycled, to meet these criteria. For items that are not currently recycled at scale, the second of these criteria assesses the degree to which recycling at scale would be possible in the future using existing recycling technology. Products such as multi-laminate plastic bags (which may contain two or more different types of polymers, as well as a thin layer of aluminium) cannot be recycled at scale with existing recycling technology. Further advances in recycling technology, such as chemical recycling, would be needed to achieve higher recycling rates. Advances in chemical recycling and increased use of this technology are likely over the next decade or so, and will help Member States to improve recycling rates.

The impact modelling focuses on items types which cannot be recycled using current technology. To achieve 'recyclability' will require redesign/switching to more 'recyclable' packaging types and/or improvement in recycling technology – primarily chemical recycling as well as other innovative technologies. These packaging types are:

– Aluminium (Primary / consumer): Flexibles e.g. foils
– Paper / board (Primary / consumer): Beverage cartons; Non-beverage liquid packaging board e.g. soups; Other paper / board
– Plastic (Primary / consumer): Rigid food e.g. pots, tubs and trays; Other rigids (non-beverage, non-food) e.g. blister packs; Multi-polymer/material stand-up pouches; Other mono/multi polymer/layer flexibles (excl. film); Films; Other (Primary / consumer): Miscellaneous (not included elsewhere)
– Plastic (Tertiary / transport): Film and bubble pouches - e-commerce

The modelling methodology, including the implicit logic modelled for the baseline, is set out in Table 4 below.

Table 4: 'Recyclability' Modelling Methodology

	Baseline	***Scenario***

	Baseline	*Scenario*
Improved recycling collection / treatment based on existing waste management practises	Achieves recycling at scale (and therefore meets recyclability criteria) for packaging types that can be recycled using existing technology.	
Redesign – Including switches to more recyclable packaging types	Increases overall recycling rate sufficient to achieve 55% recycling by 2030	Further switching above and beyond the baseline, driven by requirement for 'recyclability'
Chemical recycling + other advanced recycling technologies	Some rollout, supports attainment of recycling rate targets	Further rollout to improve recycling rates of packaging and meet recycling rate threshold for quantitative definition of recyclability

Recycled Content

For this intervention area, measure 35 'Recycled Content targets for plastic packaging' was modelled in the CBA; however, only the first two variants were quantitatively assessed, which were later discarded.

Mandatory recycled content targets would be established for plastic packaging to be met by operators placing plastic packaging on the EU market by 2030 and 2040. Specific targets have been set for beverage bottles, contact sensitive and non-contact sensitive plastic packaging.

Compostable Packaging

The CBA considered the proportion of material that would be switched from conventional packaging to compostable packaging under Measure 29. The food waste and the compostable plastics were assumed to be treated by a mix of composting and AD facilities, the proportion of which varies across Member States. The starting point for developing these assumptions was the EU Reference Model on Waste which sought data from MS on their future waste treatment infrastructure; proportions were updated based on more recent knowledge of the market (tested with stakeholders) where appropriate.[11]

It is assumed in the baseline that there is a further uptake of compostable plastics even without any changes being made to the Directive. In the absence of any policy intervention, it is assumed that there would be a 2.4% increase in compostable packaging per annum between 2019 and 2024, based on data published by the

[11] Eunomia / CRI (2014) Development of a modelling tool on waste generation and management: Appendix 6 Environmental Modelling, Report for DG Environment

European Bioplastics Association. The model assumes a further increase of the same magnitude between 2024 and 2030.

The following mass flow categories are expected to be affected by the switch to compostable packaging items:

Packaging Unit category	Compostable packaging type
Other mono/multi polymer/layer flexibles (excl. film)	Carrier bags
	Fruit / veg bags
	Tea bags
	Fruit labels
	Plastic film for perishables
Rigid food e.g. pots, tubs and trays	Fast food trays unsuitable for re-use
	Coffee capsules / pods
Films	Films for food trays
Other paper / board	Trays for fruit

A key factor driving scenario impacts in the model is the level of contamination in food waste, measured as a percentage of the amount of plastic in the collected food waste. Assumptions in this respect are shown in Table 5.

Table 5: Conventional Plastic contamination of food waste

	Business as Usual	**Mandate Compost.**	**Ban Compost.**	**Both Allowed**	**Partial Mandate Compost.**
Carrier bags	3.50%	0.20%	7.00%	2.80%	0.20%
Fruit / veg bags	0.70%	0.10%	1.00%	0.56%	0.10%
Fast food trays unsuitable for re-use	0.10%		0.10%	0.08%	0.08%
Tea bags			0.00%	0.00%	0.00%
Fruit labels	0.01%		0.01%	0.01%	0.00%
Coffee capsules / pods	0.10%		0.10%	0.08%	0.08%
Plastic film for perishables	0.20%	0.20%	0.20%	0.16%	0.16%
Films for food trays	0.20%	0.20%	0.20%	0.16%	0.16%
Trays for fruit	0.20%	0.20%	0.20%	0.16%	0.16%

Financial costs model

The financial impacts were modelled across the packaging lifecycle as follows:

- Changes in overall **waste management** costs were calculated by combining separate costs for recycling and residual waste management. It is worth noting that additional costs for one actor can result in a benefit for other related stakeholders (e.g. buyers and sellers) and that many of the policy measures proposed by this study can have a complex impact (e.g. on thousands of different types of packaging). In addition, costs were only quantified where data was available and an appropriate methodology could be designed.
- **Residual waste management** costs for incineration and landfill were obtained from the European Reference Model on Waste Management. [12]
- For **recycling**, we assumed that the most realistic costs were likely to be those from an existing well-functioning EPR scheme, in this case, Fostplus in Belgium[13].
- For **reuse**, five schemes were considered and a methodology was designed to estimate the annualised capital and operational costs of reuse schemes, with cost assumptions derived on a per use basis. The model takes into account that there is a wide variety of reuse schemes that could contribute to achieving reuse targets. These range from large national or transnational schemes (such as DRS), to markets where a multitude of privately run schemes exist to reuse, for example, transport packaging such as pallets.
- For **production and sales costs,** the change in producer turnover was calculated to understand the costs/benefits of the proposed policy changes for producers and buyers of packaging.
- **Costs specific to compostable policy** are based on the relative costs of compostable versus conventional polymers obtained from a Dutch data set.

Environmental impacts

The environmental assessment focuses on impacts for which there is the most reliable data, namely greenhouse gas impacts and air emissions with reliable data on health impacts. The assessment therefore covers the majority of the impacts for which stakeholders generally express the most concern.

The main impacts assessed are: greenhouse gas emissions, air quality pollutant emissions, water consumption, transport and washing of reusable items, compostable packaging.

One of the key assessed impacts is greenhouse gas emissions (GHG), which have been considered throughout the packaging lifecycle:

- **Impacts of manufacturing** comprise both primary energy-related emissions (e.g. from natural gas use) and electricity-related GHG emissions.

[12] Eunomia Research & Consulting (2015) *Further Development of the European Reference Model on Waste Generation and Management,* Report for European Commission Directorate-General for the Environment, May 2015, https://publications.europa.eu/en/publication-detail/-/publication/d188ce6e-9cac-11e5-b792-01aa75ed71a1/language-en

[13] https://www.fostplus.be/en/enterprises/your-declaration/rates

- **The benefits of recycling** were calculated by subtracting the GHG emissions of primary production from those of reprocessing. Reprocessing impacts are a function of the primary energy demand and electricity demand of the processes
- The emissions resulting from the **incineration and landfilling** were modelled using Eunomia's in-house waste treatment models[14], which calculate total process emissions (i.e. direct emissions arising at the facility), indirect energy-consumption related emissions, and energy generation (which displaces generation that would have produced GHG emissions).
- The emissions from **transport, collection and sorting** were calculated based on our experience of waste collection logistics modelling.

Emissions from air pollutants are included in the calculation of total externalities arising from product the product lifecycle. The pollutants accounted for in the modelling are: Ammonia (NH3); Nitrogen oxides (NOx); Particulates (PM2.5 and PM10); Sulfur dioxide (SO2), and; Volatile organic compounds (VOCs).

In practical terms, the emissions affecting air quality from reprocessing are due to the consumption of primary energy and electricity. Emissions from incineration and landfilling of the materials in question were modelled using Eunomia's internal waste treatment models.

Also included in the externalities calculation are the damage costs associated with the GHG emissions, which use the per-tonne emissions costs.

- **Water consumption**: These impacts were also modelled in a similar way as for the GHG emissions, by looking at the impacts per each phase of the lifecycle per material. Data on water consumption resulting from recycling processes and incineration and landfill of materials was modelled using Eunomia's internal models.
- **Emissions related to the transport and washing of reusable items :**The impacts of transporting reusable items from their point of use to the depot or reconditioning centre were modelled assuming an average distance of 20 km from the point of use to the depot and transport by a 12-tonne truck meeting EURO Class 5 air quality emission standards. The number of uses per domestic or industrial wash was assumed based on case studies; and the energy consumed per item in a hand wash or home dishwashing was calculated based on the energy consumption of one wash cycle.
- **Pollutant emissions from compostable packaging:** The future development of compostable plastic polymers is still unknown, which adds complexity and uncertainty to the modelling of environmental impacts. The carbon content of compostable plastic was modelled based on the chemical structure of PLA (polylactic acid: biodegradable polymer in industrial composting), for which relevant data was available.
- **Other environmental impacts** Among the other environmental impacts, impacts associated with emissions to water and soil are excluded from the assessment as there is no agreed methodology for assessing these impacts.

Social impacts

The modelled social impacts refer to **employment gain/loss** for each stage of the packaging lifecycle.

[14] These models are also the source of the data used to develop the European Reference Model on waste, which was used in the impact assessment of the Circular Economy Package for DG Environment.

- Manufacturing jobs were calculated using an approximate methodology, based on a comparison of value added per worker for each material type to producer turnover.
- The employment figures for various treatment and disposal options were sourced from previous Eunomia research conducted for the European Reference Model on Municipal Waste Management.
- The figures for reuse were calculated using the same approach to derive reuse costs, which is based on the five types of reuse schemes.

ANNEX 5: LEGAL ENVIRONMENT

5.1. Legal Basis

The current legal basis of the Packaging and Packaging Waste Directive is Article 114 of the Treaty on the Functioning of the European Union (TFEU).[15] Based on this provision, the Union can take action to ensure the functioning of the internal market.

It is proposed that the legal basis for this initiative remains Article 114 TFEU.

The function of packaging is to ensure "*containment, protection, handling, delivery and presentation of goods, from raw materials to processed goods, from the producer to the user or the consumer*". Most goods require packaging at several stages of their product life. Non-harmonised rules related to packaging can create barriers to the internal market not only for the free flow of packaging, but also for goods and services themselves. One of the main objectives of this initiative is to further detail and harmonise the essential requirements for packaging, which are conditions for placing packaging on the market and should therefore be fully harmonised.

As PPWD is based on Article 114 TFEU, the internal market notification procedure applies for draft national technical rules, as set out in Directive 2015/1535.[16] In the context of these procedures, assessment of various recent national notifications showed that the implementation of some not-fully-harmonised provisions of the Directive, such as labelling requirements under Article 8(2) of the Directive, or vague requirements, such as the essential requirements on packaging minimisation or recyclability, or indeed the implementation of the new requirements on reuse under Article 5 of the Directive, are causing additional cost to industry. Industry is calling for further harmonisation not only to limit cost but also in order to have a clear roadmap of environmental requirements, so that appropriate research and infrastructure investments can be made.

Furthermore, the problem definition of this impact assessment demonstrated further problems hindering harmonised application of packaging rules, which can pose a significant risk of further regulatory divergence leading to suboptimal impacts on the single market and the environment. This includes legislative and practical divergences between Member States on issues such as in particular: (i) understanding of essential requirements under Art. 9 PPWD, (ii) scope of EPR-related reporting, (iii) fee modulation criteria for EPR fees under collective EPR schemes, (iv) classification of reusable packaging as reusable packaging or as waste, and (v) understanding of recyclability of packaging.

The packaging market is one that is characterised by high-levels of cross-border trade between Member States, with many producers placing packaging on the market in multiple Member States. Cross-border movements have further increased with the rise in the use of the internet for distance sales of packaged goods. In the same time, Member States, which have themselves undertaken many environmental and sustainability commitments and are responding to raising public awareness, are unilaterally taking initiatives

[15] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A12012E%2FTXT

[16] Directive (EU) 2015/1535 of the European Parliament and of the Council of 9 September 2015 laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services, (OJ L 241, 17.9.2015, p. 1 – 15), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32015L1535

and regulating packaging related issues. This is leading to divergent approaches which increase the administrative complexity for business operators, particularly those selling across multiple markets. Producers increasingly face the risk of contradictory incentives for similar packaging items across different Member States

In order to achieve a circular economy for packaging in a cost-effective way, it is essential to harness the strength of the internal market. In addition to pursuing internal market objectives, the proposal will contribute to a high level of environmental protection, by unlocking opportunities for the circular, clean and green economy. Therefore, it is appropriate to use Article 114 TFEU as the sole legal basis.

5.2. Nature of the instrument

The evaluation of the Packaging and Packaging Waste Directive and the analysis preceding the impact assessment revealed that more **harmonisation is necessary. This can be better achieved in the form of a regulation**, rather than a directive, as used in the previous approach.

After the expiry of the 2-year transposition period, the 2018 amendment of the PPWD (Directive 2018/852) was not transposed in time by 23 Member States. Almost four years after the adoption of the Directive, 3 Member States have still not transposed the directive (in April 2022). This necessarily implies that such countries are also not implementing measures necessary to meet the new requirements, such has higher recycling rates in 2025. Indeed, preliminary results of the upcoming Commission's Early Warning Report show that many Member States look to be struggling to meet the recycling targets, as a consequence of the combined impacts of above problem drivers.

In considering the issue of subsidiarity in the sense of Article 5(3) of the Treaty on European Union[17] it should be taken into account that the present legislation on packaging already provides for an extensive control over the management of packaging and packaging waste. However, in order to further promote the move to a low-carbon and circular economy, a new comprehensive set of regulatory solutions will need to be put in place. Given the scope and scale of the envisaged measures to be introduced by the initiative its harmonised and correct implementation could pose a significant legislative challenge for the Member States and therefor hinder the circular economy. In order to avoid such a risk, the Commission considered a regulation to be an appropriate instrument to address the environmental challenges related to packaging and waste packaging.

Apart from the above, it has to be noted that uneven implementation of PPWD into national laws lead to creation of fragmented markets across Member States. A patchwork of national transpositions reduced the effectiveness of the policy and put in jeopardy the effective establishment of a circular economy. This situation has been aggravated by the fact that some of the Member States took unilateral action on packaging policies. This, while potentially welcome, brought further challenges for the integrity of the internal market. Individual measures employed by Member States encompassed measures related to binding and non-binding reuse targets, use of Green Public Procurement and/or use of EPR funds to promote reuse. Differing packaging and packaging waste obligations in different areas of the EU set differences of treatments between market actors and induced competitive distortions between EU market actors.

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[17] Treaty on European Union, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02016M%2FTXT-20200301&qid=1645117357771

The existing barriers in the form of differing national regulatory frameworks can only be removed by more detailed, harmonised rules on the organisation of collection and recovery processes and related responsibilities, including rules that should apply directly to economic operators. Only a regulation will ensure that the obligations are implemented at the same time and in the same way in all 27 Member States. Imposition of the same requirements to all market players will reduce the risk of distortion of competition and send clear signals to non-EU market actors, when placing products on the market in the EU allowing fulfilment of the legislative obligations under the European Green Deal and the CEAP. The instrument will also mandate the Commission to develop implementing measures to flesh out the Regulation further, where necessary, allowing for common rules to be set swiftly.

5.3. Articulation with existing and emerging EU policy

The Packaging and Packaging Waste Directive is the main EU-level instrument dealing with placing on the market of packaging and requirements for its end-of life. There are also provisions on packaging or relevant to it in other EU legislation. Given that the review of the PPWD aims at tackling complex phenomenon such as packaging waste prevention, packaging recyclability, bio-based, compostable and bio-degradable packaging, use of recycled content and hazardous substances in packaging, as well as enabling measures, such as labelling for separate collection, packaging related green public procurement requirements and EPR requirements, it is necessary to define the PPWD's articulation with existing applicable legislation, as well as other initiatives relevant for the goals of PPWD. The aim is to prevent duplication so as to minimise the administrative burden for economic operators and authorities.

Table 6 below lists and compares specific aspects of the different initiatives, showing their interaction, with the PPWD revision.

Table 6: Comparison of the PPWD revision with specific aspects of other EU initiatives

1	**EU Taxonomy Regulation and technical screening criteria**[18]
Legislative or non-legislative?	Legislative, voluntary. Status: Regulation in force. Delegating act to be adopted
Brief description	Regulation (EU) 2020/852[19], or Taxonomy Regulation (TR), establishes unified and harmonised criteria for determining whether an economic activity qualifies as substantially contributing to environmental objectives in the EU. This is primarily to enable financial market participants to make and report on sustainable

[18] https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en

[19] Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32020R0852

	investment decisions. The TR is centred on six environmental objectives: climate change mitigation, climate change adaptation, sustainable use and protection of water and marine resources, transition to a circular economy, pollution prevention and control, and protection and restoration of biodiversity and ecosystems. Technical screening criteria are developed for each environmental objective. In order to qualify for inclusion in the EU Taxonomy, economic activities will need to: (a) substantially contribute to at least one of the six environmental objectives, by complying with robust and science-based technical screening criteria; (b) do no significant harm to the remaining environmental objectives; and (c) respect minimum social safeguards, and (d) comply with robust and science-based technical screening criteria that determine what substantial contribution and do no significant harm means for a given economic activity and environmental objective. A delegated act specifying[20] the content and presentation of information to be disclosed by financial and non-financial undertakings was adopted on 6th July 2021. The technical screening criteria will be developed and adopted successively: a delegated act on the two climate-related objectives[21] has already been adopted on 4th June 2021, while the second delegated act for the remaining objectives shall be published in 2022.
Interaction with the PPWD revision	Taxonomy acts have a different scope, but in some respects may prove complementary to the PPWD review's objectives: The TR's aim to provide harmonised criteria for the recognition of projects as environmentally sustainable, and, thus, inter alia, to contribute to a circular economy. The new initiative on PPW, in turn, regulates the EU's management of packaging and packaging waste in order to reduce its negative impact on the environment and its revision strives to better align the packaging market and packaging waste management with the circular economy principles. The "Taxo4" non-climate related delegated act will be adopted in 2022, and will include setting up of technical screening criteria determining the conditions under

[20] Commission Delegated Regulation supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by specifying the content and presentation of information to be disclosed by undertakings subject to Articles 19a or 29a of Directive 2013/34/EU concerning environmentally sustainable economic activities, and specifying the methodology to comply with that disclosure obligation, https://ec.europa.eu/finance/docs/level-2-measures/taxonomy-regulation-delegated-act-2021-4987_en.pdf

[21] Commission Delegated Regulation (EU) supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=PI_COM:C(2021)2800

	which a specific economic activity qualifies as contributing substantially to the transition to a circular economy. Any criteria regarding the packaging industry, or packaging as product, to be specified in such delegated act, will have to be in line with the revised packaging requirements specified in the new PPW legislation and where they are more ambitious be scrutinised not to create barriers to the internal market for packaging and packed products. Article 19 of the TR lying down general requirements for technical screening criteria (including for transition to circularity) requires to build the criteria "where appropriate, upon Union labelling and certification schemes (…)" and to "take into account any relevant existing Union legislation". In this regards, the two initiatives should be coherent in terms of envisaged labelling of packaging and/or any future certification schemes (e.g. for recyclability, compostability, and/or recycled content). Therefore, coherence between the two initiatives should be sought in terms of TR's criteria for substantial contribution towards transition to a circular economy, which could be a liaison point between the two acts for packaging-related industries. Legally, the definitions in the new legislation proposal will take precedence as it is a higher norm in terms of hierarchy of EU legal acts than delegated acts envisaged for the Taxonomy.
2	**Eco-design Directive[22] and Sustainable Products Initiative (SPI) – Eco-design for Sustainable Products Regulation (ESP Regulation)[23]**
Legislative or non-legislative?	Legislative, obligatory. Eco-design directive: Status: Directive under revision SPI Initiative: ESP Regulation envisaged for adoption by the Commission in the first half of 2022 to be followed by implementing measures (delegated acts).
Brief description	The Eco-design Directive[24] is currently under review, to be replaced by the proposed Eco-design for Sustainable Products (ESP) Regulation. The Eco-design Directive establishes minimum product- related and, where relevant, information requirements, for 'energy-related products', on energy efficiency and other environmental aspects. This is being operationalised via implementing regulations

[22] https://ec.europa.eu/growth/industry/sustainability/sustainable-product-policy-ecodesign_en

[23] Proposal for a Regulation of the European Parliament and of the Council establishing a framework for setting ec-design requirements for sustainable products, amending Regulation (EU) 2019/1020 and repealing Directive 2009/125/EC

[24] Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of eco-design requirements for energy-related products, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0125

	per product category, in accordance with regular working plans (currently Working Plan 2016-2019; Working plan 2020-2024 planned for adoption in H1 2022). These regulations, for a given product category, prevent the worst-performing products to enter the EU market. Since the first Circular Economy Action Plan (2015) the Commission systematically includes circular economy aspects (in addition to energy efficiency) in product requirements under the Eco-design Directive, including *inter alia* reparability, durability, upgradability and recyclability when drafting new or revising existing eco-design requirements. The proposal for an ESP Regulation to replace the Eco-design Directive will extend the Eco-design framework beyond energy-related products, excluding food and feedstuff. It will also enable the setting of eco-design requirements for groups of products sharing common characteristics. The ESP Regulation will enable the setting of additional legislative measures which will strengthen products sustainability and facilitate more informed choices for consumers. Eco-design requirements to be set under ESP will be mandatory. The ESP Regulation will enable the setting of requirements that improve information flows through, inter alia, establishing a Digital Product Passport. The Digital Product Passport would give access along the value chain to relevant products characteristics (e.g. durability and reparability of products, presence of substances of concern, handling at the end of life etc.), with differentiated access to consumers, businesses and compliance authorities were appropriate.
Interaction with the PPWD revision	The ESP Regulation will enable the setting of appropriate minimum performance and information requirements for a wider range of physical products, except food and feedstuff. As regards packaging, the ESP Regulation is not envisaging to cover packaging as a (stand-alone) product under it, in order not to duplicate the PPW legislation. However, product-specific delegated acts under the ESP Regulation could include where appropriate aspects of packaging that are specifically related to the design of products, to enable further sustainability gains beyond the reach of the sectoral packaging legislation. In particular measures aimed at minimalizing the amount of packaging used could be considered. The proposed articulation is that the ESP Regulation will allow for the setting, where appropriate, of requirements on the packaging of specific products covered by ESP delegated acts (as already possible under the current Eco-design Directive), while the instrument replacing the PPWD will set cross cutting (essential) requirements for all packaging, with possible differentiation for some specific packaging types. Where packaging for specific product groups might be regulated by delegated acts under the ESP Regulation, this will have to be done in coherence with any definitions and methodologies under the new PPW legislation, and vice

	versa regarding any implementing provisions under the PPW legislation. Coherence should also be sought in terms of the envisaged interaction between the SCIP database (Substances of Concern In articles as such or in complex objects (Products) database) and the IT infrastructure of the Digital Product Passport (DPP) foreseen to be established under ESP Regulation. In line with one of the measures considered under the PPWD revision, the scope of the notification obligation in the SCIP database for articles that fall under the category of packaging could be extended to a broader set of such as those with a harmonised classification under CLP or to "substances of concern", as defined in the Chemicals Strategy for Sustainability. Given such information exchange is envisaged, due account should be taken of any proposed expansions in the scope of information to be notified to SCIP as regards packaging, when planning and designing any future evolution of the database, as well as of the architecture and design of the planning of the DPP to which it could be linked. DPP will not cover packaging as an independent product and, given that the ESP Regulation will not apply to food, it will not address the matter of food packaging. Therefore, the new legislation on PPW should refer to ESP Regulation with respect to DPP for non-food packaging, where necessary. If application of similar instruments proves to be useful also for food packaging, new legislative provisions regarding them should be prepared and adopted. Finally it needs to be ensured, that information requirements related to a product under the ESP Regulation can be clearly distinguished from information requirements related to a products' packaging that might be required under the PPW legislation.
3	**Waste Framework Directive[25] (WFD)**
Legislative or non-legislative?	Legislative, mandatory. Status: Directive in force; last revised in 2018.
Brief description	The WFD[26] establishes horizontally applicable concepts and definitions related to waste generation and waste management, including waste treatment, recycling and recovery. It lays down waste management principles, which should contribute to the reduction of adverse impact of the waste management to human health or the environment, with an emphasis on waste prevention. The WFD defines the waste hierarchy as a priority order waste prevention over reuse and/or recycling, subsequently recycling over other recovery options and final disposal via

[25] https://ec.europa.eu/environment/topics/waste-and-recycling/waste-framework-directive_en,

[26] Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02008L0098-20180705

	landfilling. Additionally, it outlines conditions for waste to be considered a by-product and regulates the end-of-waste status. Pursuant to Art. 9 of the WFD, Member States must undertake actions to prevent waste generation, with measures encouraging the re-use of products, promoting and supporting sustainable production and consumption and reduction of hazardous substances in materials and products. The WFD sets targets for the preparation for re-use and the recycling of waste materials from municipal waste, which were increased in the 2018 revision through the setting of targets for the 2025, 2030 and 2035. The WFD obliges Member States to ensure the functioning of Extended Producer's Responsibility (EPR) schemes, which is a set of measures taken by Member States to ensure that producers of products bear financial responsibility or financial and organisational responsibility for the management of the waste stage of a product's life cycle. The WFD sets up a set of minimum requirements for EPR schemes to that end In the new Circular Economy Action Plan, adopted in March 2020, the Commission committed to take steps towards: - significant reduction of generation of waste, - better use of secondary raw materials and - environmentally sound waste management. The Commission furthermore committed itself to assess feasibility of harmonising the separate waste collection systems in the Member States. With a view to implementing these objectives and in order to comply with the WFD's review clauses, the Commission has launched the revision of the act.
Interaction with the PPWD revision	The primary objective of both the WFD and the PPWD is sustainable management of waste, in order to contribute to circularity. PPWD is broader in coverage in that it explicitly regulates the entire life cycle of packaging from its production to the end-of-life. It also has as its objective the preservation of the internal market, whereas the WFD is currently limited to environmental and human health aspects of waste, in line with the waste hierarchy "*as a priority order in waste prevention and management legislation and policy*" (Art. 4 WFD). The scope of these two legal acts differs also in the sense that WFD lays down the foundations for waste management in a horizontal way whereas the PPWD specifically targets packaging. WFD – being a framework legislation for management of waste – applies also to packaging in terms of its general principles, with PPWD, as *lex specialis,* taking precedence in case of divergence or more specific measures. PPWD is therefore implementing, for the sector of packaging waste, objectives and measures envisaged in the waste framework directive. PPWD sometimes explicitly refers to WFD for certain definitions (e.g. waste, waste management, collection, separate collection, prevention, reuse, treatment, recovery, recycling, disposal, extended producer responsibility scheme) and as regards detailed description of certain requirements (e.g. EPR, separate waste

	collection, waste management plans, etc). Both PPWD and WFD are being currently reviewed, both reviews implementing broader carbon reduction and sustainability commitments from the Green Deal and the new CEAP, but with different timelines for their finalisation. Measures to prevent and reduce the generation of waste and increase circularity of products are at the centre of both reviews. The WFD review's relevance for packaging will for instance relate to possible new definitions of recycling, which will re-consider the role of chemical recycling in the waste hierarchy, possible new requirements and further harmonisation of the separate waste collection and as regards the EPR, in particular for on-line sales. As regards the separate waste collection in context of the new PPW legislation, it is foreseen to provide for a harmonised labelling for consumer sorting of waste. However, as the adoption of the system of labels is likely to be broader than packaging only, it is proposed that the implementing act – envisaged in the PPWD review – and detailing the exact symbols for consumer disposal of packaging is adopted after the revision of the WFD as an overarching measure. Furthermore, both PPWD and WFD will introduce further waste prevention measures and possible targets. Given the early stage of WFD revision, it is premature to speculate on these measures, but it can be considered that the envisaged waste prevention measures targets under the PPWD's review will contribute to the reduction of municipal waste, which is one of the objectives of the WFD's revision. Further, Members States must meet targets for the preparing of municipal waste for re-use and recycling; also under the PPWD, packaging recycling targets must be met. Currently, packaging waste constitutes 1/3 of municipal solid waste, so updating packaging legislation in view of reducing packaging waste generation and increasing and improving recycling, will contribute to meeting the WFD's objectives. For example, under the new PPW legislation, Member States and/or producers will be obligated to ensure that (i) certain plastic packaging placed on the market contains a certain amount of recycled content and (ii) that all packaging is recyclable. There will also be measures requiring better collection and labelling for disposal of packaging. These measures are therefore going to help Member States to meet their targets under the WFD as they are going to ensure more and better quality recycling of packaging, which will reduce residual municipal waste and increase recycling rates. Furthermore, under the PPWD, by end of 2024, Member States are to ensure that producer responsibility schemes are established for all packaging. Article 8a of WFD lays down general minimum requirements for EPR which would also apply to those schemes; providing for transparency, accountability and common principles for cost coverage. The review of the PPWD envisages further harmonisation of certain EPR reporting requirements for packaging, so to ease

	administrative burden for Member States. The initiative furthermore envisages a harmonisation of EPR fee modulation criteria for packaging, thus implementing the mandate under Art. 8a(5), third sub-paragraph, of WFD. The harmonised criteria will be adopted via implementing measures. Further measures to support the effective functioning of EPR schemes are also planned to be considered to apply in a horizontal way under the review of the WFD, in particular to tackle general EPR free-riding of on-line market places participants. This would then also apply to packaging for which it would be highly relevant.
4	**Single-use plastics (SUP) Directive**
Legislative or non-legislative?	Legislative, obligatory Status: Directive in force.
Brief description	The SUP Directive[27] targets the 10 single-use plastic items most commonly found on Europe's beaches, as they represent 86% of SUP items and 43% of all marine litter. The Directive has the objective to prevent and reduce the impact of the littering of certain SUP and fishing gear, on the environment, in particular the aquatic environment, and on human health. The measures envisaged in the SUP Directive are proportionate and were established upon consideration of availability of more sustainable alternatives. Therefore, the Directive prohibits placing on the market of certain SUP items (cotton bud sticks, cutlery, plates, straws, beverage stirrers, balloons sticks, food containers made of expanded polystyrene, beverage containers made of expanded polystyrene and cups for beverages made of expanded polystyrene), and limits the use of other SUP items (cups for beverages, including their covers and lids, and food containers), by other legal instruments, such as design or labelling requirements, consumers' awareness-raising, or introducing waste management and clean-up obligations for producers, including EPR schemes. The SUP Directive obliges Member States to meet separate collection targets for plastic bottles and to ensure that beverage bottles contain the indicated amount of recycled content. Further, the directive prohibits Member States from placing a range of single-use plastics on the market, the only remaining single-use plastic that is related to packaging is polystyrene containers for takeaway food and beverages, which makes up a tiny fraction of the overall market for plastic packaging. Furthermore, as regards consumption reduction for concerned single use plastics, the directive does not provide for specific quantitative targets (the target for quantitative reduction of LPCBs is optional).

[27] Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment, https://eur-lex.europa.eu/eli/dir/2019/904/oj

Interaction with the PPWD revision	Both acts aims to restrict negative environmental impact of certain products present on the European market. While PPWD targets management of packaging and packaging waste, SUP focuses on waste prevention, in relation to single-use plastic products that are most found on the beaches, fishing gear containing plastic and oxo-degradable plastics. From the legal point of view, the two instruments differ in that PPWD is based on the internal market legal basis (Art. 114 TFEU) and SUPD on the environmental legal basis (Art. 192 TFEU). The complementarity between PPWD and SUPD rules is recognized, as both pursue a the same broad policy objective, but the SUPD addresses only a part of all plastic packaging. Some of the products placed on the market, which simultaneously satisfy the conditions for classification as packaging and single use plastics fall within the scope of both acts. Examples of such products include food and beverage containers, beverage cups, packets and wrappers and lightweight plastic carrier bags. As a result, measures provided in those two acts are complementing each other; possible conflicts result from different legal bases, which requires a careful interpretation of the Member States' limits of discretion when implementing various bans and other restrictions for single use plastic packaging, in particular when they want to go beyond the provision of the SUP Directive. The areas of potential interlinkages between PPWD and SUPD are many, in particular, certification, verification and reporting on recycled content targets in plastic packaging, EPR schemes and their scope, collection targets and mandatory DRS, as well as labelling. Of particular relevance are also issues related to the mandate for the future evaluation of the SUP Directive (possible new bans and restrictions for plastic packaging items, consideration of the environmental benefits of change of materials and/or switches to reusable business models, the status of biodegradable plastic packaging). SUP requires attainment of target of 25 % and 30 % of recycled plastic content for certain beverage bottles placed on the market by 2025 and 2030 respectively with an implementing act specifying the related calculation, verification and reporting requirements planned for adoption in 2022 Common solutions will be sought as regards the calculation and verification of recycled content targets. By 2030 the beverage bottles covered under the SUPD are expected to account for 17% of plastic packaging placed on the market but due to the target will be responsible for 32% of the total recycled content used in plastic packaging overall. The lack of a recycled content target for other plastic packaging therefore creates a disproportionate amount of PET bottle recycling (also due to the 90% collection target). PPWD revision envisages harmonisation of the criteria for packaging EPR fee modulation based on design for recycling approaches. The design of this measure

	should take into account if and how it will affect the EPR scheme provided for in the SUP Directive. Member States react with different intensities and some inconsistency in their implementation of the Directive. This has led to the fragmentation of the internal market in the EU with only 13 Member States out of the total having implemented the restriction under the SUP directive[28]. In recent years, several Member State have notified under the TRIS notification system (Directive 2015/1535 on the procedure to prevent technical barriers to trade between Member States) national measures taken to implement the SUPD that clearly deviates from harmonised PPWD measures and represent a barrier to intra EU trade and thus further justify reinforcement of harmonised pan-European measures at the level of PPWD. As regards labelling the two legal acts will in principle not overlap as SUP addresses labelling only for single use plastic products that are not packaging (wet wipes, tobacco products or sanitary towels) while revision of PPWD will aim at harmonisation of labelling on collection and disposal routes for waste packaging. The future revision of the SUP Directive will have to take into account the revised PPWD and any additional restrictions and bans that will be adopted thereunder, as both legal acts can regulate restrictions on plastic packaging items.
5	**Food contact materials**[29]
Legislative or non-legislative?	Legislative, mandatory. Status: Regulation in force and under revision (2023)
Brief description	Materials and articles intended to come into direct or indirect contact with food (Food Contact Materials (FCMs)) are subject to a separate regulatory regime. In order to be placed on the market, the FCMs must be compatible with: ○ general requirements laid down in: (i) **FCMs Regulation**[30]; ○ specific manufacture and marketing requirements laid down in various (ii) **Commission Regulations.**

[28] EuPC, IK, and essencia (July 4, 2022). "EU harmonisation going backwards for the EU Single-Use Plastics Directive's first anniversary." European Plastics Converters

[29] https://ec.europa.eu/food/safety/chemical-safety/food-contact-materials_en

[30] Regulation (EC) No 1935/2004 of the European Parliament and of the Council of 27 October 2004 on materials and articles intended to come into contact with food and repealing Directives 80/590/EEC and 89/109/EEC, https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32004R1935

	The FCMs Regulation outlines a general framework of the FCMs' regulatory regime. The Act sets out generic rules and procedures in terms of safety criteria, labelling, and traceability of the FCMs through all stages of manufacture, processing and distribution. FCM **Regulation** obliges Member States to ensure compliance with the rules on the national level by setting up relevant sanctions for their infringements and ensuring an efficient scheme of official audits inspections. The system so designed provides a high level of protection of human health and consumer safety and contributes to effective functioning of the internal market. The Commission has adopted a number of **Regulations** laying down further, specific requirements for certain FCMs, i.e. plastics (also recycled), ceramics, regenerated cellulose film, and active and intelligent materials. Such specific requirements were established for instance in the Commission Regulation (EU) No 10/2011[31] for plastics. Annex I of this Regulation sets out the Union list of authorized substances which can be employed in the manufacture of plastic layers in plastic materials and articles intended for contact with food. Substances not included in the Union list must go through a permitting process in order to be authorized for use. Similar logic was followed in case of recycled plastic, for which specific requirements were established in Commission Regulation (EC) No 282/2008[32] with the difference that a substance is not authorized by inclusion on an official list in a legal act, but by decisions, which addresses a specific recycling process. Revision of the FCMs legislation was announced in May 2020 as part of the Farm to Fork Strategy. It is intended to accelerate the transition to a sustainable food system and to make food systems fair, healthy and environmentally friendly. FCMs legislation will be revised to improve food safety and public health, and examine ways to create a sustainable food labelling framework. The Commission has launched a revision procedure of the FCMs Regulation with adoption foreseen for Q2/2023. The Regulation as it stands targets individual substances and materials. The revision will refocus on other types of materials (e.g. "organic/synthetic" FCM: plastics, rubbers or "natural" FCM such as wood, paper and board). This approach will improve efficiency of the regulation. To improve FCM's safety and sustainability, the Commission will set up rules aimed at better addressing full characteristics of final materials and articles. The proposed legislation will more thoroughly address the issue of food safety and enhance rules on Good Manufacturing Practice (GMP). In addition, legislation shall focus on all substances that may pose a risk to consumers including non-intentionally added substances. What is more, emphasis will be put on support of safer and more sustainable alternatives. The Commission will focus on development of new methodologies and rules to ensure that new production methods can be assessed more efficiently, and will implement measures expanding rules to support safe re-use and recycling (ensuring that risk of contamination is excluded). Lastly, the new

[31] Commission Regulation (EU) No 10/2011 on plastic materials and articles intended to come into contact with food, https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32011R0010

[32] Commission Regulation (EC) No 282/2008 of 27 March 2008 on recycled plastic materials and articles intended to come into contact with foods and amending Regulation (EC) No 2023/2006, https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32008R0282

	provisions will improve supply chain information to ensure the quality and accessibility of data. Legislative work is also ongoing on the adoption of an act that will establish new specific requirements for recycled plastic and repeal current Commission Regulation (EC) No 282/2008.
Interaction with the PPWD revision	Both legal frameworks address relevant aspects of packaging on the EU market. However, their scope differs as PPWD addresses management of packaging and packaging waste from the environmental perspective, while FCMs legislation focuses on human health and safety aspects of packaging as a food contact material. Thus, primarily food packaging has to meet requirements set up by both the regulatory regimes. The topics where possible legislative overlaps may occur, as they fall within the scope of both of these regulatory regimes are: (i) recycling, (ii) requirements regarding the composition of packaging, (iii) labelling and (iv) reuse of packaging. The PPWD obliges Member States to attain minimum recycling targets for materials contained in packaging waste. The new legislative proposal on PPW intends to additionally impose recycled content targets on economic operators placing packaging on the EU market. At the same time, new requirements to be met during manufacturing of recycled plastic materials and articles before they are placed on the market will be introduced by Commission's new *Regulation establishing specific requirements on recycled plastic materials and articles intended to come into contact with foods.* Particular emphasis will be placed on the source of recycling material that will have to originate from waste collected separately. Autonomous 'separate collection' definition will be introduced for the purpose of this act requiring e.g. business operators to set up quality assurance systems which would ensure traceability of each batch of waste. What is crucial is that the acts will not be compatible with each other as regards the concept of recycled materials — what can be regarded as recycled on the basis of new legislative proposal on PPW may not meet the definition under the food packaging regime. It is not possible to predict at this stage how this new requirement will affect market availability of recycled food packaging material, however its decline cannot be excluded during adaptation period. For this reason, the recycled content targets for plastic packaging will be differentiated based on contact sensitivity, which substantially lower targets set for food contact packaging. The new legislation on PPW will define the term "recyclable". As this definition would not cover determination that the recycled material should be used for the same purpose as it was used primarily, **no inconsistencies** with the FCM legislation on this point have been identified. They may however arise if both legislative acts would include the definition of 'recycler', which will need coordination in the legal drafting phase. In addition, the new PPW legislation

	would include a provision stating directly, that **any packaging being a food contact material, needs also to meet the more stringent criteria established under the FCM Regulation and the** proposed definition of recyclable packaging will include a requirement that whenever possible, a mono-material structure should be preferred and additives should only be used when necessary to perform the core functions of packaging. Both initiatives aim to increase the safety and sustainability of packaging in terms of its composition. Coordination between FCMs and PPWD legal drafting teams in this regard will ensure complementarity and alignment. It is necessary to assure that the assumptions and requirements are not mutually exclusive and, as far as possible, do not adversely affect the objectives pursued by each act. One of the areas where such coordination will be particularly important concerns the introduction of requirements under which some packaging will have to be obligatorily compostable, as some of these applications would be food contact materials. It was agreed to include a rule in the PPWR stating that all compostable packaging, which are FCM, must be compliant also with FCM legislation. The FCMs Regulation sets up rules on labelling and traceability so that products complying with the chemical safety requirements required for FCMs bear a distinctive mark and can be easily distinguished by the consumer. Article 13 in the PPWD requires Member States to provide packaging users with various information relating to the return, collection and recovery systems but there are no existing mandatory requirements on the labelling of packaging as recyclable. Furthermore, Article 8 PPWD provides for harmonised, yet voluntary marking of materials contained in packaging. Revision of PPWD aims at further harmonising labelling related to packaging to ensure that divergent national requirements do not set barriers to the internal market and create competitive disadvantages while at the same time increasing packaging recycling. The most novel will be harmonisation of mandatory labels for consumer disposal of packaging and harmonisation of voluntary labels for recycled content in packaging. This last topic will be moved from the current Commission Regulation (EC) No 282/2008 to PPWD. In addition, labelling of reusable packaging will be introduced in the PPW act, which bears some inpact on the measure contemplated under the revised FCM legislation. As both the packaging and food are excluded from the scope of the ESP Regulation, either of these new acts should contain provisions similar to those regarding Digital Product Passport included in the ESP Regulation. As reuse of packaging, the PPWD revision will set more precise definitions and possible mandates for future standards or implementing measures to promote reuse. It is also being considered to set reuse targets in specific sectors, such as HoReCa and introduce rules on standardisation of reusable packaging formats. The implementation of these requirements and any packaging waste prevention or reuse targets will need to take due account of human hygiene and safety requirements which will be defined in the future revision of the FCMs legislation. It was agreed that DG SANTE will support DG ENV once this part of the legislation is worked on (e.g. standardisation requests), with respect to food packaging, so that such standards cover issues of hygiene, and traceability (labelling). Similarly, DG SANTE will be involved in the preparation of the minimum requirements on the deposit and return systems in the legal drafting phase, to ensure that their policy

	objectives regarding human health protection are properly addressed. Some measures envisaged under the new PPW legislation will enhance the achievement of objectives of the FCM legislation e.g. establishment of mandatory and minimal requirements for DRS would result in obtaining cleaner materials fit for recycling in the meaning of FCM regulations and free from hazardous substances.
6	**Chemicals in products -** **Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)**[33]
Legislative or non-legislative?	Legislative, mandatory. Status: Regulation in force and under revision, to be adopted in Q4 2022.
Brief description	Existing EU chemicals legislation (particularly on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)[34], and on Classification, Labelling and Packaging of substances and mixtures (CLP)[35], complemented via sectoral legislation) offer the legislative tools for regulating the placing on the market, use and, where appropriate, restricting substances in the EU on the basis of chemical safety considerations. REACH aims to ensure a high level of protection of human health and the environment from risks resulting from the intrinsic properties of chemical substances (mostly identified under CLP), as well as the free circulation of substances on the internal market, while enhancing competitiveness and innovation. REACH is organised around four processes, namely the **registration, evaluation, authorisation and restriction** of chemicals. Manufacturers and importers of substances are generally required to gather information on the properties of their chemical substances, which will allow their safe handling, and, for substances produced in quantities exceeding 1 tonne per year, to **register** this and other information in a central database. The European Chemicals Agency (ECHA) is empowered to assess the completeness and compliance of the registrations during

[33] https://ec.europa.eu/environment/chemicals/reach/reach_en.htm

[34] Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02006R1907-20211001

[35] Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02008R1272-20211001

	the **evaluation** process. Most important for the PPWD, the manufacturing, placing on the market or use of a substance (also when included in articles such as packaging) can be linked to information requirements in the supply chain (see section on 'Tracking substances in products'), to an **authorisation** procedure, or to compliance with the conditions of a **restriction**. Authorisation applies to the placing on the market and use of substances of very high concern (e.g. carcinogenic or very-persistent-and-very-bio-accumulative substances), aiming at their progressive substitution by less hazardous substances and by subjecting their use to specific conditions. Restrictions included in REACH Annex XVII prohibit or limit the manufacturing, placing on the market and use of certain substances (varying from a complete ban to a restricted use under specific conditions), including as part of 'articles'. Restrictions can be adopted in case of an unacceptable risk to human health or the environment (Art.68(1)), following a dedicated procedure involving the agency ECHA (Art. 69-73), or, in cases of substances classified under specific categories of carcinogenicity, germ cell mutagenicity or reproductive toxicity and present in consumer articles (Art. 68(2)) The recently adopted Chemicals Strategy for Sustainability[36] announces the targeted revision of the REACH Regulation (as well as that of CLP and sectoral chemicals legislation), which will be limited to achieving the specific aims set out in the strategy (adoption of a proposal is currently planned for Q4 2022). Options include amongst others: o Extending the generic approach to risk management (currently in REACH Art 68(2), restrictions based on hazardousness) to other categories of substances; o Simplifying the authorisation procedure; o Strengthening enforcement. It is important to note that the policy commitments in the strategy do not include any measures to broaden the scope of REACH beyond its current focus on chemical safety of substances, mixtures and articles to include also other sustainability aspects. Therefore, the revision of REACH will not offer a basis to better manage packaging when it becomes waste (waste is excluded from the scope of REACH).
Interaction with the PPWD	Article 11 of the PPWD restricts the use of four heavy metals in packaging (lead, cadmium, mercury and hexavalent chromium), but it does not provide for any

[36] https://ec.europa.eu/environment/pdf/chemicals/2020/10/Strategy.pdf

revision	further specific restrictions on the use of chemicals, Annex II, Section 1, 3rd indent of the PPWD stipulates that packaging shall be so manufactured that the presence of *noxious and other hazardous substances and materials* (….) is minimized (…). REACH does not allow for the restriction of a substance for reasons other than chemical safety even if, in certain cases, restrictions can have an impact beyond safety e.g. lead to an improvement on sustainability aspects other than chemical safety (e.g. recyclability, composability). REACH could be the instrument used to restrict the manufacturing, placing on the market and use of substances of concern used in packaging but maintaining such restrictions under the PPWD is also an option under consideration. The scope in terms of the types of substances concerned and the approach and legal instrument to restrict substances of concern in packaging are analysed in this impact assessment.
7	**Tracking chemicals in products -** **REACH (Art. 33), WFD (Art. 9), and the CLP Regulation**
Legislative or non-legislative?	Legislative, mandatory.
Brief description	The information flow about the presence of hazardous substances on their own or in mixtures in products is regulated by three pieces of legislation: (i) REACH Regulation[37], (ii) Waste Framework Directive (WFD)[38] and (iii) the Regulation on Classification, Labelling and Packaging of substances and mixture (CLP)[39]. Annex VI to the CLP Regulation contains a list of harmonized classifications for around 7,000 hazardous substances. Substances of Very High Concern **(**SVHCs) are specified in the so-called "Candidate List" of substances of very high concern for Authorisation, which is publicly available on a website of the European Chemical Agency (ECHA). If SVHCs are present in an article in the concertation above 0.1 % by weight (w/w), the actor placing the article on the market is required to provide relevant

[37] Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02006R1907-20211001

[38] Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02008L0098-20180705

[39] Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02008R1272-20211001

	information in this regard to: (i) to the next recipient in supply chain and to (ii) European Chemicals Agency (ECHA), respectively, as stipulated in provisions discussed below. Article 9(2) WFD mandated ECHA to establish a database with information on articles containing SVHC. The database is called SCIP (Substances of Concern In articles as such or in complex objects (Products)) and since 5 January 2021 suppliers of articles, including those used as packaging, containing SVHCs in a concentration above 0.1% weight by weight (w/w) must provide the information pursuant to Article 33(1) of REACH to the database. This process is referred to as 'SCIP notification'. Pursuant to Article 7(2) REACH, producers and importers must notify to ECHA SVHCs in articles when the substance is present above a concentration of 0.1% (w/w) and if the substance is present in articles in quantities totalling over one tonne per year. Article 33(1) of the REACH Regulation requires suppliers of articles containing substances identified as SVHC in a concentration above 0.1 % (w/w) to pass on sufficient information on the substances contained in the article (as a minimum, the name of the substances) down the supply chain to allow safe use. Suppliers of articles are also required to provide such information to consumers upon request (Article 33(2) REACH).
Interaction with the PPWD revision	Increasing the sustainability of packaging and the safety of materials recycled from packaging, both for human health and for the environment, may require imposing restriction on substances of concern used in packaging including, for instance, risk management measures either in the product or in the waste phase. In order to identify candidate substances towards potential restrictions in packaging, it is important to have information regarding the presence of certain types of hazardous substances in packaging, including SVHCs. The classification and labelling provisions in CLP Regulation and supply chain information flow requirements in Article 33 of REACH and Article 9 of the WFD all can contribute to obtaining the relevant information to screen and identify such substances currently in use in packaging.
8	**Green Public Procurement**[40]
Legislative or	Legislative, voluntary. Status: Revision of mandate to develop packaging specific

[40] https://ec.europa.eu/environment/gpp/index_en.htm, in particular Communication (COM (2008) 400) "Public procurement for a better environment".

non-legislative?	GPP criteria.
Brief description	Green Public Procurement (GPP) is a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured. EU GPP is currently a voluntary instrument, and Member States and public authorities can determine the extent to which they implement it. Since 2008, the Commission has developed more than 20 common GPP criteria.
Interaction with the PPWD revision	Common EU GPP criteria have been developed for priority products and services identified to be most suitable for "greening" through public procurement (such as: computers, textiles, catering and cleaning services). However, these criteria tend to focus on mitigating the negative impacts arising from the products or services themselves, and do not, in general, include criteria aimed at tackling the impact of any associated packaging. Although in most cases the impact of the product or service outweighs that of the packaging, the impacts associated with the packaging are not negligible and should not be ignored. Whilst packaging requirements have historically featured within GPP criteria for some product groups (for example, criteria for ensuring recyclability and separability of packaging materials, use of packaging materials based on renewable raw materials), more recent updated versions of EU GPP guidance have not included criteria addressing packaging impacts specifically. The new legislative initiative on PPW envisages setting up of mandatory GPP criteria for packaging delivered for public procurement contracts for priority products and services. Other measures were also considered such as setting up of GPP criteria for packaging for all products and services as well as updating of current voluntary set of GPP criteria to include packaging. This will be a change from the currently voluntary system – the GPP criteria which are currently in place are not legally binding on Member States. Reform of this system would require inclusion of a mandate to develop packaging specific GPP criteria in the new legislative proposal on PPW. It is envisaged that JRC would be the entity responsible for developing additional criteria for packaging, which will be implemented via a legal act adopted by the Commission. Such criteria will create an obligation of compliance on the part of the Member States' procurement authorities. As the current GPP criteria a not binding and are mostly outstanding as far as packaging is concerned, there will be no conflict with the current legal set-up.

9	**Plastic Own-Resource**[41]
Legislative or non-legislative?	Legislative, obligatory. Status: Council Decision and Regulation in force.
Brief description	There are four main types of revenues which constitute own resources entered in the Union budget as laid down in Article 2(1) of Council Decision 2020/2053[42]: o "traditional" (such as: Common Customs Tariff, levies, premiums); o the VAT-based (rate of 0.30 % for all Member States to the total amount of collected VAT); o the GNI-based (counted as uniform percentage of Member States' GNI); o plastic own resource. The latter became binding on 1 January 2021. As of that date, Member States are obliged to pay an additional levy to the EU budget based on quantity of plastic packaging waste that was not recycled multiplied by a rate of EUR 0.80 per kilogram. The amount of non-recycled plastic is calculated as a difference between: (i) the weight of the plastic packaging waste generated in a Member State in a given year and (ii) the weight of the plastic packaging waste recycled in that year. The data on quantity of generated and recycled waste comes from Member States' annual reporting performed in accordance with provisions of the Article 12 PPWD and Commission Decision 2005/270/EC[43]. Financial contributions of some of the Member States are subject to a lump sum reduction in order to avoid overcharge of less wealthy Member States. The measure aims at incentivising recycling of plastics and transition towards circular economy. Spain and Italy have since indicated that they intend to generate revenue from plastic packaging introducing a tax rate of €450 per tonne but for all single-use/non-reusable/non-recycled plastic packaging. Both of these could be seen as a reaction to the requirements of the SUPD (consumption reduction) and go partway to paying for the plastics own resource contribution. Exemptions in Italy are limited to medical devices, medicines and compostable plastics, whereas Spain excludes plastic packaging for medicines, sanitary products, food for special

[41] https://ec.europa.eu/info/strategy/eu-budget/long-term-eu-budget/2021-2027/revenue/own-resources/plastics-own-resource_en
[42] Council Decision (EU, Euratom) 2020/2053 of 14 December 2020 on the system of own resources of the European Union and repealing Decision 2014/335/EU, Euratom, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32020D2053&qid=1609775612824
[43] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32005D0270

	medical purposes and infant formula for hospital use.
Interaction with the PPWD revision	The link between the acts lies in the fact that the PPWD constitutes a legal basis for reporting obligation encompassing the data necessary for the calculation of the plastic own-resource, i.e. one of the component of national contributions to EU budget own resource[44]. Member States are legally required to send data pertaining to their packaging generation to Eurostat. This data is obtained by Member States either through EPR schemes for packaging, which oblige national operators to report on packaging and packaging waste management and/or via waste analyses. For the Member States that have not indicated the implementation of a national tax (i.e. the contribution will be absorbed by their own budget), the impact on plastic waste generation and recycling is likely to be very minimal. For Spain and Italy, there will be an incentive from 2023 for packaging producers to incorporate more recycled plastic in packaging as the tax rate is likely to be higher than the increased cost of recycled material. There is also an incentive in Italy to increase the use of compostable plastics although market penetration for these materials is already higher than any other EU country. However, it is unclear how the markets in those countries will respond particularly for applications that are more difficult to include recycled content (e.g. food packaging) . One of the measure envisaged for revision of PPWD is modification of the scope of data transmitted under the EPR schemes with the primary objective of making them more consistent and create a more accurate overview of the EU packaging market. As this might increase the granularity of data reported, it will have a positive impact on the data available to the Member States and the Commission in the calculation of the plastic own-resource contribution. However, the amendment mentioned above should not affect the calculation of the amount of a country's contribution to the EU budget based on the amount of non-recycled plastic packaging waste; the data needed to calculate them will continue to be reported by the Member States. Furthermore, the upcoming definition and methodology of assessment of packaging recyclability will drive up the recycling rate of plastic packaging and help MS meet the plastic packaging recycling targets. It will thus reduce the relative weight of Member States' contribution to the EU budget based on the plastic own resource. Mutually reinforcing, both initiatives will drive down the proportion of non-recyclable plastic packaging put on the EU market.
10	**Green Claims[45]**

[44] https://european-union.europa.eu/institutions-law-budget/budget/revenue_en
[45] https://ec.europa.eu/environment/eussd/smgp/initiative_on_green_claims.htm

Legislative or non-legislative?	Legislative, voluntary. Status: Regulation to be adopted.
Brief description	The Green Claims initiative ("**GCI**") was announced by the European Green Deal, the new Circular Economy Action Plan[46] and the New Consumer Agenda[47]. It aims to ensure that environmental claims are substantiated based on reliable, comparable and verifiable information. The initiative will apply horizontally to claims related to products (goods and services), food and non-food, and organisations, both B2C and B2B. It does not cover social sustainability. The Green Claims Initiative **will introduce a set of minimum requirements for green claims and governance criteria for environmental labels**. These complement the Empowering the Consumer for the Green Transition initiative and its modifications to the Unfair Commercial Practices Directive, namely on practices that are considered unfair in all circumstances. Minimum criteria will be linked to the reliability, comparability and verifiability of information, in line with the objectives of the initiative. The criteria are general, so they apply also to packaging claims: o The initiative will include minimum criteria on claims. They are general, so they apply also to packaging claims: The environmental claim is based on robust, independent, verifiable and generally recognised evidence which considers the latest scientific findings. o The environmental claim is clear and unambiguous regarding which aspects of the product or its life cycle or which aspects of the trader's operation, as applicable, the claim refers to. o Any environmental claim related to future environmental performance shall be based on firm commitments with clear targets and timescales, with involvement of a heterogeneous group of stakeholders and ensured third party monitoring of those commitments. o The environmental claim shall provide a link to the information on which the substantiation of the claim is based. The link may take the form of a weblink, QR code or barcode. This information shall include the method used, whether verification was carried out by an independent party (and if yes, by which party), and proof of the correctness of the claim. The latter may be proved by providing the study, indicators, results and/or explanations underpinning the claim.

[46] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2020:98:FIN&WT
[47] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0696

	○ There must be a link to the additional information on which the substantiation of the claim is based (e.g. method used, whether third party verification is being carried out etc.). In addition, the **Green Claims initiative will introduce requirements of a more technical nature** on how voluntary green claims are made related to products and organizations (including companies). It will include measures on substantiating and communicating voluntary environmental claims on environmental impacts[48] or overall or life cycle environmental performance relying on the PEF and OEF methods[49] or, if existing, related Product Environmental Footprint Category Rules (PEFCR) and Organisation Environmental Footprint Sector Rules[50] (OEFSR). The Green Claims Initiative will furthermore include requirements related to the development of PEFCRs/OEFSRs, to verification, data governance and existing ecolabels. This will in turn lead to an improvement in the reliability, verifiability, and comparability of claims falling within its scope. Within the Environmental Footprint methods, for the packaging industry, the following industry-specific guidelines are recommended for considering recycled content when calculating environmental impacts at the end of life (circular footprint formula): ○ For the container glass industry: the European Commission Regulation No 1179/2012. This regulation requests a statement of conformity delivered by the cullet producer. ○ For the paper industry: European Recovered Paper Identification System (CEPI – Confederation of European Paper Industries, 2008). This document prescribes rules and guidance on necessary information and steps, with a delivery note that shall be received at the reception of the mill. ○ For beverage cartons no recycled content is used so far. If needed, the same guidelines as for paper shall be used as being most suitable (beverage cartons are covered by a recovered paper grade category under the European list of wastepaper grades, EN643). ○ For the plastics industry: EN standard 15343:2007. This standard prescribes

[48] PEF/OEF studies reflect the calculation of the life cycle impacts of a product or organisation along the 16 environmental footprint impact categories. The impact categories covered are: climate change, ozone depletion, human toxicity – cancer, human toxicity – non-cancer, particulate matter, ionising radiation – human health, photochemical ozone formation – human health, acidification, eutrophication – terrestrial, eutrophication – freshwater, eutrophication – marine, ecotoxicity – freshwater, land use, water use, resource use – minerals and metals, resource use – fossils.

[49] Commission Recommendation (EU) 2021/2279 of 15 December 2021 on the use of the Environmental Footprint methods to measure and communicate the life cycle environmental performance of products and organisations.

[50] PEFCRs and OEFSRs translate the requirements of the PEF/OEF methods to a specific product category (e.g. pasta, sparkling wine, batteries) or sector (e.g. retail). Their specific requirements allow to compare the performance of a specific product to a benchmark. The benchmark represents the environmental performance of the average product on the market. Existing PEFCRs/OEFSRs are listed on the website, https://ec.europa.eu/environment/eussd/smgp/PEFCR_OEFSR_en.htm

	rules and guidelines on traceability. The supplier of the recyclate is requested to provide specific information. When using company-specific recycled content (R_1) values other than 0, traceability throughout the supply chain is mandatory. The following general guidelines shall be followed: o The supplier information (through e.g., statement of conformity or delivery note) shall be maintained during all stages of production and delivery at the converter. o Once the material is delivered to the converter for production of the end products, the converter shall handle information through their regular administrative procedures. o The converter for production of the end products claiming recycled content shall demonstrate through its management system the percentage [%] of recycled input material into the respective end product(s). o The latter demonstration shall be transferred upon request to the user of the end product. In case a PEF profile is calculated and reported, this shall be stated as additional technical information of the PEF profile. o Industry- or company-owned traceability systems may be applied as long as they cover the general guidelines outlined above. If not, they shall be supplemented with the general guidelines above. The minimum requirements have implications for environmental labels in general. Although the GCI only applies to voluntary claims (thus, not labels required or regulated by EU law), coherence with best practice should be considered. For example, the GCI will require that a claim always contains a reference to the method used (relevant, for example, for a recyclability label), state whether third party verification was done and include a link (e.g., through a weblink, QR code or barcode) to information substantiating the claim. It encourages numerical values only in cases when they can be compared.
Interaction with the PPWD revision	The PPWD encourages the provision of information for consumers. The GCI is expected to complement the act on PPW and may cover packaging as a final or intermediate product. There are also some interlinkages between the green claims and the initiative on PPW as regards the measuring and traceability of plastic recycled content. The packaging legislative act will mandate the development of a harmonised approach to the calculation, verification and reporting of recycled content in plastic

	packaging. Under the environmental footprint, recycled content is taken into account as input information to calculate the impacts of the packaging material. However, the focus is on the impacts, and it is not meant to "certify" (and therefore substantiate) the recycled content of a product/packaging. In the PEF method, there are references to a few standards when detailing how to take account of recycled content. These standards and rules will be taken into account when developing the packaging related rules, but it is possible that the environmental footprint rules will need to adapt in the future. For certain types of claims (for instance, regarding conditions in which possible comparisons of the environmental performance of the packaging are allowed and can be substantiated by the EF methods), the GCI is expected to act as a *lex specialis.* As regards labelling, the GCI and PPWD rules will be mutually reinforcing. If, in the future, the GCI will prioritise claims related to recycled content and consider introducing detailed requirements (e.g. on how to substantiate, communicate and verify them). It will build upon the provisions related to recycled content in packaging defined in the PPW legislation. Any methodological aspects set up within the context of the initiative on PPW would be considered as a starting point for any methodological requirements to be developed under GCI. At the same time, the EF methods may underpin some of the measure under consideration in the revision of the Directive (such as demonstrate that compostable plastic is the preferred material for a particular application or calculate the minimum number of re-uses to achieve a packaging that performs better environmentally than a single use packaging item). Methodological coherence would therefore be ensured.
11	**Empowering the Consumer for the Green Transition**[51]
Legislative or non-legislative?	Legislative, obligatory. Status: Directive to be adopted.
Brief description	This Directive will aim at: o enhancing consumer information aspects at the point of sale, in particular the fact that consumers lack reliable information for choosing more

[51] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12467-Empowering-the-consumer-for-the-green-transition

	environmentally sustainable products; and o protecting consumers against certain unfair commercial practices in relation to sustainable purchase, such as greenwashing, early obsolescence of consumer goods and non-transparent sustainability labels or digital tools. The measures under the Initiative on Empowering the Consumer for the Green Transition builds upon the existing EU horizontal consumer law framework[9]. Once finally adopted, the initiative will result in targeted amendments by "greening" existing consumer law (i.e. the Consumer Rights Directive and the Unfair Commercial Practices Directive). The initiative regulates the provision of information on the environmental characteristics of products in particular about two aspects relevant to environmental sustainability, namely durability and reparability. Furthermore, it will also explicitly identify certain greenwashing and early obsolescence practices in the "Annex I" of the Unfair Commercial Practices Directive, i.e. the blacklist of commercial practices that are prohibited under all circumstances.
Interaction with the PPWD revision	With certain exceptions, the two consumer law directives amended by this initiative, apply across all economic sectors. Due to their general scope, they apply to many aspects of business-to-consumer transactions that may also be covered by other, more specific EU legislation in different areas. The interplay between the different instruments of Union law is regulated by the *lex specialis* principle. Under this principle, the general consumer law directives apply whenever the relevant aspects of business-to-consumer transactions are not regulated by more specific provisions of EU law. Thus, the general consumer law directives work as a 'safety net', ensuring that a high level of consumer protection can be maintained in all sectors, complementing and filling gaps in sector-specific Union law. The PPWD is such sector-specific Union Law. The initiative will not regulate claims/marking aiming at informing consumers of correct disposal of packaging, as such claims and labelling are envisaged to be covered by the PPWD. The new legislative proposal on PPW will mandate Commission to come up with harmonised symbols for disposal of packaging, matching with marking placed on container/bag where is should be disposed. Implementation of such measure is linked to the review of Waste Framework Directive (and a separate waste collection model harmonisation). The revised PPWD will also include a measure to restrict the ways in which information on the subjects covered by the PPWD labelling measures (material composition, sorting information, reusability, recycled content) can be communicated and prevent MS, EPR schemes and producer responsibility organisations (PROs) from mandating their own labelling systems in these areas. This measure will complement the Green Claims initiative, which will reduce confusion resulting from wider environmental labelling or brand and design

	choices (factors beyond the scope of PPWD).
12	**Policy framework on biobased, biodegradable and compostable plastics**[52]
Legislative or non-legislative?	Non-legislative; adoption envisaged in 2022
Brief description	Policy framework on biobased, biodegradable and compostable plastics will aim to address: o biobased plastics (wholly or partly derived from materials of biological origin e.g. biomass) – BBP and, o biodegradable plastics (plastics with biodegradation properties) and compostable plastics (plastics that only biodegrade in (mostly industrial) composting facilities) - BDCP. focusing on sourcing, labelling and use of BBP that result in genuine environmental benefits, and on use of BDCP plastics that is beneficial to the environment. BBP and BDCP present similarities but also differences, which makes their understanding challenging. Concerning BDCP, current legislation does not ensure access to clear, complete and trustworthy information to consumers and end users. In particular, insufficient information on the type of plastics and associated disposal pathway may lead to wrong disposal choices, which in turn may result in contamination of both recycling streams i.e. contamination of compost by conventional, non-biodegradable plastics and, although to a lesser extent, contamination of conventional plastics by compostable ones, reducing the potential for plastics circularity. Other unintended effects could be reduced environmental concerns (which in turn may lead to more material consumption) and increased littering (it might be more acceptable to litter biodegradable items, and also conventional ones if no distinction is made between similar products). The initiative aims to clarify the role that BBP, BDCP can play in commitments on a carbon neutral and circular economy. It will help improve the understanding of the full lifecycle environmental impacts of these plastics as well as the applications which are likely to be the most appropriate. The following measures will be considered:

[52] https://ec.europa.eu/environment/topics/plastics/bio-based-biodegradable-and-compostable-plastics_en

	○ for both BBP and BDCP - establishing clear definitions and overarching principles; ○ for BBP, clarifying the measurement method and labelling of the part of a plastic product that is entirely or partly derived from biomass (the 'biobased' content); ○ for BDCP, clarifying definitions, applications and criteria for its applications, as well as the role of testing, labelling and certification to ensure effective biodegradation, alignment with actual disposal infrastructure, and better information to consumers. The recommendations set out in the policy framework will take stock of the years of work on BBP and BDCP and guide their use in the European market. The proposal is planned to be published in the Q3 of 2022.
Interaction with the PPWD revision	Both the policy framework and PPW legislation will aim at addressing use of compostable plastics. However, the framework will only outline proposed solutions as to the role of these plastics in a circular economy and the conditions under which their use may be beneficial. It will not make their use mandatory (as it is not legislative in nature). The solutions proposed in the PPWD will be binding on the Member States and require implementation at national level. The ongoing work of both teams is conducted in a close cooperation. The proposed measures (for PPWD) and recommendations (in case of the framework) are developed based on the same scientific materials in order to ensure their reciprocal compliance. The following publications were employed by both of the teams: "Relevance of biodegradable and compostable consumer plastic products and packaging in a circular economy"[53] by Eunomia, and "Biodegradability of plastics in the open environment"[54] by Group of Chief Scientific Advisors. It is important that both instruments remain consistent with the terminology used and that decisions on the general approach to specific issues regarding compostable packaging are taken jointly. It has been agreed on so far that Standard EN 13432 requires an urgent update. Update is necessary in order to specify concepts of biodegradability and compostability, and to ensure that actual composting conditions currently occurring within European biowaste treatment facilities are taken into account. Both acts are intended to improve quality of information provided to consumers through labelling in view of improving recycling, composting and reducing littering of plastic items to the environment. For this purpose uniform and non-

[53] https://op.europa.eu/en/publication-detail/-/publication/3fde3279-77af-11ea-a07e-01aa75ed71a1/language-en/format-PDF
[54] https://op.europa.eu/en/web/eu-law-and-publications/publication-detail/-/publication/0c0d6267-433a-11eb-b27b-01aa75ed71a1

	misleading labelling of packaging is being considered. The policy framework will focus on the easy distinction between BPP, BDCP and conventional plastic, while PPW legislation will aim at harmonisation of labelling on collection and disposal routes for waste packaging. There may be overlaps between the two initiatives in terms of information on disposal of plastic packaging. However, this will be addressed through cooperation between teams.
13	**EU Ecolabel**[55]
Legislative or non-legislative?	Legislative; voluntary
Brief description	The EU Ecolabel is the European Union voluntary label scheme for environmental excellence established in EU Ecolabel Regulation[56]. The award of the label is based on ecological, and for some product categories also social criteria, published as decisions of the European Commission. Aim of the EU Ecolabel criteria is to limit access to the label to those products (goods or services) that are environmentally best-in-class in the given product group (10-20%). The criteria are developed with the participation of scientists, experts and representatives of all relevant stakeholders, such as the competent bodies of MS, manufacturers, representatives of the industry, and environmental and consumer organisations. Methodology for establishment of criteria relies on life cycle assessment (LCA). LCA method allows identification of environmental impacts and processes of importance for a given product category. Every 5-6 years on average, the criteria are revised to reflect technical innovation such as evolution of materials, production processes or in emission reduction and changes in the market. The process of conformity assessment of products and services for the EU Ecolabel is carried out by the national competent bodies notified to the European Commission. EU Ecolabel licenses are issued with a validity linked to the reference Commission Decision, the average duration is of around 5 years. Currently, the EU Ecolabel covers 24 product groups (e.g. detergents, cosmetics, paints, paper, furniture, mattresses, hard coverings, textiles) and 78,071 products in total. The products groups most recently covered by the Eco labelling are: (i) animal care products, (ii) cosmetic products (replacing rinse-off cosmetic products) for which the criteria establishing decisions were published in October 2021.

[55] https://ec.europa.eu/environment/ecolabel/

[56] Regulation (EC) No 66/2010 of the European Parliament and of the Council of 25 November 2009 on the EU Ecolabel, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02010R0066-20171114

Interaction with the PPWD revision	Unlike the PPWD, the EU Ecolabel is a voluntary scheme. Its criteria cover only certain groups of products, and packaging requirements do not pertain to all those groups. The PPWD, in contrast, sets up obligatory requirements which cover all packaging placed on the market in the EU. Packaging related criteria under EU Ecolabel were established for the following ten product groups: - laundry detergents, - dishwasher detergents, - hand dishwashing detergents, - hard surface cleaning products, - lubricants, - industrial and institutional dishwasher detergents, - industrial and international laundry detergents, - animal care products, cosmetic products, footwear. The established criteria covers in particular: - packaging design, - recyclability, - packaging/ product weight utility ratio, - level of recycled content, or - availability of packaging take back schemes. These general types of criteria translates into more detailed requirements. For instance, in case of cosmetics, no secondary packaging for the product is allowed (packaging design), while plastic packaging of lubricants has to contain post-consumer recycled content at the level of minimum 25% (level of recycled content). Requirements stemming from EU Ecolabel Regulation and new legislative proposal on PPW may to some extent overlap. Introduction of new requirements concerning PPW such as mandatory recyclability of packaging or certain uptake of recycled content, if not already included in the EU Ecolabel criteria, may result in inconsistencies that will need to be solved. However, given the voluntary basis of the EU Ecolabel, mandatory legislation would in any case apply to EU Ecolabel products, and to this extent, all EU Ecolabel criteria have the following pre-requisite: "*As a prerequisite the product shall meet all applicable legal requirements of the country or countries in which the product is placed on the market. The applicant shall declare the product's compliance with this requirement*." There could also be a risk of terminological inconsistencies between both acts. For example, term "recyclability" was defined under EU Ecolabel decisions as: *"designed to facilitate effective recycling by avoiding potential contaminants and incompatible materials that are known to impede separation or reprocessing or to reduce the quality of recyclate*". Such wording of term "recyclability" does not correspond to any of the proposed options for a definition of "recyclable" (measures 22a-22c) under the revision of the PPWD. As a result most likely, the EU Ecolabel criteria and definitions will need to be adjusted to the new provisions of PPWD once they come into force. That can be done in two ways - during prospective revisions of the EU Ecolabel criteria for each of the products groups, or through *ad hoc* amendments of Commission's decisions establishing EU ecolabel criteria.
14	**EU marketing standards for agricultural products**

Legislative or non-legislative?	Legislative, voluntary. Status: Draft delegated regulation (planned to be adopted in third quarter of 2022).
Brief description	The EU marketing standards for agricultural products[57] have been established to address the economic needs of the actors in the chain, including consumers of the products concerned. The initiative to revise these standards[58] is aimed at ensuring the uptake and supply of sustainable products and modernising, simplifying or increasing responsiveness to sustainability considerations laid down in the Farm to Fork strategy[59]. It is intended to provide a more significant role to societal issues such as environmental sustainability or animal welfare. This initiative covers revision of several directives and adoption of delegated and implementing acts in the field of marketing standards for agricultural products. The Commission intends to adopt a delegated regulation regarding this matter based on Article 75(2) read with Article 227 of the Regulation (EU) No 1308/2013. These provisions empower it to adopt delegated acts on marketing standards, e.g. on products such as fresh fruits and vegetables (F&V), in order to take into account the expectations of consumers and to improve the economic conditions for the production and marketing as well as the quality of the agricultural products. The Commission is also entitled to establish derogations and exemptions from such standards in order to adapt to constantly changing market conditions, evolving consumer demands, developments in relevant international standards and to avoid creating obstacles to product innovation.
Interaction with the PPWD revision	One of the key issues that the revision of PPWD is to tackle is the problem of the growing generation of packaging and packaging waste, due to the increased use of single-use packaging formats and reduced use of reusable packaging. One of the proposed measures in the PPWD revision will address the issue of 'unnecessary' single-use packaging for F&V. This would be done by a legal provision pursuant to which it will not be allowed to use such packaging for fresh F&V of weight less than 1.5 kg unless there is a demonstrated need to avoid water loss or turgidity loss, generation of food waste, microbiological hazards or physical shocks. Adoption of this measure shall contribute to meeting the waste prevention objective, including supporting the process of switching to reusable or multi-use packaging. It in particular complements, for a specific sector, targets on waste

[57] Regulation (EU) No 1308/2013 of the European Parliament and of the Council of 17 December 2013 establishing a common organisation of the markets in agricultural products and repealing Council Regulations (EEC) No 922/72, (EEC) No 234/79, (EC) No 1037/2001 and (EC) No 1234/2007, OJ L 347, 20.12.2013, p. 671.
[58] Agricultural products – revision of EU marketing standards (europa.eu)
[59] Farm to Fork Strategy (europa.eu)

	prevention. In view of the fact that Member States legislative initiatives providing for such measures have been adopted recently (France, Spain) or are being considered (Belgium), the measure will also provide for harmonisation and avoid obstacles to the Internal Market which would have arisen by diverging Member States provisions at this respect. As this matter will be covered by the PPWD revision, it would not need to be addressed in delegated and implementing acts in the field of marketing standards for agricultural products.

ANNEX 6: THE PROBLEM ANALYSIS

6.1. Problem Tree

The aim of this initiative is to tackle **three groups of highly interlinked problems** related to packaging and packaging waste (Figure 5).

Figure 5 Overall problem tree

Context	**Green Deal – Transition to a lower carbon, circular economy, Plastic Strategy, Circular Economy Action Plan, Zero Pollution Action Plan**	
 **Drivers**	**Market failures** - Externalities and fragmented market - Information failures (unclear labelling) - Suboptimal market structure along the waste value chain	**Regulatory failures** - Delayed / incorrect transposition of current Directive - Essential Requirements poorly designed, unenforceable, and unevenly applied - Difficulties of the Member States to ensure compliance with national recycling targets - SUPD and ORD only cover plastic packaging, and this partly
 **Problems (highly interrelated)**	**High level of and growing packaging waste:** - High levels of avoidable packaging - Increasing single use packaging	**Barriers to packaging circularity:** - Packaging design features that inhibit recycling - Cross contamination of compostable recycling stream - Reuse systems not cost efficient - Inconsistent and confusing labelling

Consequences	**Environmental impacts** - Climate impacts - Littering - Landfill / incineration / export at end life - Presence of hazardous substances	Economic impacts - Inefficient use of resources - High costs of packaging - Inefficient and costly waste management
Objectives	**General objective to reduce negative environmental impacts of packaging and packaging waste and improve the functioning of the internal market** Specific objectives to meet this general objective is: 1. Reduce the generation of packaging waste 2. Promote a circular economy for packaging in a cost-efficient way 3. Promote the uptake of recycled content in packaging	
Polity options	Option 1 – Better standardisation and clearer Essential Requirements Option 2 – **Mandatory targets for waste reduction**, reuse and **minimum recycled content in plastic packaging**, requirements to ensure **full recyclability by 2030** and harmonised product rules Option 3 – Higher mandatory targets and additional product requirements	

The **first group** relates to **high and growing level of packaging waste** These problems are linked to high level of avoidable packaging and the increase of single-use packaging**.** Both the efforts made to **introduce light-weighting material** and the **shift in material use**, particularly from glass to plastic seem some of the underlining causes hampering improvements in packaging and packaging waste.

The **second group** of problems relates to **barriers to packaging circularity** driven by the increase use of **packaging design features that inhibit recycling**, increased **cross-contamination of conventional and compostable recycling streams**, lack of information about **substances in pacakging that may be hazardous** (that potentially constitute a risk for human health and the environment) and **incosistent and confusing labelling** of recyclable pacakging.

The **third group of problems** relates to **low levels of uptake of recycled content in packaging**, which limits the EU's potential to prevent and increase the uptake of recycable packaging. A number of shortcomings in the current regulatory framework are a drag on the profitability of recycling activities and put a strain on investment in technologies and logistic linked to the supply chain to ensure that packaging is available, returned and recycled through better management of distribution. These shortcomings include also a quality risk and a non optimal functioning of markets for secondary raw materials.

6.2. High and growing levels of packaging waste

The Circular Economy Action Plan (CEAP) notes that:[60]

The amount of materials used for packaging is growing continuously and in 2017 packaging waste in Europe reached a record – 173 kg per inhabitant, the highest level ever.

Accordingly, the CEAP states that the Commission will consider measures with a focus on:

Reducing (over)packaging and packaging waste, including by setting targets and other waste prevention measures;
Driving design for re-use […] of packaging, including considering restrictions on the use of some packaging materials for certain applications, in particular where alternative reusable products or systems are possible or consumer goods can be handled safely without packaging;

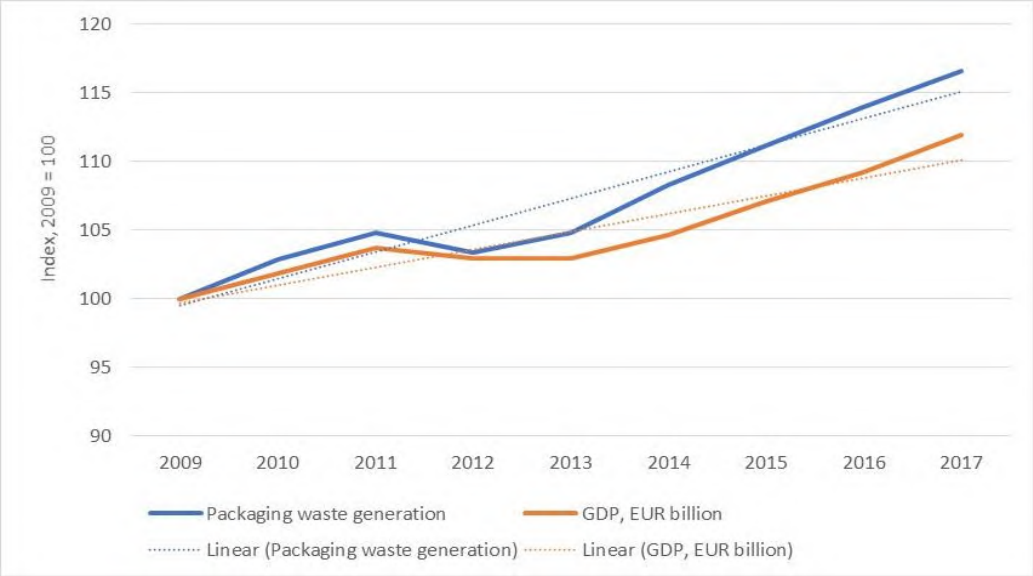
The quantity of packaging generated within the EU has seen a **general upward trend** both in absolute terms and in terms of packaging waste generated per capita since the introduction of the PPWD in 1994.

According to Eurostat, around 69 million tonnes of packaging waste were generated in 2005, and an estimated 77.5 million tonnes in 2017 – representing a **12% growth in tonnage of packaging waste** generated in the EU in this period[61]. Whilst there has been significant economic growth in this period, packaging waste generation is still increasing faster than GDP.

Figure 6. Trends in Packaging Waste Generation and GDP adjusted by PPP, EU (27 countries - from 2020)

[60] European Commission (2020) A new Circular Economy Action Plan for a Cleaner and more Competitive Europe, COM(2020) 98, 11th March 2020, available at https://eur-lex.europa.eu/resource.html?uri=cellar:9903b325-6388-11ea-b735-01aa75ed71a1.0017.02/DOC_1&format=PDF

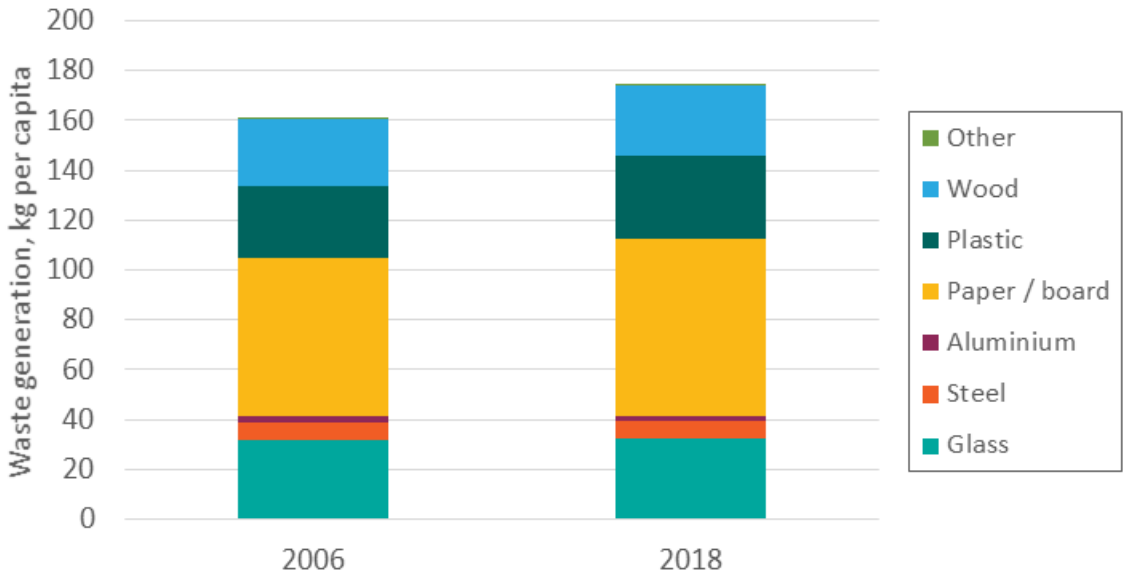
[61] Eurostat *Eurostat - Data Explorer - Packaging waste by waste management operations and waste flow*, accessed 25 April 2019, http://appsso.eurostat.ec.europa.eu/nui/show.do?lang=en&dataset=env_waspac



Source: Eunomia baseline report, Eurostat data

Even when accounting for population growth within the EU, **packaging waste generated per capita** increased from 158 kg per person in 2005 to 174kg per person in 2017 representing a 10% increase over the period (Figure 7).

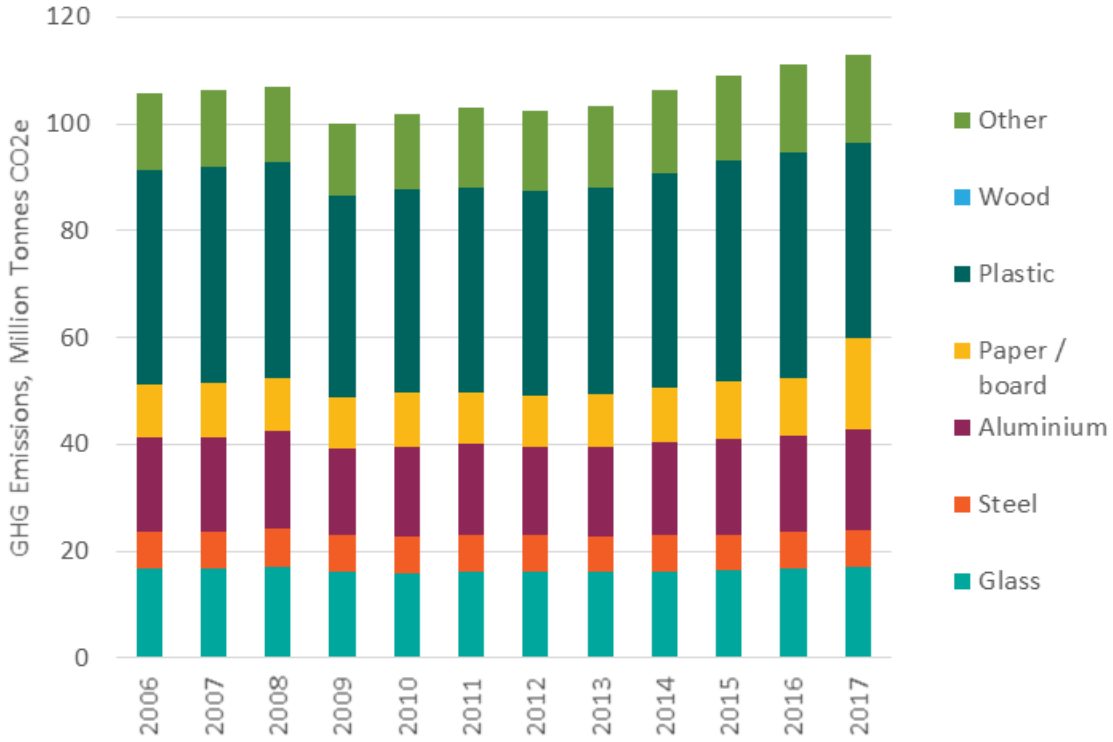
Figure 7. Trend in Packaging Waste Generation per capita (EU-27 countries)



Source: Eunomia baseline report, Eurostat data

The manufacture of packaging, accounting for both resource extraction and subsequent production processes has a significant impact in terms of carbon emissions, as displayed in Figure 8.

Figure 8. GHG emissions from manufacturing for the packaging materials



Source: Eunomia baseline report

Two key elements of this problem are:

- High levels of avoidable packaging ; and
- An increase in the proportion of packaging that is single-use.

6.3. High levels of avoidable packaging

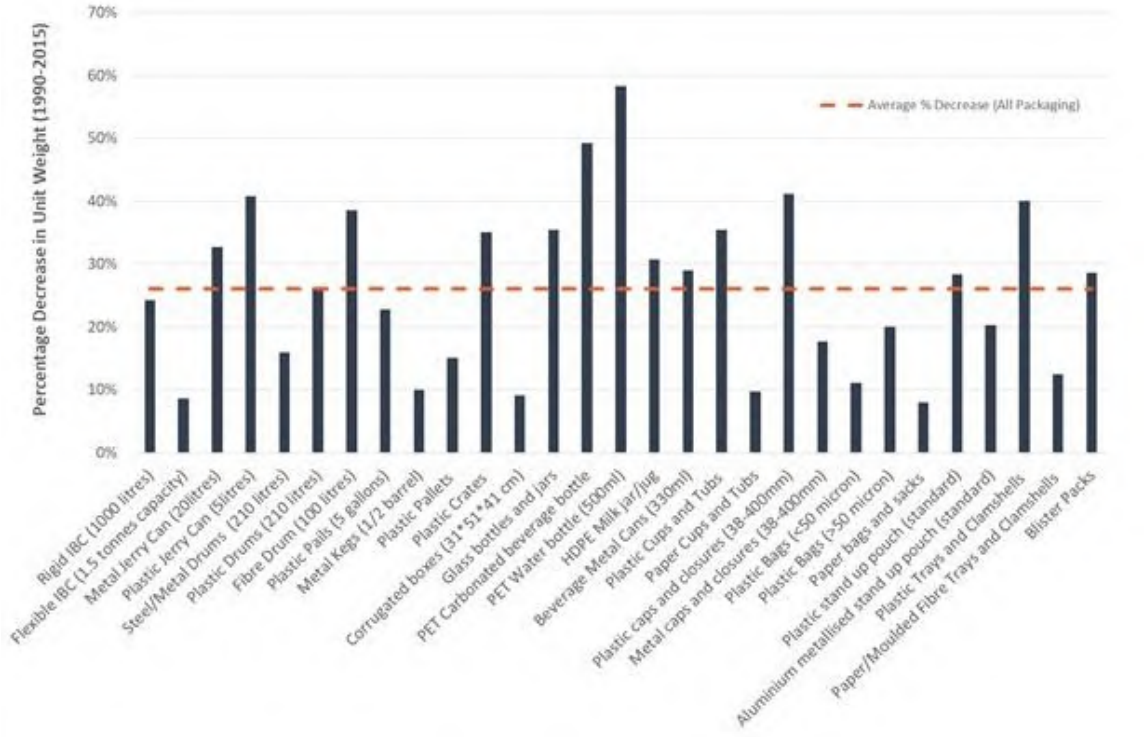
Light-weighting efforts within material categories have **led to a relative increase in packaging material efficiency** (i.e. the amount of packaging by weight used for a certain application) on a per unit basis, and this has helped, to an extent, to stem the increase in overall packaging use.

Heavier packaging materials like glass and metal being replaced by plastic and paper. According to Transparency Market Research (TMR) data, **a decrease in unit weight has been observed across all packaging types between 1990 and 2015**, as shown below[62] reducing by an average 26% in unit weight, with some packaging types reducing by a more significant amount. Moreover, of the packaging types

[62] Transparency Market Research (2018) *Packaging Market - Europe Industry Analysis, Size, Share, Growth, Trends and Forecast, 2018 – 2026*, December 2018

covered, all saw a reduction in unit weight over this period. There are however, limits, to material efficiency improvements. The primary functions of packaging remain product protection, safety, hygiene, shelf life and labelling and continued efficiency improvements at the detriment of these functions would be counterproductive, and as such, **it should not be presumed that light-weighting trends will continue indefinitely** (Figure 9).

Figure 9 Percentage decrease in unit weight by product and material categories from 1990 to 2015



Source: Eunomia baseline report

However, the examples shown below represent averages, and there can be significant variations from the mean in terms of the weight of packaging of a specific material for a certain product type. A good example, but by no means the only case of this is glass wine bottles. The range of bottle weights available from one of the leading global glass packaging manufacturers Owens-Illinois (OI) is shown in Figure 10. While this does not show levels of consumption for each weight class, indications from stakeholders suggests that there more packaging is being used than is strictly necessary for the purposes of product protection.

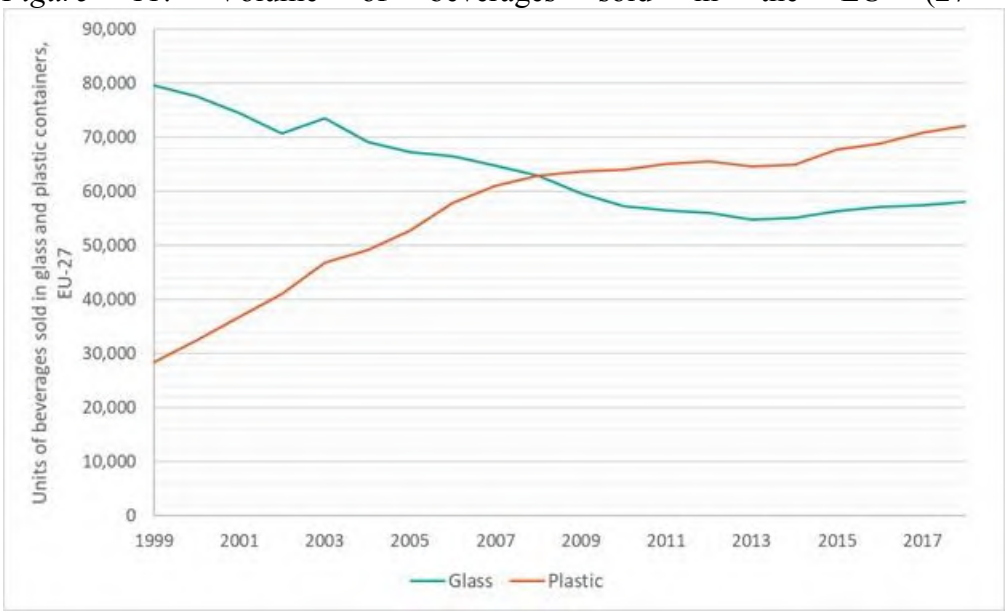


Figure 10: Variation in Packaging Weights of Still Wine Bottles

Source: OI Glass Catalogue

Light-weighting of packaging has been accompanied by a **shift in material use**, particularly from glass to plastic, and particularly for beverages, but these factors together have not led to an overall reduction in the weight of packaging used.

Figure 11: Volume of beverages sold in the EU (27 countries - from 2020)



Source: Global Data

Accordingly, there are still many examples of **packaging that remains heavier and larger than might be considered strictly necessary** for the purpose of protecting the product it contains, as often evidenced by

comparison with the same products from other brands where less packaging is used, and from the extra outer packaging and void space evident in most e-commerce packaging. There remains **significant potential for further reductions**, but in the absence of further interventions this potential seems unlikely to be realised.

6.3.1. **Identified Examples of over-packaging or unnecessary Packaging**

An Online Public Consultation was distributed to relevant stakeholders (companies, associations, EU citizens, non-governmental organisations, etc) in January gathering views on packaging, packaging waste, and reuse options to help inform the assessment of the Packaging and Packaging Waste Directive. Of the respondents, **68% thought that there was either too much or far too much packaging being placed on the EU market**. When asked which categories of products exhibited unnecessary or over-packaging, over two thirds of respondents thought that either cosmetics, ready meals, electronic goods, children's toys had too much or far too much packaging. While there has been a drive from product brands and retailers to lightweight packaging for several decades, evidently there is the perception that there are still instances of unnecessary packaging, packaging that has not yet reached its optimum weight or size. Instances of over-packaging can broadly split into the following categories:

- Functionally necessary packaging which is excessive in terms of its volume or weight;
- Packaging that is unnecessary in that it serves no essential function and could be avoided without the need for an alternative;
- Packaging that could be replaced by a reuse system.

Work by Eunomia for WRAP and other clients, and confirmed by industry experts in the food retail sector[63], has highlighted, for example, that some wine and beer bottles vary greatly in weight, despite having exactly the same functionality. Wine bottles, for example, can vary from 300g for a 75cl bottle, to over 600g for the same volume. Some references[64] give a 'standard' glass wine bottle as 540g (per 75cl) and a 'light weighted' bottle 420g or less. Vinbudin, the state alcohol company of Iceland, allows a search of wine bottles on its website by those that have been light weighted, showing that many have not[65].

In a recent survey by Forbes Insights and DS Smith, 60% of e-commerce executives indicated that more than a quarter of their packaging (25%) is empty space, while separate research across product categories indicated that the empty space in e-commerce packaging ranges from 18% for clothing and footwear to 64% for glassware.[66] According to a recent JRC study, an additional layer of packaging (excluding inner protective materials) provides an additional demand for almost 1.5 million tonnes of cardboard and around 26,000 tonnes of light density polyethylene foil for Europe generated by e-commerce.[67] The JRC study presented a baseline scenario data for 2030, which showed that under the conditions where expected annual revenue growth rates between 2019 and 2021 can be applied for the linear increase of fulfilled units, packaging materials can be expected to roughly double in total for cardboard and LDPE film by 2030.

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[63] Environment Manager, Commercial Team – Food Policy, UK Co-Operative Group

[64] https://www.vinbudin.is/english/home/um_atvr/samfelagsabyrgd-og-umhverfi/tabid-2388/weight-of-packaging

[65] https://www.vinbudin.is/english/home/products/vorur?lightglass=true

[66] Forbes Insights & DS Smith (2018) The Empty Space Economy.

[67] Romagnoli, V., Aigner, J.F., Berlinghof, T., Bey, N., Rödger, J. and Pätz, C. (2020), Identification and assessment of opportunities and threats for the Circular Economy arising from E-commerce. Ed. Orveillon, G., Garbarino, E. and Saveyn, H. Luxembourg, Publications Office of the European Union.

The problem is not confined to e-commerce however, despite the publicity this receives; significant over-packaging issues are evident in the categories of food and drink, home and hygiene, cosmetics, hardware (e.g. home improvement, vehicle maintenance), and consumer electronics [68]. The OPC survey supporting this study showed that 68% out of 280 of respondents considered that there is currently too much packaging (37% indicated too much packaging and 31% indicated far too much packaging) around products placed on the EU market in general, with a particular concern over electronics/electricals, toys, cosmetics, ready meals and fashion accessories (in declining order from 82% to 66% noting too much or far too much packaging).[69]

In France, evaluations of the reduction potential of single-use plastic packaging have been made based on feedback from stakeholders, including Citeo.[70] The findings of this work are summarised in Table 7, in regard to where there is significant potential for reduction.

Table 7 Links and trade offs relating to general objectives

Category	Reduction potential	Of which avoidance and reduced size / weight	Of which reuse potential
Prepared dishes	40%	50%	50%
Fruit and vegetables	40%	Mostly elimination/substitution	Limited potential
Water, Soft Drinks	20%	25%	75%
Savoury groceries	20%	50%	50%
Hygiene/beauty	25%	40%	60%
Home improvement	25%	40%	60%

[68] This reflects the expert opinion of consultees based on market observations, declared priorities by Plastics Pacts, and stakeholder feedback under the OPC.
[69] Source: OPC Question "Considering any online purchases in the last 12 months, please choose a description from the options below that best matches your general impression about the amount of packaging." Valid responses: 280.
[70] Preparatory work for decree 3R – Elements for consultation on the potential for reduction, reuse and recycle of single-use plastic packaging, July 2020.

Category	Reduction potential	Of which avoidance and reduced size / weight	Of which reuse potential
Other (e.g. toys, hardware, electronics)	50%	100%	0%
Secondary packaging	20%	100%	0%
E-commerce	75%	33%	67%
Rigid transport packaging	80%	0%	100%

Source: Citeo

Stakeholder feedback to this current study has broadly acknowledged the potential for further improvement, including strong support from CITEO, and the Consumer Council at the Austrian Standards Institute which had identified many examples of overpackaging in previous studies[71], picking out electronics, toys, cosmetics, software, food and DIY (e.g. home improvement) products with potential for substantial improvement in terms of reduced packaging volume or weight.

While overpackaging can occur in various packaging styles and materials, single use glass is known to be particularly problematic in that glass bottles are bought by style and weight to reflect brand placement (with heavier weight being perceived as equating to higher quality) rather than just functionality. One expert[72] noted that there are three broad categories for wine bottles that are well understood in the wine trade (all 70cl):

1. 290g to 320g for budget/entry-level brands
2. 320g to 360g for mid-range brands
3. 360g plus for high end brands

Further evidence of the wide range of glass bottle weights is found when looking at the range of bottle weights available from one of the leading global glass packaging manufacturers Owens-Illinois (OI - Figure

[71] Packaging waste – Consumer council of the Austrian Standards Institute, March 2005.
[72] Paula Chin, WWF, formerly packaging sustainability at the second largest UK supermarket, Sainsbury

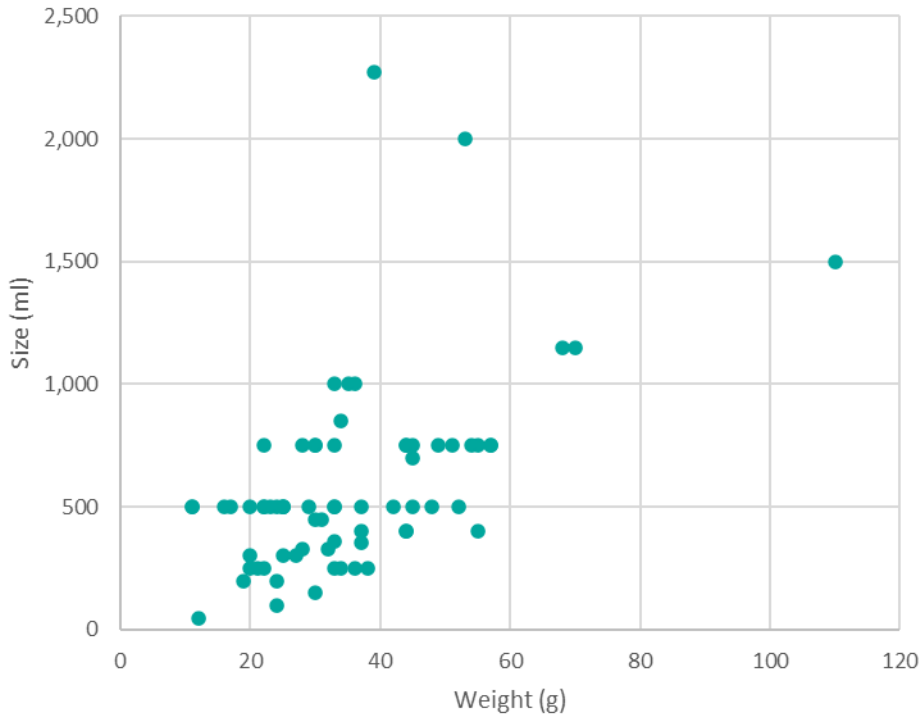
10). The range of weights of their 75CL still wine bottles, 70CL spirits bottles and 500ml beer bottles. Clearly, for each bottle type there is wide variation in bottle weights, pointing to the conclusion that there are significant numbers of bottles being placed on the market for which significant light-weighting could still be undertaken.

A comprehensive 2016 LCA for the Nordic Alcohol Monopolies[73] states that "… *the large variation in the weight of individual packaging for the same purpose shows that reduction in packaging weight is an important improvement option. This is obviously especially important for glass bottles, but also PET bottles, aluminium cans, and Bag-in-Box show large variations in weight for the same volumes.*"

Similar data can be established for spirit bottles (where again weight is perceived as equating to quality) and jars. Malt whiskies and specialist gins are often bottled in 70cl bottles that are in excess of 600g and sometimes over 800g, showing huge potential for reduction. While it can be argued that some alcohol bottles need to be stored for considerable periods, this is perfectly possible with any wine or spirits bottle, all of which have to withstand robust handling in distribution and transport by consumers.

Bottle unit weight data gathered by Eunomia show a very large variation across all plastic and glass bottles (Figure 12 and Figure 13 for still drinks, sparkling showing similar variation), and even within a subcategory like beer and wine in glass or soft drinks in plastic (Figure 14, Figure 15 and Figure 16).

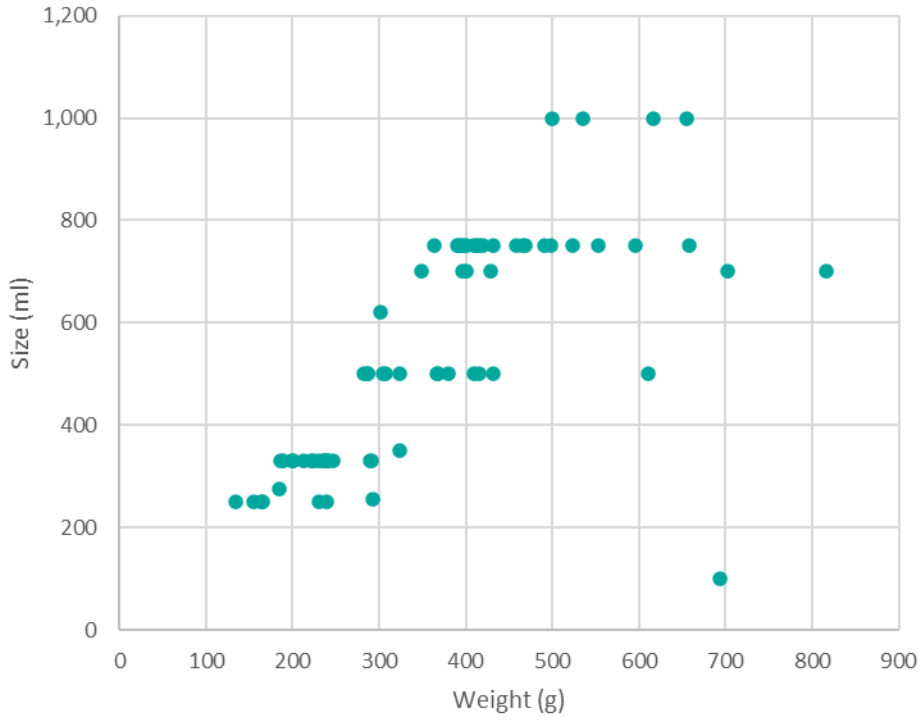
Figure 12 Plastic (still beverage) bottle unit weight variation



[73] Environmental impacts of alcoholic beverages as distributed by the Nordic Alcohol Monopolies 2014, 2.-0 LCA Consultants, 2016

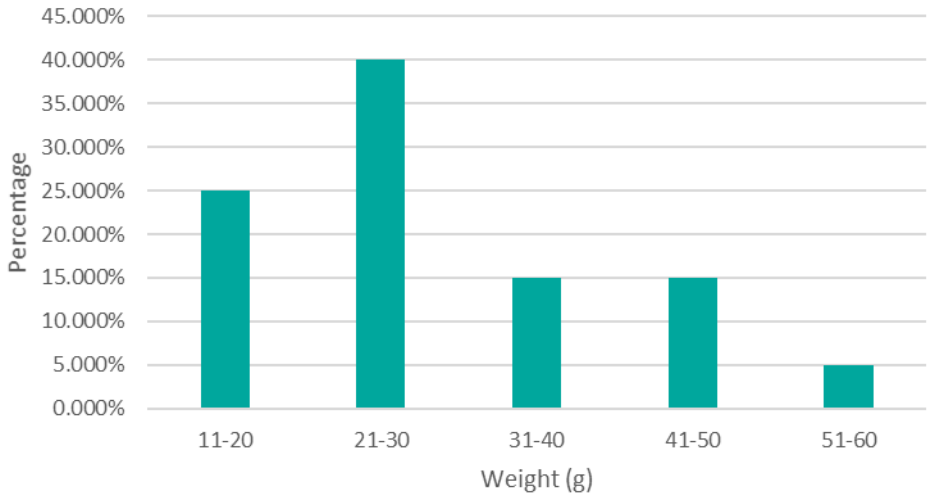
Source: Eunomia sample data

Figure 13 Glass (still beverage) bottle unit weight variation



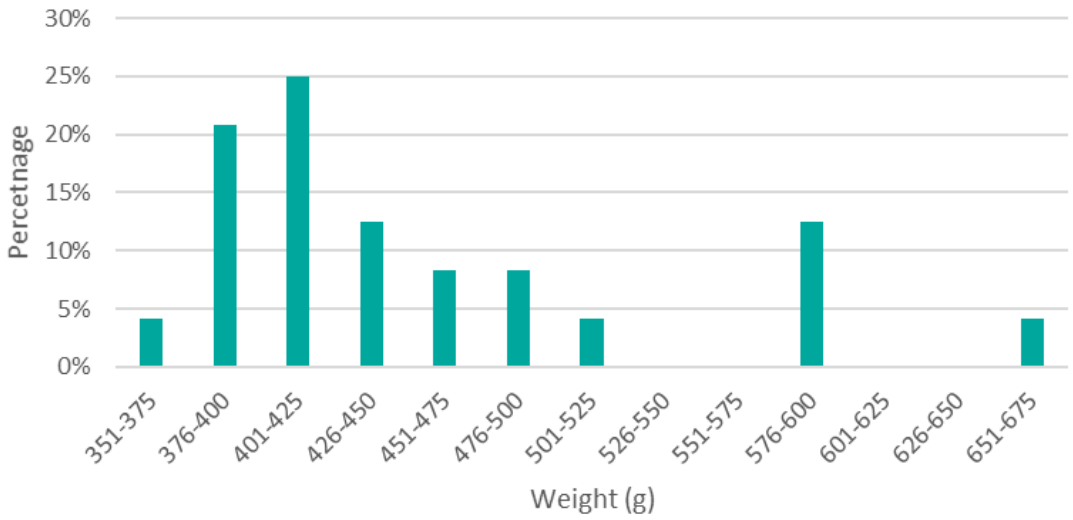
Source: Eunomia sample data

Figure 14 Plastic 500ml (still beverage) bottle weight distribution



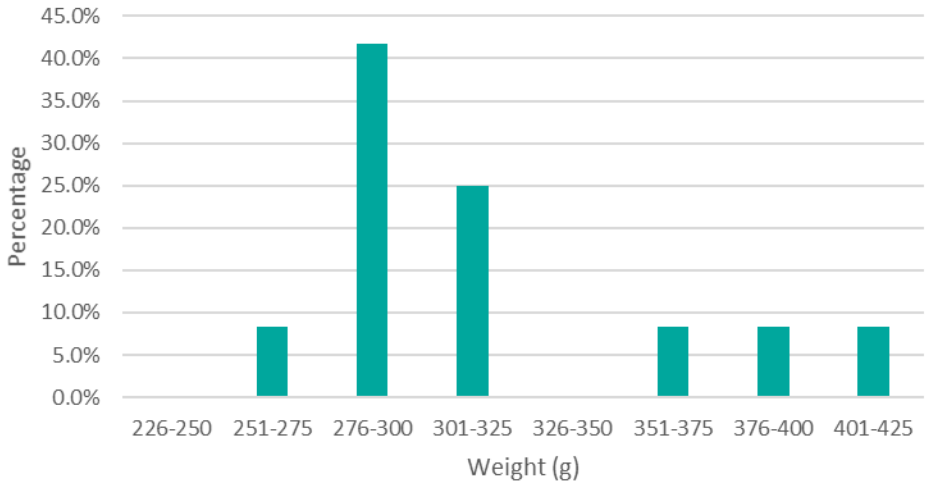
Source: Eunomia sample data

Figure 15 Glass wine bottle (700ml) weight distribution



Source: Eunomia sample data

Figure 16 Glass beer and cider bottle (500ml) weight distribution



Source: Eunomia sample data

There are also some special cases where the product weight is close to or even less than the packaging weight. An extreme example of this is the single serve glass preserves jar as seen below and used in hospitality. In this case the product itself weighs 28g (when the jar is full) whilst the packaging weighs 25g. Additionally, these types of packs often have high quantities of residue, i.e. product that is not easily removed to be eaten, hence resulting in product waste.

6.3.2. **E-commerce sector**

Important incentive for companies is related to savings from reducing empty space. It can lead to lower freight costs, reduced packaging material costs for fillers and potentially also lower unit costs due to lesser material to build a parcel. 65% of executives surveyed by Forbes Insights and DS Smith believed they can achieve a packaging cost reduction of at least 25%, and 62% believed that they can achieve such savings in their logistics costs.[74] DS Smith estimated that this translates into $46 billion globally of potential annual savings. The estimation accounts for potential savings in logistics costs, but it does not include further savings in material reduction or storage and handling costs, for instance (*ibid.*). The packaging optimization can be facilitated by delivery services. Couriers have traditionally priced parcels according to their weight. Based on the findings from interviews, recently, this approach is being replaced by the dimensional pricing. For example, UPS and FedEx instituted dimensional pricing in 2015 in order to save space in trucks and compensate for the revenue lost due transportation of oversized parcels (over-sized parcels took a lot of space, however, the cost based on weight was too little too compensate for the empty space).[75]

Based on the procurement research analysis carried out by SpendEdge, the demand for lightweight packaging is increasing mostly because companies are focusing on reducing the overall weight of the packaging to reduce the transportation cost.[76] The potential for environmental gains is greater in the e-commerce sector than a bricks and mortar supply chain, because there are according to DS Smith at least four times as many touchpoints in this sector.

Additionally, reduction in packaging in e-commerce has advantages because it can improve customer's satisfaction, as there is a growing number of eco-conscious consumers and because households face increasing recycling obligations from their municipalities waste collection services. According to the BillerudKorsnäs Consumer Panel, 64% of respondents (based in 16 megacities around the world) indicated that they may change a product for another one if it clearly provides a more sustainable choice.[77]

E-commerce often comes in for criticism in regards to excess packaging, and this is often because of the automated processes used, and the difficulty and cost associated with storing the multitude of bag and box sizes that would be needed to optimise. While box-on-demand systems are available to create the right-sized box, these are generally too slow for fast moving fulfilment warehouses. There is a positive facet to the move to greater e-commerce however.

Amazon, for example, has for ten years been running its Frustration Free Packaging initiative with suppliers with the aim of shipping single items in their original primary packs, without the need for an outer collation box or bag. While the number of case studies are small compared to huge array of products sold on Amazon, this shows the potential for further minimisation. Amazon has, for example, recently worked with Hasbro, the toy manufacturer, to produce better packaging for a popular toy, thereby reducing the amount of material used and the pack volume by over 50%. Similar work has been done with Fisher Price and other toy

[74] Forbes Insights & DS Smith (2018) The Empty Space Economy.

[75] CMS (N.d.), 6 Practical Tips To Reduce Shipping Costs Even With Dimensional Pricing. Written by Paul Johnson. Available at: https://cms-colorado.com/6-tips-reduce-shipping-costs-even-dimensional-pricing/

[76] BillerudKorsnäs (n.d.), Transport Packaging Optimization Best Practices. Available at: https://www.billerudkorsnas.com/managed-packaging/knowledge-center/articles/transport-packaging-optimization-best-practices

[77] BillerudKorsnäs (2018), Packaging Sustainability for Helpful Brands - Views on the role of brand owners in packaging sustainability. Available at: https://www.billerudkorsnas.com/globalassets/billerudkorsnas/about-us/global-trends/billerudkorsnas-packaging-sustainability-for-helpful-brands-2018.pdf

brands78. This is an interesting example in that toys that are sold from the shelf in a toy shop 'need' to be larger for shelf impact reasons, being attractive to children. Internet shopping avoids the side-by-side comparison and hence allows the pack to be properly sized for its main purpose – product protection.

6.3.3. **Regulatory Drivers**

The cases highlighted as clear examples of overpackaging suggest the regulatory measures used to date have not been wholly effective. Under Article 4 and 9 of the Waste Framework Directive, Member States must implement waste prevention measures but these articles do not specify minimal requirements on the content or extent of these measures. Here are examples of some relevant waste prevention measures reported by Member States in the questionnaire – there were only a limited number of responses, so a more systematic assessment was not carried out:

- In Belgium, the largest 20% of packers/fillers and importers by packaging placed on the market must introduce a packaging prevention plan every three years, with the aim of committing to packaging waste prevention measures. Belgium have also introduced a tax on single use beverage packaging and through the Producer Responsibility Organisation, Fostplus, operates a platform where consumers may report instances of over-packaging.
- In Germany, the legal framework of the German Packaging Act is complemented by voluntary measures. For instance, the Federal Ministry for the Environment has launched a 'round table' dialogue between important producers with the aim of reducing unnecessary plastic packaging. This has led to prominent producers making commitments to reduce their use of plastic packaging.
- In Italy, the Producer Responsibility Organisation CONAI has implemented a number of initiatives with the aim of assisting producers with waste prevention through light-weighting. Examples include 'Prevention Awards' that reward packaging manufacturers who have been able to reduce the environmental impact of their packaging, online tools that allows producers to apply 'eco-design' principles to their products, and an online platform that provides information on good practise in packaging design.
- In Spain, producers are also required to submit packaging waste prevention programmes that include quantitative reduction measures that achieve reductions on a per unit basis.

Whilst the PPWD sets material specific targets for recycling, with an overall target of 65% to be met by 2025, there are no targets in respect of waste prevention but rather the general obligation for packaging to be conform to the 'essential requirements'. PPWD Annex II states that:

"Packaging shall be so manufactured that the packaging volume and weight be limited to the minimum adequate amount to maintain the necessary level of safety, hygiene and acceptance for the packed product and for the consumer".

The Harmonized European Standard EN 13428:2000,[79] compliance with which provides presumption of conformity (how the Essential Requirements were implemented in practice) with the above mentioned requirement for all packaging placed on the market, provides for a procedure for assessing compliance on

[78] https://www.aboutamazon.com/packaging/case-studies

[79] Standards, E. *Packaging - Requirements specific to manufacturing and composition - Prevention by source reduction*, accessed 15 May 2020, https://www.en-standard.eu/din-en-13428-packaging-requirements-specific-to-manufacturing-and-composition-prevention-by-source-reduction/

prevention by source reduction. This procedure relies on identifying one or more **"critical areas",** which are specific performance criterion that prevents further reductions in the weight and/ or volume of packaging. There is little detail in the Standard about how to test and verify the critical areas, but **the performance criteria (equally weighted)** are specified as: Product protection; Manufacturing process; Packing/ filling process; Logistics; Product presentation and marketing; User/ consumer acceptance; Information; Safety; Legislation; Other issues

Assessments should state for each relevant criterion whether this is a "critical area" meaning that no reduction of packaging is possible due to this criterion. Essentially, each of the above criteria outranks the need to reduce packaging at source.

Defining "product presentation and marketing" as a critical area gives suppliers significant latitude to claim that the quantity of packaging is necessary to effectively market the product and hence not infringe the standard. Indeed, in the Member State questionnaire, it was cited that there were many cases of excessive quantities of packaging being used for protection and distribution due to the packaging's marketing needs. Furthermore, the concept of "consumer acceptance" is also contestable, with previous studies concluding that it is "difficult to define or to evaluate". What is acceptable to consumer is a relative concept, of course, and could be used to reflect the desires or needs of a small niche group rather than to reflect a far wider societal need or desire. It should also be noted that "consumer acceptance" does not necessarily prevent reductions in the volume of weight of packaging, as consumers can be concerned by perceived 'over-packaging' just as much as they can be concerned about the convenience offered by a pack for example. While "other issues" is an all-encompassing category and there is no guidance on who should adjudicate upon whether any "other issues" cited are appropriate

Section A.2 of the Standard explains that tests or studies will be used to identify critical areas, however no further information is provided on what form these tests should take or how they are to be verified. Importantly, the procedures taken from the standard series EN ISO 9000 ff and EN ISO 14000 do not contain any clear, quantifiable criterion for reducing the use of packaging. In short, "the minimum adequate amount" of packaging lacks the necessary clarity to be enforceable and the standards do not help determine what can and cannot be placed on the market – so the problem is with both the Essential Requirements and the standard.

Furthermore, in the context of the PPWD, Extended Producer Responsibility (EPR) for packaging has been introduced in most Member States, whereby producers are required to bear the cost of recovery for the packaging they place on the market with fees typically based on the weight of packaging placed on the market. These schemes shall be established for all packaging in accordance with Articles 8 and 8a of the Waste Framework Directive by end of 2024 at the latest (see Art. 7 PPWD), and the existing schemes that have been established before 4 July 2018 shall be made compliant with these provisions by 5 January 2023. In addition to the funding of collection and recycling infrastructure, EPR fees are also intended to drive producers towards minimising the packaging generated by providing a financial incentive to reduce the weight. When expressed in terms of the costs per item of packaging, the costs of EPR fees are rather low and not of the scale to encourage producers to change their choice of packaging, or move to different business models, such as those based on reuse and refill. This is exacerbated in the case of plastic packaging, where despite tonnage based fees being, generally higher than for other materials, the lower package weights in comparison to packaging made from other materials leads to a very low cost per item of plastic packaging. And while the fees as a proportion of the cost of the packaging tend to be low, they are even smaller relative to the cost of the packaged product. Although Member States will be required to modulate their fees even further, the modulation would need to be relatively high in order for the costs of EPR fees to be a significant proportion of the costs of a packaging item and to drive change. In the Member State survey, it was pointed

out that the revenue raised through increased marketing and the resulting increase in packaging would likely outweigh increased costs associated with EPR.

Pharmaceutical packaging

Pharmaceutical packaging was highlighted in Article 20 of the PPWD as an area that may require special measures to address primary packaging for medical devices and pharmaceutical products due to the many restrictions on the design and use of pharmaceutical packaging that provide a barrier to waste prevention, and as such are set out below (no other legislation with packaging specific requirements of this nature was found in the review):

- Pharmaceutical packaging criteria / restrictions are implemented through the following EU legislation:
- Regulation (EC) NO 726/2004 on the authorisation and supervision of medicinal products for human and veterinary use and establishing a European Medicines Agency
- Directive 2010/84/EU amending Directive 2001/83/EC medicinal products for human use
- Falsified Medicines Directive (Directive 2011/62/EU)
- Pharmacopoeia (European Pharmacopoeia)
- Also some international guidelines are applicable to pharmaceutical packaging:
- ICH note for guidance on stability testing: stability testing of new drug substances and products (ref: cpmp/ich/2736/99)
- WHO guidelines on stability testing of pharmaceutical products containing well established drug substances in conventional dosage forms
- WHO - general aspects of packaging

Registration procedure: After the clinical trials, the registration authorities will decide whether a drug substance and the primary (immediate and outer) packaging can be admitted to the market. The primary (immediate and outer) packaging is an integral part of the registration file and thus will be the subject of a thorough investigation (integrity and stability of the drug substance, patient compliance etc.). The registration procedure is stopped in the case that the packaging was insufficiently tested or does not meet the abovementioned requirements of public health.

Stability study: The mandatory stability studies need to demonstrate that the packaging guarantees the integrity and full stability of the drug substance, and this during at least the shelf life of the drug substance. Next, the primary packaging should be adapted to the specific physical characteristics of the patient (e.g. user-friendly for an elderly person, adequate protection for children).

Product standards: Product standards for pharmaceuticals include standards for their packaging. Packaging standards are related to the protection of the drugs from temperature fluctuations, storage or use. An important criterion therefore is e.g. the sturdiness of the packaging. These standards result in little freedom in the choice of primary packaging of pharmaceuticals. Some examples:

- recycled glass as primary immediate packaging is explicitly prohibited;
- the primary outer packaging cannot be made entirely from recycled cardboard because recycled cardboard is less sturdy and the medicinal products are less protected;
- blister packs are usually only manufactured with multiple inseparable layers in order to create an adequate barrier for external organisms.

Multifunctionality**:** The primary packaging of a medicine has a specific role and in most cases must be able to perform several functions at the same time. Packaging prevention is therefore limited to the extent that these different functions can be fulfilled. The following functions are deemed essential:

- Distribution: transport must be possible without damage or deterioration and must also be able to withstand handling by the patient.
- Hygiene: protection of the active substance of the medicinal product throughout its shelf life. The packaging must therefore contribute to ensuring good hygiene of the product.
- Portioning: design in such a way that a correct dosage can be administered.
- Information: contains legally defined information, such as the expiry date, lot number, manufacturer's name, brand name, active substance name and information on the correct use of the medicinal product.

Storage of the product: protection against external influences (light, humidity, air, temperature differences, etc.). The primary (immediate and outer) packaging must offer protection against external influences (light, humidity, air, temperature differences, etc.).

Safety conditions: pharmaceutical legislation requires additional safety requirements to be met by a particular form of packaging due to the risks associated with the misuse of medicines.

Problem Evolution

Understanding in what way the generation of packaging waste has evolved and thus may evolve further in the future is challenging. As discussed above, there are many influencing factors. Population is one factor, and as the population in the EU is expected to increase, other things being equal, waste generation would continue to go up.[80] This in itself is not a 'problem' per se, as it is normal for waste generation to be correlated to population. However, packaging waste generation per capita has also increased due to changes in the population's household composition as well as to rising levels of goods consumption and increasing packaging intensity in certain market areas (incl. e-commerce). As GDP has increased across Member States, so too has consumption, with waste not yet fully decoupling from GDP across all Member States. With these drivers in mind, the levels of packaging waste generated are likely to continue to increase.

In addition to the increased consumption, the increasing demand for convenient products, including purchasing through e-commerce and on-the-go consumption is not forecast to reduce in the future. The European flexible packaging market is set to grow at an annual rate of 2% over the next three years, [81] and one source suggests the e-commerce market for packaging will grow at a rate of 5.59% in the years to 2023 in Europe,[82] which in the light of Covid-19 may be an underestimation. The unit weight of packaging has reduced significantly since the introduction of the Packaging and Packaging Waste Directive; however, there are physical limits to how much more can be achieved especially considering the tendencies going in the opposite direction of more packaging consumption.

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[80] Eurostat, E.C. (2019) *The EU's population projected up to 2100*, accessed 7 May 2020, https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20190710-1

[81] Packaging News (2019) *European flexible packaging forecast to grow to €16bn by 2023*

[82] *E-commerce Packaging Market in Retail Industry 2018 Ongoing Trends - Reuters*, accessed 29 April 2019, https://www.reuters.com/brandfeatures/venture-capital/article?id=34305

These trends may get a counterweight in the increasing concerns of national regulators and consumers regarding over-packaging and packaging waste in general. As has already been stated, though, whilst there is greater public awareness of environmental issues, it is not certain to what extent this will have impact on consumption trends, with consumers likely to hold producers primarily responsible for realising the reduction in packaging waste. There is evidence that industry groups are beginning to make commitments on the absolute reduction of packaging waste placed on the market. The Plastics Pact is a network of regional and local initiatives initiated by the Ellen Macarthur Foundation that connects stakeholders to implement circular solutions for plastic packaging waste.[83] Through this, national networks have been set up in Portugal, France, the Netherlands, and Poland, with members – both national authorities and industry as well as other stakeholders - making pledges to reduce their use of plastic packaging. In this context, the signatories of the Dutch plastic pact have pledged to reduce their use of plastic packaging by 20% per kilogram of product by 2025. Furthermore, a wide European network of stakeholders has been initiated, with a core aim to prevent and reduce over-packaging and packaging waste; the European Plastics Pact has set the target to "*reduce virgin plastic products and packaging by at least 20% (by weight) by 2025, with half of this reduction coming from an absolute reduction in plastics*".

These types of industry initiatives have resulted in companies making further voluntary pledges. Notably, Unilever has pledged to halve its use of virgin plastic by 2025, by reducing its absolute use of plastic packaging by more than 100,000 tonnes, although if this is achieved through switching to heavier materials, this may not result in a reduction in packaging. Similarly, Aldi has pledged to reduce its use of plastic packaging by 25% by 2023. The majority of industry pledges have, however, focused on ensuring all packaging is reusable or recyclable, whilst refraining from making reduction pledges.

The Ellen Macarthur Foundation identify further examples of producers eliminating packaging components from their products in their Global Commitment 2020 Progress Report.[84]

An example of direct elimination was provided by ASOS, the fashion retailer, who removed plastic hangers, swing tickets, and plastic kimbals from some of its brands. These components were largely superfluous and were not essential to the protection of those products. Indeed, as an online retailer, there is less need to use packaging to market products.

In the food and drink sector, producers such as Mars Incorporated, Kesko Corporation, and Barilla G.e R. Fratelli SpA are eliminating plastic windows from some of their products including boxes of rice, bread packaging, and pasta boxes. These plastic windows serve a marketing function by allowing the consumer visibility of the product and do not provide a product preservation function.

Cosmetics producers such as Natura Cosmetics and L'Occitane en Provence raised the elimination of seals and shrink wrap as a method of removing unnecessary packaging. Whilst some products do require seals to extend the lifetime of products, this is often not the case and in the case of shrink wrap, it is often used to sell multi-packs together when arguably, these products could just as easily be sold individually.

[83] Ellen MacArthur Foundation *Plastics Pact*, accessed 30 June 2020, https://www.ellenmacarthurfoundation.org/our-work/activities/new-plastics-economy/plastics-pact

[84] Ellen MacArther Foundation (2020) *The Global Commitment 2020 Progress Report*, accessed 9 November 2020, https://www.ellenmacarthurfoundation.org/assets/downloads/Global-Commitment-2020-Progress-Report.pdf

The retail company Ahold Delhaize, who operates in several Member States, is trialling the sale of unpackaged fresh fruit and vegetables, using an innovative technique involving the spraying of produce with a 'dry, fine mist' that extends the lifetime of the produce. This is claimed to potentially save 270 tonnes of packaging each year. In a similar vein, this retailer is also replacing the stickers used on fresh fruit and vegetables with 'natural branding' saving 13 tonnes annually of plastic packaging

The cross-border aspects of some of the problem drivers present challenges for solutions at the national level, which is being highlighted in particular by industry. Firstly, according to multiple industry members, the level of cross-border e-commerce is increasing more rapidly than domestic e-commerce. Measures implemented at a national level to ban specific packaging types or materials place additional burden on producers who sell products across the EU, who would be required to use multiple packaging types to comply with a range of national requirements, depending on the scope of the national measures. Measures taken to address over-packaging, such as standards or minimum dimensions, will be difficult to enforce across borders and as such may negatively impact the competitiveness of domestic companies. Similarly, if waste prevention targets that apply to producers are implemented, non-domestic companies for whom the targets do not apply, may be given a competitive advantage. Such measures have therefore been criticised by industry as potentially undermining the functioning of the single market and the freedom of movement of packaged goods.

Impact of Covid-19 On the Generation of Unnecessary Packaging Waste

The restrictions placed on consumers and businesses through the course of the Covid-19 crisis has severely impacted levels of consumption across the EU. The household saving rate in the EU recorded its all-time highest year-on-year increase in the first and second quarters of 2020. This was largely due to significant reduction in household consumption expenditure, which in the second quarter, was 17.6% less than in 2019.

However, whilst household expenditure has fallen across Europe in 2020, it does not necessarily follow that the generation of packaging waste has fallen too. Indeed, in Ireland whilst there was a fall in commercial waste generation of 50% between March and May, this was offset by increases in residual waste and recycling of 19% and 8% respectively. With citizens spending much more time at home, the sales of groceries rose by 25% and likely drove this increase in waste generation. Furthermore, whilst under the strictest lockdowns all hospitality venues were required to close, when restrictions were eased many hospitality businesses turned to offering take-away, leading to increases in demand for service packaging from these businesses.

The Covid-19 crisis has been an accelerator for some pre-existing trends. E-commerce was already gaining market share, however since the beginning of the pandemic the B2C online sales of physical goods have experienced a surge of demand in certain products, particularly for medical supplies, household essentials and food products. In addition to the primary packaging surrounding the products, additional transport packaging is now being generated of and disposed of too.

All in all, the reduced consumption in several household expenditures during the pandemic has been by far overcompensated by increased sales in supermarkets for food consumed at home instead of restaurants, more take-away/prepared home delivery of food and internet sales, which further increased the generation of packaging waste.

As discussed, existing regulations have weaknesses with regards to the prevention of packaging waste, and will need to be strengthened in order to reduce unnecessary packaging. The Waste Framework Directive (WFD) instructs Member States to take waste prevention measures on multiple occasions. Article 4 WFD mandates Member States to encourage options that deliver the best environmental outcome in accordance with the waste hierarchy:



2. *When applying the waste hierarchy referred to in paragraph 1, Member States shall take measures to encourage the options that deliver the best overall environmental outcome. This may require specific waste streams departing from the hierarchy where this is justified by life-cycle thinking on the overall impacts of the generation and management of such waste.*

Furthermore, according to the 2018 modification of the Waste Framework Directive, under Article 9, Member States are required to implement further waste prevention measures covering a large number of waste areas. Whilst packaging is one of the areas that Member States are asked to target, the Article does not specify what measures should be taken and leaves Member States significant latitude to choose the measures taken. As evidenced earlier, Member States have not taken a consistent approach with differing levels of effectiveness. Similarly, Article 29 requires Member States to adopt National Waste Prevention Programmes, in which they were advised to set quantitative targets and indicators for the reduction of waste. Whilst many of these plans do set quantitative targets for the reduction of municipal waste generation,[85] this is not specific to the generation of packaging waste, and the measures involved often relate to other aspects of municipal waste, such as the separation of food waste.

[85] Magrini, C., D'Addato, F., and Bonoli, A. (2020) Municipal solid waste prevention: A review of market-based instruments in six European Union countries, *Waste Management & Research*, Vol.38, pp.3–22

Article 4 of PPWD sets out additional waste prevention measures related to packaging and refers to the WFD:

> *1. Member States shall ensure that, in addition to the measures taken in accordance with Article 9, other preventive measures are implemented in order to prevent generation of packaging waste and to minimise the environmental impact of packaging.*
> *Such other preventive measures may consist of national programmes, incentives through extended producer responsibility schemes to minimise the environmental impact of packaging, or similar actions adopted, if appropriate, in consultation with economic operators, and consumer and environmental organisations, and designed to bring together and take advantage of the many initiatives taken within Member States as regards prevention.*
> *Member States shall make use of economic instruments and other measures to provide incentives for the application of the waste hierarchy such as those indicated in Annex IVa to Directive 2008/98/EC*[86] *or other appropriate instruments and measures.*

In order to tackle the growing amounts of packaging waste generated, Member States were consulted via a survey to identify their preferred waste management measures as well as the level at which such measures should be taken. Member States are divided in their views of a preferred way forward. A minority thought that consumption reduction targets could be an effective measure, provided it was implemented at a sectoral level - although most raised concerns as to whether targets set at an EU-level would be achievable for all Member States and may put some at a disadvantage. A requirement for producers to implement corporate waste prevention policies was suggested by several Member States, from a range of geographies, as an effective method.

In accordance with the Waste Framework Directive Articles 4 and 9, some measures have already been implemented in Member States. For example, some Member States, including Spain and Belgium, require producers to create and implement packaging prevention plans, where producers must include in the plans measures to reduce packaging use per product, and remove the superfluous use of packaging. Several 'informative' measures have also been implemented in Member States, largely through Producer Responsibility Organisations (PRO), that offer advice, guidance and training to producers who are seeking to reduce their use of packaging. In Italy, for instance, the PRO offers an eco-design and LCA tool to producers, whilst in Ireland, Repak deliver a certified training course. Regulatory measures that limit or support the use of certain types of packaging (e.g. requirements for bio-based plastic packaging or plastic packaging containing recycled content), as well as national bans for certain single-use plastic packaging, which are not covered by the SUP Directive, are being increasingly implemented at a Member State level and would benefit from an EU-wide approach. For some non-packaging items covered by the SUP Directive, Article 192 TFEU which is the legal basis for the SUP Directive, would seem to allow for such bans under the general conditions of proportionality and non-discrimination, however for many packaging items be it covered or not by the SUP Directive, these bans are not permitted as placing on the market of packaging is harmonized at the EU level and any national packaging waste prevention measures taken to implement Article 4(1) of the PPWD must comply with Art. 18 of the PPWD. However, an EU-wide approach would prevent these occasions from occurring and remove any doubts.

The new Circular Economy Action Plan (nCEAP) as published on 11 March 2020 specifically states the aim of "reducing (over)packaging and packaging waste, including by setting targets and other waste prevention

[86] The Waste Framework Directive (WFD)

measures",[87] in addition to committing to reviewing the legislation for specific waste streams, including packaging, with the view, *i.a.* to preventing waste, the new CEAP commits to preventing waste and setting waste reduction targets as part of a broader set of measures on waste prevention in the context of a review of Directive 2008/98/EC.[88] Furthermore, the CEAP announces a Sustainable Product Policy Initiative, with the aim to make products on the EU market more sustainable, *i.a.* by extending their lifetimes and promoting reuse and repair. This could reduce the pace at which products are discarded and replaced by new products and thereby also the packaging used for the new products. Approximately half of the items covered by the Single Use Plastic Directive (2019/904) are packaging, and contains objectives for consumption reduction of items through measures such as setting national reduction targets and bans on specific packaging types such as food containers made of EPS.[89]

In summary, whilst there are some indications that producers are seeking to eliminate unnecessary packaging (either whole or elements), and reduce packaging weight in some quarters, the publicised examples are very few and far between compared to the overall market, despite there being hundreds if not thousands of brand signatories. The voluntary agreements and 'Pacts' all have their strongest focus on 100% recyclability and/or compostability and/or reuse. Where avoidance is mentioned at all this is limited to a very small selection of packaging items that the brands and retailers are willing to sacrifice, such as collation packaging. Very few individual brands, in their commitments, say anything at all about their commitments to reduce and eliminate.

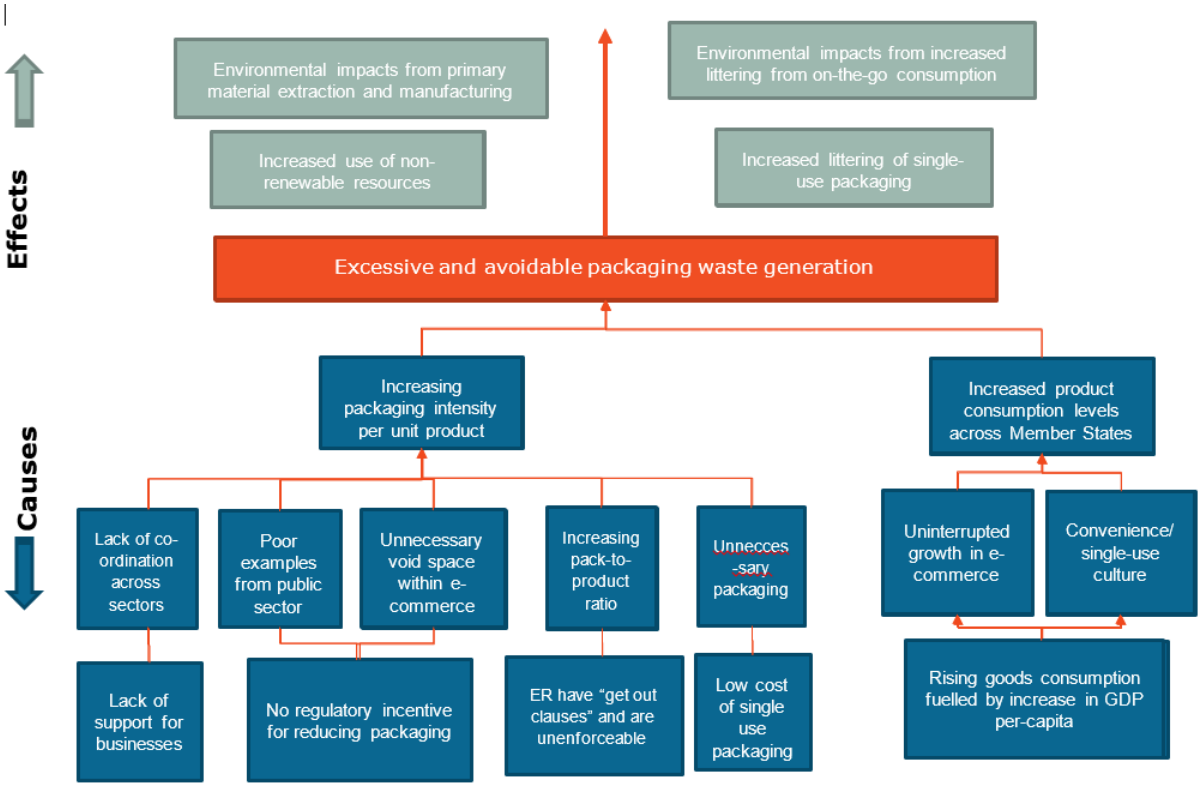
While recent or recently announced policy interventions could contribute to reducing the rate of increase of packaging use in the EU, in the absence of further regulatory efforts, there is no strong evidence that the trend for increasing packaging waste generation in absolute terms will diminish. In fact, consumer pressure, and brand commitments, in regard to 100% recyclability and less plastic may well further drive weight increases as there is switch back, in some product categories, to cardboard and glass from plastic.

6.3.5. **Problem Tree for avoidable packaging waste**

[87] European Comission (2020) *A new Circular Economy Action Plan*, accessed 7 May 2020, https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN

[88] European Comission *Implementation Tracking Table - Circular Economy Action Plan*, accessed 7 May 2020, https://ec.europa.eu/environment/circular-economy/pdf/implementation_tracking_table.pdf

[89] European Commission *Single-use plastics: New EU rules to reduce marine litter*, accessed 18 June 2020, https://ec.europa.eu/commission/presscorner/detail/en/MEMO_18_3909



6.4. Increase in the proportion of packaging that is single-use

Data on packaging reuse across Europe is limited. Very few Member States have official data on reusable packaging or report voluntarily on reusable packaging under the PPWD. Only Denmark, Finland and Luxembourg regularly report to Eurostat on the amount of packaging reused within their national boundaries. Where data is available, there are issues with different data collection methods, different products and varying modes of reuse. In some instances, the data are not available from organisations or businesses due to competition concerns.

However, overall country specific trends indicate a **reduction in reusable** primary and tertiary packaging (no data are available for secondary packaging) over the past two decades. The reuse of consumer (primary) packaging is increasingly uncommon, and is limited primarily to beverage packaging at a national scale. Even within beverage packaging, a steep decline in reusables has been recorded, with some exceptions in the hospitality sector. Table 8 shows the Member States which have experienced the greatest market share decreases for refillable beverages over the last two decades, the highest being Denmark with a 76% reduction in market share of refillables.

Table 8: Change in Refillables' Market Share for Beverages, 1999-2018

Country	Market Share refillables 1999	Market Share refillables 2018	% difference

Denmark	91%	15%	**-76%**
Finland	79%	5%	**-74%**
Norway	77%	8%	**-69%**
Romania	70%	15%	**-55%**
Bulgaria	74%	22%	**-52%**
Hungary	63%	15%	**-48%**

Source: Reloop, GlobalData (2019)

The tertiary sector remains the strongest in terms of reuse practices. The use of reusable transport packaging has remained relatively stable, although there are some material and sector-specific challenges, which contribute to a mixed picture. Some reusable packaging such as crates, kegs, drums and pallets show an increase in use while others show a decline.[90] There is an ongoing shift from corrugated single-use packaging towards reusable plastic RTPs (Returnable Transport Packaging), such as pallets and crates for fresh products including eggs, fruit and vegetables, meat and fish.[91] The consumption of reusable wooden pallets has also risen in the past decade, but the reuse/reconditioning of steel drums has fallen. This is partly due to switches to plastic drums and Intermediate Bulk Containers (IBCs).

In addition, a significant amount of packaging reuse takes place in the hospitality sector (hotels, catering and restaurants). This is predominantly glass beverage bottles, such as for beer, water and soft drinks. The system works through channels of distribution between companies and restaurants for instance. Collection and redistribution occurs through the same channel. Empty reusable bottles are collected and stored by the restaurant, and are returned to the bottling plant to be washed and refilled.

There are a number of difficulties in reporting packaging reuse data. Principally, it is difficult to quantify the reuse of most materials, as they do not enter the waste stream. This is compounded by the lack of a unified reporting system across Member States, meaning that reuse is measured in a variety of ways, at different channels and for diverse materials. Thus, data on packaging reuse currently collected on an official basis is limited; although, this is likely to improve with the revised PPWD requiring reporting on reusable packaging

[90] Deutsche Umwelthilfe (DUH) (2019) *Aufkommen und Verwertung von Verpackungsabfällen in Deutschland im Jahr 2017*, accessed 5 May 2020, https://www.umweltbundesamt.de/publikationen/aufkommen-verwertung-von-verpackungsabfaellen-in-12
[91] ibid.

from 2022 (for reference year 2020) as well as the Commission Implementing Decision 2019/665[92] regarding the reporting formats for reusable packaging. Additionally, in May 2020, the Commission published Eurostat guidance on the compilation and reporting of data on packaging and packaging waste[93]. This includes guidelines for completing reporting Table 3, as established by Commission Implementing Decision 2019/665/EC, on reusable packaging.

Furthermore, reuse systems are emerging in the wine industry. Notable examples include:

- In 2011, the region of Styria in Austria initiated a wine bottle reuse system for small and medium sized wine companies. Around 60 producers are now involved and the bottles circulate between vineyards, supermarkets, restaurants, retailers and bottle-washing facilities. The number of refills increased by 3.5% during the project's first year.[94]
- In Spain, the reWINE project established a system for reusing wine bottles in the Catalan wine industry. The project involved producers, bars, restaurants, wholesalers and shops and uses reWINE stickers on labels. A pilot test was completed in June 2019 and expects to recover around 100,000 bottles, reducing glass packaging waste by about 45 tonnes.[95] The project plans to extend the system throughout Catalonia and to other wine-growing regions of Spain.
- Launched in 2017, in France, the Bout à Bout reuse scheme based in Pays Nantais, allows producers to wash seven sizes of Burgundy bottles at a facility in Clisson. The scheme involves wine producer, distributors, shops and restaurants.[96]

Data provided by Finland presents an overview of reuse trends for different materials and all packaging types. Figure 17 shows data, which combines all packaging that is used again for its original purpose, including reused beverage bottles, plastic and cardboard boxes, roller cages and wooden pallets. The reuse rate is calculated as the amount of refilled packaging divided by the amount of total use of packaging (one-way plus refillable packaging) – not clear whether the method is aligned with the EU methodology or not. The rate is presented as a percentage. Between 2000 and 2018, wood packaging decreased by 17%, although there are now signs of a recovery in the market. Metal, plastic and paper packaging reuse have remained fairly static while glass has had the biggest decline; there has been a switch from refillable glass beer bottles to aluminium cans.

*Figure 17 Packaging Reuse Statistics, Finland, 2000-2018 (%)**

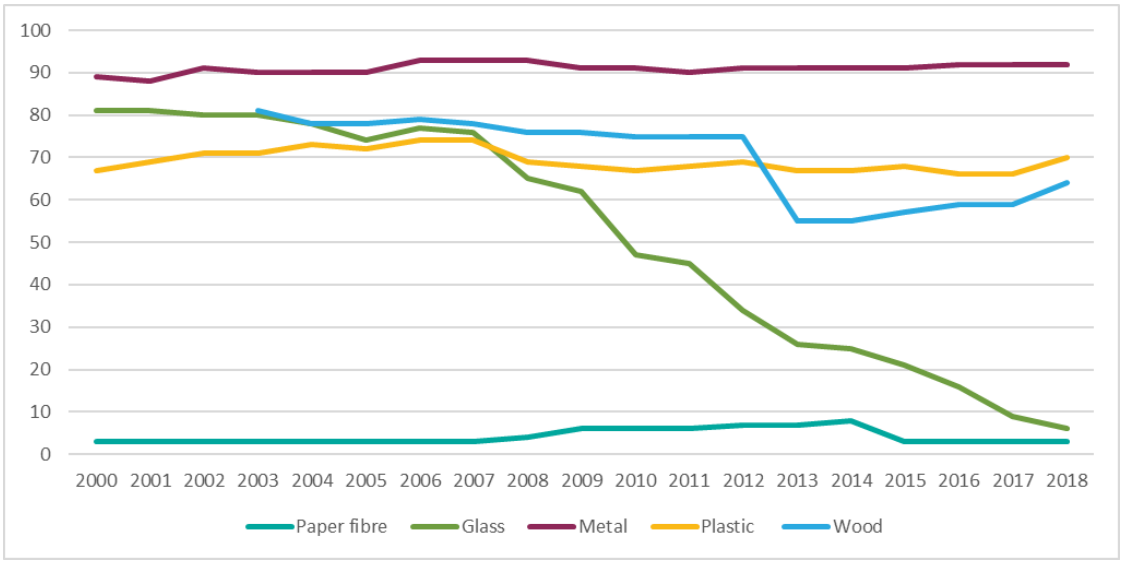
[92] Commission Implementing Decision (EU) 2019/665 of 17 April 2019 amending Decision 2005/270/EC establishing the formats relating to the database system pursuant to European Parliament and Council Directive 94/62/EC on packaging and packaging waste

[93] European Commission (2020) *Guidance for the compilation and reporting of data on packaging and packaging waste according to Decision 2005/270/EC*, accessed 15 September 2020, https://ec.europa.eu/eurostat/documents/342366/351811/Guidance+for+the+compilation+and+reporting+of+data+on+packaging+and+packaging+waste+%E2%80%93+20+May+2020+version

[94] Meiningers Wine Business International (2019) *Ingenious ways to reuse bottles instead of recycling them*, accessed 15 September 2020, https://www.wine-business-international.com/wine/general/ingenious-ways-reuse-bottles-instead-recycling-them

[95] Rewine (2019) *reWINE*, accessed 15 September 2020, https://www.google.com/maps/d/viewer?mid=1DdNZrBF26NxSmPPXoaz82PTznr5v8xNc&hl=ca

[96] Meiningers Wine Business International (2019) *Ingenious ways to reuse bottles instead of recycling them*, accessed 15 September 2020, https://www.wine-business-international.com/wine/general/ingenious-ways-reuse-bottles-instead-recycling-them



** Reuse rate (%) is the amount of refilled packaging divided by the amount of total use of packaging. Total use of packaging includes one-way packaging and refilled packaging.*

Source: RINKI 2020 [97]

To conclude, there are two key European level trends for reusable packaging: I) the reuse of transport packaging shows relative stability, although there is some variation according to packaging type, and II) the reuse of consumer (primary) packaging is increasingly uncommon and has declined to particularly low levels over recent decades, limited primarily to beverage packaging at national scale, with individual retailer schemes operating for some other kinds of packaging in some Member States.

As products, materials and consumption patterns have evolved, there has been a **significant rise in the use of one-way packaging, especially single-use plastic**. The evolving retail landscape, with larger distribution networks, produced and packed on high-speed packaging lines, have combined to exert a downward pressure on reuse.

This is a trend which looks set to continue despite the introduction of the SUP Directive, which requires Member States to implement certain consumption reduction measures for some forms of plastic packaging, along with product bans; however, this may well lead to a straight switch to non-plastic[98] single use items for convenience rather than a wholesale shift to reusable solutions.

There have been recent signals, albeit on a small scale, that this decline in reusable primary packaging may be slowing in some areas and for some consumer packaging types. **There is significant opportunity in this sector to build upon a rise in consumer awareness, and the growing popularity in some EU cities of packaging free/zero waste shops**. Also, as previously mentioned, reuse in the tertiary sector is a well-established practice and could be expanded.

[97] RINKI (2020) *Packaging statistics*, accessed 5 May 2020, https://rinkiin.fi/for-firms/packaging-statistics/
[98] Alternative materials for disposable packaging, such as bamboo, composite materials, aluminium, paper, coated paper and glass.

In addition, at the national level, some Member States are taking action to encourage reuse, through for example: binding and non-binding reuse targets, use of Green Public Procurement and/or use of EPR funds to promote reuse. While potentially welcome, such initiatives at the Member State level may lead to challenges to the integrity of the internal market.

6.4.1. Non Transport Packaging

Trends in the reuse of transport packaging show relative stability, although there is some variation according to packaging type and some switches to plastic materials. There is an ongoing shift from corrugated single-use packaging towards reusable plastic RTPs (Returnable Transport Packaging), such as pallets and crates for fresh products including eggs, fruit and vegetables, meat and fish.[99] The use of RTPs for meat crates has increased by around 30% to 400 million containers in Europe between 2012 and 2019. Bread crates increased by around 50% to 600 million containers and fruit and vegetable crates increased by 7-8% to around 350 million containers over the same period.[100] This growth has been attributed to the requirement for stable, conveyor-technology compatible standard boxes which are necessary for automated processes.[101]

In Austria for instance, approx. 8.5 million RTP are in circulation between suppliers and dealers (excluding pallets/roll containers). The boxes are reused around ten times per year. [102] Table 9 presents data regarding RTP in Austria including both inhouse and cross-company systems, indicating the number and circulations of RTP in different industries. The food/grocery sector holds the largest share of RTP, although the report notes that since exact RTP numbers could not be quantified in some industries, it is assumed that the real number of RTPs is higher.

Table 9 RTP across companies and inhouse for Austria

Industry	**Crates/boxes/other load carriers**			**Pallets/Movable container**	
	Number	**Weight [t]**	**Circulation**	**Number**	**Weight [t]**
RTP inhouse					

[99] Deutsche Umwelthilfe (DUH) (2019) *Aufkommen und Verwertung von Verpackungsabfällen in Deutschland im Jahr 2017*, accessed 5 May 2020, https://www.umweltbundesamt.de/publikationen/aufkommen-verwertung-von-verpackungsabfaellen-in-12
[100] pulswerk GmbH (2019) *MTV 2019 in Österreich: Überblick über den Einsatz von Mehrwegtransportverpackungen in Österreich*, accessed 24 June 2020, http://www.pulswerk.at/mtv2019.htm
[101] pulswerk GmbH (2019) *MTV 2019 in Österreich: Überblick über den Einsatz von Mehrwegtransportverpackungen in Österreich*, accessed 24 June 2020, http://www.pulswerk.at/mtv2019.htm
[102] pulswerk GmbH (2019) *MTV 2019 in Österreich: Überblick über den Einsatz von Mehrwegtransportverpackungen in Österreich*, accessed 24 June 2020, http://www.pulswerk.at/mtv2019.htm

Industry	Crates/boxes/other load carriers			Pallets/Movable container	
	Number	Weight [t]	Circulation	Number	Weight [t]
Food/grocery	1.000.000	2.000	10.000.000	22.000.000	440.000
RTP across companies					
Food/grocery	8.500.000	12.700	85.200.000	-	-
Pharmaceutical	130.000	200	23.590.000	-	-
Book trade	155.000	200	-	-	-
Chemical industry	1.150.000	2.300	9.230.000	450.000	78.800
Electricals and electronics	4.230.000	8.000	-	60.000	-
Total	15.165.000	25.400	128.020.000	22.510.000	-
Pooling pallets - equivalents in Austria across all industries				28.500.000	620.000

Source: http://www.pulswerk.at/mtv2019.htm

The consumption of reusable wooden pallets has also risen in the past decade, having recovered from a sharp decline after the financial crisis of 2007/8.[103] [104] On the other hand, SERRED, the European Association of Reconditioners, notes that reuse/reconditioning of steel drums has fallen. This is partly due to switches to plastic drums and Intermediate Bulk Containers (IBCs).

6.4.2. Consumer Packaging

In comparison, reuse of consumer packaging is increasingly uncommon and has declined to particularly low levels over recent decades. [105] In a report to the European Commission focused on primary packaging reuse across Europe, two key trends were highlighted: the transition from glass to plastic beverage bottles, and an overall increase in single-use packaging since the 1960s.[106] These trends have occurred simultaneously but at different rates and to differing degrees across Member States. Consumption, product mix, retail trends and demographics are factors which influence the extent of these trends in different countries.

With regards to reusable beverage packaging specifically, between 2000 and 2015, the share of the total beverage market for drinks sold in refillable containers across Europe decreased from 41% to 21%.107 This includes the following types of drinks: carbonates, water, beer/cider, juice and energy drinks, and the following package types: refillable glass, refillable PET and metal cans. Indeed, Figure 18 shows the decline in sales of reusable glass beverage containers between 1999 and 2018 across Member States in Europe (excluding Cyprus and the UK).

Figure 18 Sale of Reusable Glass Beverage Containers, 1999-2018 (millions of units sold)

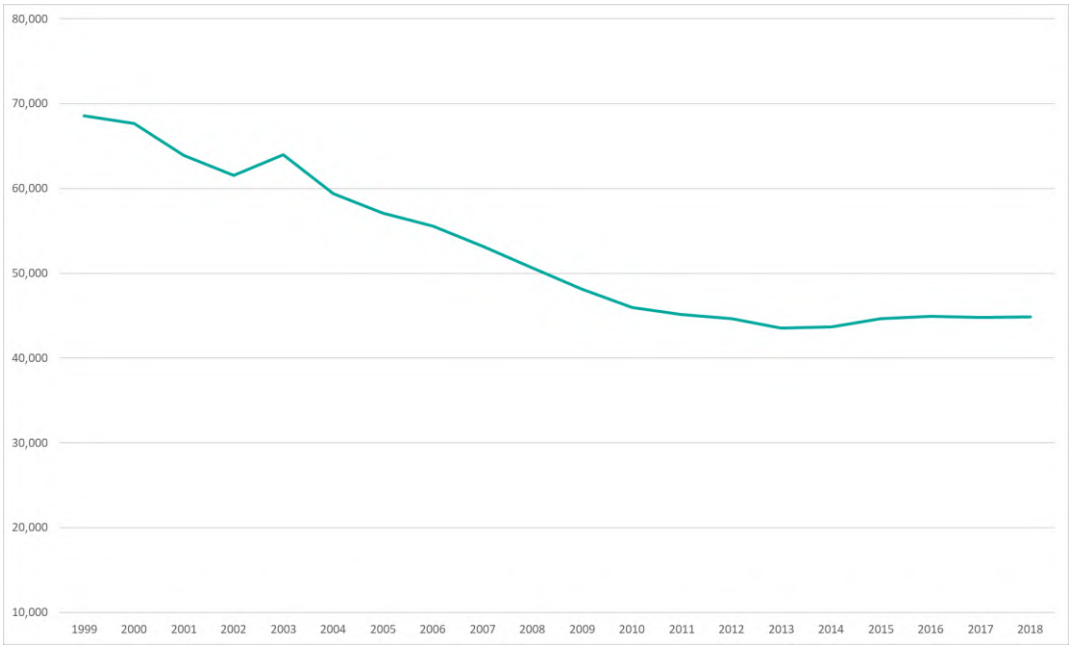
[103] Deutsche Umwelthilfe (DUH) (2019) *Aufkommen und Verwertung von Verpackungsabfällen in Deutschland im Jahr 2017*, accessed 5 May 2020, https://www.umweltbundesamt.de/publikationen/aufkommen-verwertung-von-verpackungsabfaellen-in-12

[104] UN Committee on Forests and Forest Industry (2016) *Trends and perspectives for pallets and wooden packaging*, accessed 5 May 2020, https://www.unece.org/fileadmin/DAM/timber/meetings/20161018/E/ECE_TIM_2016_6_FINAL_wooden_packaging.pdf

[105] European Commission (2018) *A European Strategy for Plastics in a Circular Economy*, January 2018, http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1516265440535&uri=COM:2018:28:FIN

[106] Golding, A. (1999) *Reuse of Primary Packaging: Final Report, Part I- Main Report*, accessed 17 April 2020, https://ec.europa.eu/environment/waste/studies/packaging/reuse_main.pdf

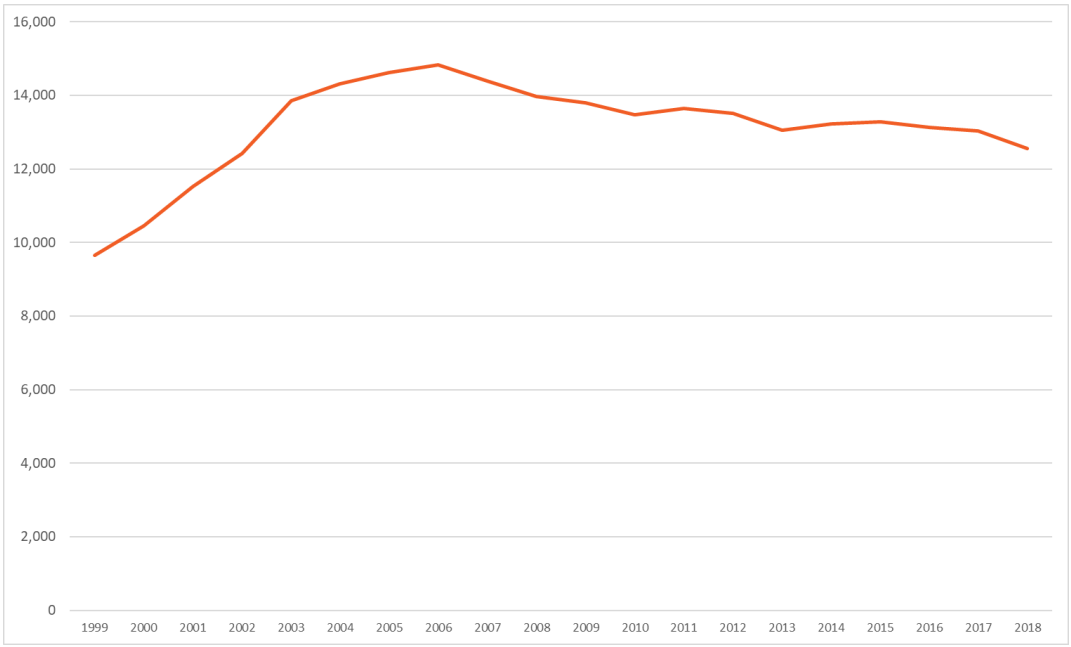
[107] Reloop (2020) *The Vanishing Refillable*, accessed 17 April 2020, https://www.reloopplatform.org/beverage-sales-by-container-type-in-austria-16/



Source: GlobalData (2019)

In comparison, the sale of reusable plastic beverage containers increased between 1999 and 2006, before declining steadily to 2018, as shown in Figure 19.

Figure 19 Sale of Reusable Plastic Beverage Containers, 1999-2018 (millions of units sold)



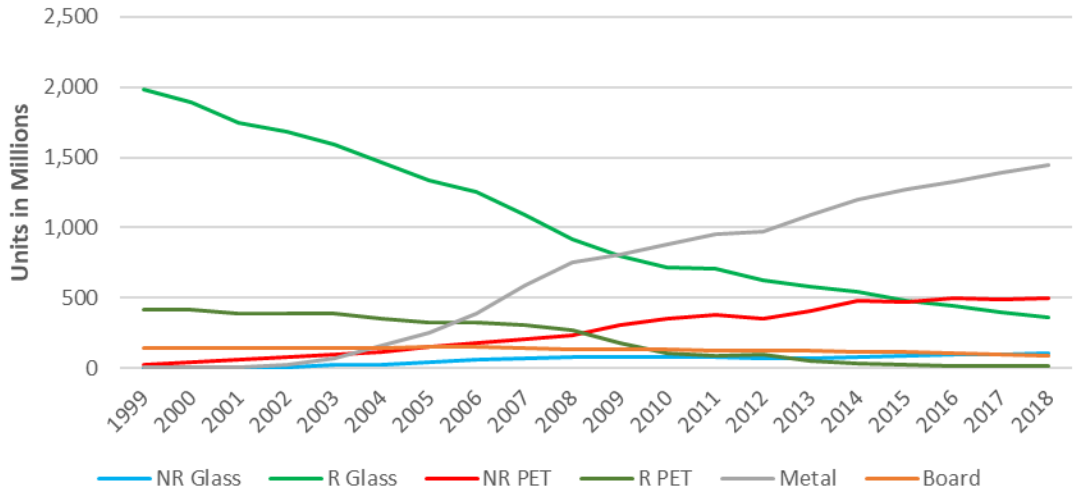
Data does not include Cyprus, Estonia, Greece, Italy, Latvia, Portugal, Romania, Slovenia or UK. Source: GlobalData (2019)

GlobalData shows that in 1999, North-East Europe had an overall market share of 60% for refillables, falling to 15% in 2018. The most notable reductions in market share in the region were in Sweden, Finland and Norway.[108] As previously discussed, this is related to national policy changes as well as the introduction of deposit refund system (DRS) for single-use beverage containers. Additionally, in 2018, Western Europe had an overall market share of 25% for refillables, with Germany responsible for over half of refillables sold in this region. The lowest market shares are found in France and Ireland. Indeed, reuse systems for beverage bottles in countries such as France, Ireland and the UK have almost disappeared from the market, covering market shares of less than 5%.

Denmark experienced experienced the greatest market share decreases over the study period due to a combination of policy change and implementation of a DRS for single-use containers. Denmark had a DRS for refillable beverage containers decades before a system was introduced for single-use equivalents. Indeed, in 1997, 260 million glass bottles for wine and spirits were consumed in the country. The return rate for bottles in the voluntary DRS was close to 90%, enabling the majority of bottles to be washed and refilled.[109] In 2002, the Danish government lifted the ban on canned beer and soft drinks and established a recycling scheme in retail shops (DRS for single-use beverage containers). As shown in Figure 20, this resulted in the steady increase in the use of beverage cans, which overtook the use of refillable glass bottles in 2009.

Figure 20. Sales of All Beverages (soft drinks, beer/cider) by Material Type, Denmark, 1999-2018

R = Refillables; NR = Non-Refillables



Source: Reloop, GlobalData 2019

[108] Reloop (forthcoming) Global data on refillable beverage containers, 1999-2018.

[109] edie (2002) *Denmark lifts ban on one-use-only drinks cans*, accessed 16 September 2020, https://www.edie.net/news/0/Denmark-lifts-ban-on-one-use-only-drinks-cans/5084/

In Finland, glass reuse experienced the greatest decline, from 81% to 6%. This happened during the period in which a Deposit Return System (DRS) for single-use packaging was introduced. In a DRS, the consumer typically pays a deposit at the point of purchase which can be redeemed when they return their used container. DRS are most commonly used for beverage bottles. Evidence from a number of countries across Europe, including Finland, the Netherlands and Germany, indicates that return rates consistently above 90% are possible with a DRS. Principally, a well-designed DRS for single-use beverage bottles is likely to increase the recycling rate by providing a source of separately collected, clean and therefore higher-quality material. Indeed, some Member States have introduced mandatory deposit systems for non-reusable beverage packaging in order to increase the recycling rate of this packaging type.

Alternatively, a DRS for reusable beverage packaging uses a deposit to encourage the return of containers for refilling. Denmark for instance, has two DRSs: one for reusable containers which involves the collection through breweries for refilling, and another for one-way containers which are collected through Dansk Retursystem A/S for recycling.[110]

The product categories for which DRSs have been introduced were traditionally in refillable containers often managed by industry-operated voluntary schemes; predominantly glass bottles for beer, water and soft drinks. In some countries, notably Denmark, Finland and Sweden, the shift to one-way beverage packaging and subsequent implementation of DRSs for one-way containers have together impacted the use of refillables. In Denmark for example, when the DRS for single-use containers was introduced in 2002, the market share of refills fell from 90.3% in 2000 to 16.9% in 2017.[111] This occurred at the same time as the abolition of the country's ban on the use of cans for beverages. This resulted in a shift from previous reuse systems for beer and soft-drinks in glass bottles, to the greater use of recyclable beverage cans.[112]

What is more, **for consumers, the return systems for both refillable and one-way containers appear the same**.[113] This is likely to cause issues of confusion for consumers. Indeed, in personal correspondence with DUH, this was highlighted as a current issue.[114] Bar codes on RVMs will prevent refillables entering the recycling system, although this may happen manually in some systems in small amounts. Ultimately, whilst there is correlation between the introduction of DRSs for one-way containers and the decline in use of reusables, wider policy making and shift in materials play a more significant role.

With regards to household packaging, Figure 21 shows the reduction in reusable household packaging in Belgium from 2000-2016, as reported by Fost Plus members.

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[110] European Parliament (2011) *A European Refunding Scheme for Drinks Containers*, accessed 16 September 2020, https://www.europarl.europa.eu/RegData/etudes/note/join/2011/457065/IPOL-AFET_NT(2011)457065_EN.pdf

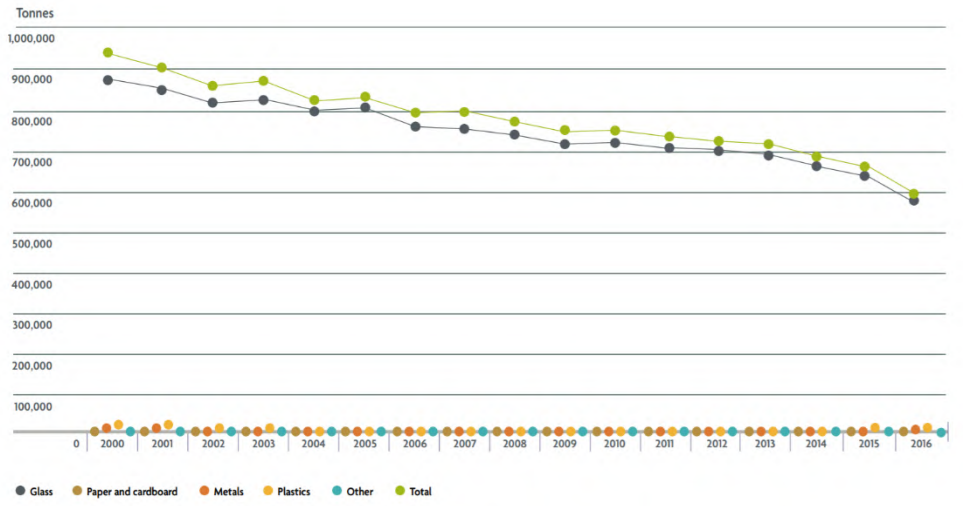
[111] Oakdene Hollins Research & Consulting (2018) *Raise the Glass*, https://feve.org/wp-content/uploads/2018/11/FINAL-Raise-the-Glass-Study-FULL.pdf

[112] Foodnavigator (2008) *End to 20 year Danish can ban*, accessed 15 September 2020, https://www.foodnavigator.com/Article/2002/01/15/End-to-20-year-Danish-can-ban

[113] Oakdene Hollins Research & Consulting (2018) *Raise the Glass*, https://feve.org/wp-content/uploads/2018/11/FINAL-Raise-the-Glass-Study-FULL.pdf

[114] Personal communication with DUH (2020)

Figure 21. Overall trend in reusable household beverage packaging reported by Fost Plus (tonnes)



Source: Interregional Packaging Commission, Activity Report 2017, Brussels.

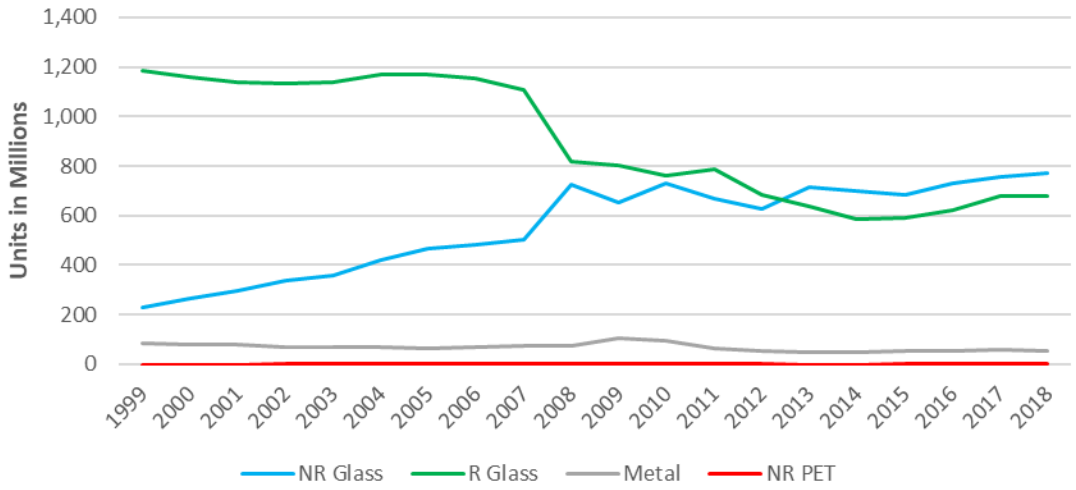
The decline in reusable beverage packaging has occurred at uneven rates across Member States and different sectors. Indeed, reuse occurs predominantly in hospitality: hotels, restaurants and catering (HORECA), a sector which is particularly strong in southern European countries.

In 2018, Spain and Portugal for instance each had market shares of 20% for refillable beverage bottles, with reuse especially high in the beer industry. [115] In Portugal, although having fallen from 79% in 1999, the refillable glass bottle still held a 45% share of the Portuguese beer/cider market in 2018, as shown in Figure 22, eclipsed by non-refillables in 2013. Similarly in Spain, the refillable held 31% of the Spanish beer/cider market in 2018, having decreased from 49% in 1999.

Figure 22. Sales of Beer/Cider by Material, Portugal, 1999-2018

R = Refillables; NR = Non-Refillables

[115] Reloop (forthcoming) Global data on refillable beverage containers, 1999-2018.



Source: Reloop, GlobalData, 2019

While the dominant trend for the reuse of consumer packaging is decline, there are some recent indications of areas where there may be upward trends. The number of packaging free shops for instance has increased across Europe, signalling a growing demand for refillables. Evidence from a survey of packaging free shops in Europe shows that from a very low baseline, the sector has experienced strong growth over the past ten years, a trend which is forecast to continue. The study showed that the most common product types sold are food and drink products, particularly alcoholic beverages, eggs and spices. For non-consumerables, cleaning products, cosmetic products and zero waste accessories were the most commonly sold. It should also be noted, that 74% of the shops which responded to the survey were located in city centres with far fewer located in city peripheries and countryside locations.[116]

6.4.3. Consequences

This section discusses the impacts of the decline in reusable packaging and the range of stakeholders affected by this trend.

Firstly, **the decline in reuse has contributed to the increase in overall packaging waste generation**. With the recent shift to convenience and on-the-go consumption, consumers are likely to increase their generation of single-use packaging waste. For instance, in Germany, disposable tableware and on-the-go packaging contributed to a 44% increase in waste generation between 1994 and 2017. Specifically, the amount of waste generated by disposable cups/mugs for drinks (only which a part of is packaging) increased by 102%, for disposable plates, boxes and bowls for food the increase was 173% and waste generated by disposable cutlery increased by 114%.[117] As a result, local authorities, municipalities and waste companies will also be

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116 Zero Waste Europe, Eunomia Research & Consulting, and Reseau Vrac (2020) *Packaging free shops in Europe an initial report*, accessed 7 July 2020, https://zerowasteeurope.eu/wp-content/uploads/2020/06/2020_06_30_zwe_pfs_executive_summary.pdf

117 NABU (2018) *Einweggeschirr und To-Go-Verpackungen Abfallaufkommen in Deutschland 1994 bis 2017*, accessed 5 May 2020, https://www.nabu.de/umwelt-und-ressourcen/abfall-und-recycling/25294.html

collecting, processing and disposing of more single-use packaging waste. This may increase the cost of waste management.

The increased incidence of litter from on-the-go consumption, particularly of single-use plastic packaging, has been shown to have severe consequences on ecosystems, especially on marine life.[118] Once such litter enters the environment, it can move through a number of pathways, including sewerage systems and rivers, often reaching the ocean where it impacts the health of marine flora and fauna. Notably, the 2019 SUP Directive seeks to address the issue of single-use plastic marine litter.

On the contrary, reuse ensures that a material's value is maintained and used in the economy for as long as possible and that less waste is generated on the whole. For instance, in some countries, refillable glass bottles are reused up to 50 times, whilst reusable plastic pallets and crates with a life-span of 10-15 years can be used up to 200 times.[119] [120] This removes the need to manufacture more bottles and avoids the environmental impacts associated with bottle production and waste management. Crucially, the decline in reuse presents a challenge to the principles of the EU's Circular Economy Action Plan and the overarching objective to increase circularity across the EU.

Secondly, the reduction in reusable packaging might not align with the European Green Deal. Launched in 2020, the Deal presents a roadmap to transition to climate neutrality in Europe by 2050. The Deal seeks to foster a transition away from carbon-intensive processes, towards climate-neutral and climate-resilient activities, and also proposes to set the framework for removing fossil fuel subsidies.[121] Counter to these aims, the heightened demand for single-use plastic packaging depends to some degree upon the extraction and use of fossil fuels as raw materials in production, although this can be countered by the use of recycled content in packaging, which also results in a less carbon intensive packaging. With regards to aluminium beverage cans for instance, evidence suggests that the carbon intensity can be as low as 0.5 tonnes CO_2 equivalent per tonne of recycled aluminium compared to up to 20 tonnes CO_2 equivalent per tonne of aluminium from coal-based production.[122]

The environmental impacts of reusable beverage packaging systems vary according to a number of parameters, including:[123,124,125]

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[118] ICF and Eunomia Research & Consulting (2018) *Plastics: Reuse, recycling and marine litter – Impact assessment of measures to reduce litter from single use plastics*, Report for DG Environment, 2018, http://ec.europa.eu/environment/waste/pdf/Study_sups.pdf

[119] Reloop (2017) *Policy instruments to promote refillable beverage containers*, accessed 25 June 2020, https://www.reloopplatform.org/wp-content/uploads/2017/10/Refillables-policy-Final-Fact-sheet-June30.pdf

[120] Svenska Returnsystem *Eurocrate: A full-scale demonstration of reusable crates and pallets*, accessed 25 June 2020, https://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.showFile&rep=file&fil=LIFE00_ENV_S_000867_LAYMAN.pdf

[121] European Commission (2019) *The European Green Deal Communication*, accessed 30 June 2020, https://ec.europa.eu/info/sites/info/files/european-green-deal-communication_en.pdf

[122] European Aluminium (2019) *Circular Economy Action Plan*, accessed 8 September 2020, https://european-aluminium.eu/media/2903/european-aluminium-circular-aluminium-action-plan.pdf

[123] WRAP (2010) *Single Trip or Reusable Packaging - Considering the Right Choice for the Environment*, 2010, http://www.wrap.org.uk/sites/files/wrap/FINAL%20Reusable%20Packaging%20Factors%20Report.pdf

- Distance between filler and retail;
- Number of reuse/refill cycles;
- Characteristics of reusable items: pool size of reusables, item weights and related impact on vehicle utilisation; and
- Impacts associated with washing and repair of reusables (energy and water).

Life Cycle Analysis (LCA) studies generally agree that refilling bottles can decrease the environmental impact of beverage packaging, although this is very much contingent on the type of material, the volume of the bottle, length of journey and number of reuses.[126] [127] [128]

Studies of existing systems have also indicated emissions savings. For instance, Svenska Returnsystem operates a pooling system for RTP in Sweden. In 2019, the system transported more than 8 million reusable plastic pallets and 150 million standardised reusable crates between the majority manufacturers and wholesale/retailers in the Swedish food industry. The reusable system has reduced product damage and eliminated 50,000 tonnes of waste annually. Indeed, since the programme inception in 2001, reusable crates have replaced over 1.3 billion pieces of disposable packaging. Around $22 million is saved annually in retail store labour and in 2016, a life-cycle analysis showed that reusable crates reduced CO_2e emissions by 78% compared with the equivalent disposable packaging.[129] [130] Thus, under certain conditions, reusable packaging systems have the potential to reduce greenhouse gas emissions. There are a number of upcoming studies which will examine the carbon impact of single-use compared to reusable packaging in more detail[131].

Producers, distributers and retailers are impacted in different ways by a decline in packaging reuse. On the one hand, there can be labour savings for producers. For instance, Svenska Returnsystem records annual savings in retail store labour of around $22 million.[132] Additionally, when PepsiCo switched from wooden pallets to leasing reusable ones in Oakland, California, $20,000/year were saved from the reduced labour needed to deal with defunct/damaged pellets. Similarly, Full Belly Farm in California switched from

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[124] Owen, T.H., and Boyd, K. (2013) Beverage Container Review

[125] Mata, T.M., and Costa, C.A. (2001) Life cycle assessment of different reuse percentages for glass beer bottles, *The International Journal of Life Cycle Assessment*, Vol.6, No.5, pp.307–319

[126] Owen, T.H., and Boyd, K. (2013) Beverage Container Review

[127] WRAP (2010) *Single Trip or Reusable Packaging - Considering the Right Choice for the Environment*, 2010, http://www.wrap.org.uk/sites/files/wrap/FINAL%20Reusable%20Packaging%20Factors%20Report.pdf

[128] Simon, B., Amor, M.B., and Földényi, R. (2016) Life cycle impact assessment of beverage packaging systems: focus on the collection of post-consumer bottles, *Journal of Cleaner Production*, Vol.112, pp.238–248

[129] Svenska Retursystem (2020) *Svenska Retursystem*, accessed 14 May 2020, https://www.retursystem.se/en/

[130] Reloop (2017) *Making the Switch: The Business Case for Reusable Packaging*, accessed 14 May 2020, https://www.reloopplatform.org/wp-content/uploads/2017/10/BusinessCaseReusablePackaging-MAY-181.pdf

[131] Zero Waste Europe and Reloop (2020) *Re-usable vs single-use packaging: A review of environmental impacts, https://zerowasteeurope.eu/wp-content/uploads/2020/12/zwe_reloop_report_reusable-vs-single-use-packaging-a-review-of-environmental-impact_en.pdf.pdf_v2.pdf*

[132] Reloop (2017) *Making the Switch: The Business Case for Reusable Packaging*, accessed 14 May 2020, https://www.reloopplatform.org/wp-content/uploads/2017/10/BusinessCaseReusablePackaging-MAY-181.pdf

disposable cardboard boxes to reusable plastic totes, resulting in net labour savings as washing the totes took less time than assembling and lining cardboard boxes.[133]

On the other hand, the employment created by upscaling reusable packaging systems could represent significant economic and social benefits. For instance, in 1998 in Germany, of the 161,000 jobs which were directly connected to the production, filling, distribution and retailing of beverage packaging, the market share of reuse packaging was around 73%.[134]

For retailers, reuse can present dis-economies of scale, a typical consequence of which is increased prices, both for the retailer and the consumer. In the UK, for instance, 94% of UK milk was delivered in glass bottles historically, but this had dropped to 3% by 2016.[135] [136] [137] Compared to £1.10 for a four-pint plastic bottle of semi-skimmed in a supermarket, the equivalent can cost £2.27 to be delivered in glass. Refill systems can also result in the loss of retail space due to the storage required for both full and empty containers, as well as additional handling costs associated with returned containers. In order to manage such costs however, some refill systems apply a handling fee as part of deposits on containers, such as in Finland.[138] The fee is paid to retailers to cover some or all of the costs of collection, sorting and handling.

6.4.4. Problem Summary

Data on packaging reuse across Europe is limited, but overall country specific trends indicate a reduction in reusable primary and tertiary packaging over the past two decades, in particular for beverages with some exceptions in the hospitality sector. Notwithstanding, there have been recent signals, albeit on a small scale, that this decline may be slowing in some areas and for some consumer packaging types, through packaging free shops. The picture is more mixed with regards to transport packaging, showing overall stability with variation in some specific products.

As products, materials and consumption have evolved, there has been a significant rise in the use of one-way packaging, especially single-use plastic primary packaging. This has strongly influenced a shift from reusable to more convenient, single-use packaging; a trend which looks set to continue despite the introduction of the SUP Directive, which requires Member States to implement certain consumption reduction measures for plastic packaging – i.e. a switch to non-plastic single use items is likely rather than a wholesale shift to reusable solutions. This presents a critical problem if the resource efficiency principles and greenhouse gas reduction targets of the EU Circular Economy Action Plan and European Green Deal are to be met.

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[133] Reloop (2017) *Making the Switch: The Business Case for Reusable Packaging*, accessed 14 May 2020, https://www.reloopplatform.org/wp-content/uploads/2017/10/BusinessCaseReusablePackaging-MAY-181.pdf

[134] Golding, A. (1999) *Reuse of Primary Packaging: Final Report, Part I- Main Report*, accessed 17 April 2020, https://ec.europa.eu/environment/waste/studies/packaging/reuse_main.pdf

[135] Lee, D.P., Vaughan, P., Bartlett, C., Hollins, O., Bhamra, T., and Trimingham, R. (2008) Refillable glass beverage container systems in the UK

[136] Dairy UK (2018) *The UK Dairy industry*, accessed 4 May 2020, https://www.dairyuk.org/the-uk-dairy-industry/

[137] Turns, A. (2018) *Best in glass – can the return of the milkround help squash our plastic problem?*, accessed 25 June 2020, https://www.theguardian.com/lifeandstyle/2018/feb/07/return-milkround-plastic-problem-glass-bottle-deliveries

[138] Crittenden, G. (2003) *Costs and Benefits of Established Refilling Systems*, accessed 14 May 2020, https://www.solidwastemag.com/feature/costs-and-benefits-of-established-refilling-systems/

6.4.5. Problem Drivers

There are a number of social, political and economic factors, which have driven the decline in reusable consumer packaging. These factors interlink and are connected by deeper-seated changes across different aspects of society. This section first addresses the market drivers of the decline, before examining the systemic and regulatory factors, which have contributed to these changes.

6.4.5.1. Market Drivers

Over the past decades retail in most Member States has shifted from many small stores, to fewer, larger stores. Self-service supermarkets have increased market share, whilst home delivery of some products in reusable packaging, such as milk in glass bottles, has declined. For retailers, barriers to reuse include: the retail space required and the capital costs of facilities for cleaning, repair and storage, establishing management and collection system and procuring dispensers or refillable containers.

Meanwhile, over the past 25 years the single market, combined with **globalisation, has driven increasingly diffuse supply chains both across Europe and the globe. Coupled with cheaper transport, the costs of distributing single-use primary packaging between countries have reduced**. This is compounded by the cost of collecting, washing and refilling reusable packaging. Moreover, favourable economies of scale have seen consolidation as industry can lower average costs by increasing in size. Similar economic incentives have driven industries to grow distribution networks, particularly in international trade.

In an open EU market, where packaged products are transported between countries, the return of empty reusable containers is a significant challenge. Moreover, with the growth in number of products, less standardised packaging and the emergence of large multinational corporations with centralised facilities, the logistics (such as sorting a wide range of brands) and costs of running refillable schemes have increased compared to the low costs of single-use packaging materials.

Some retailers and brand owners also oppose reusables on commercial grounds. In the fast-moving soft drinks sector for instance, one-way packaging can provide greater flexibility for packaging design. Indeed, many companies have developed bespoke bottles as additional means of brand differentiation. With greater emphasis on product image, some brand owners are concerned that scuffing and wear on bottles as a result of re-use could damage brand image.[139] [140]

Demand for cost-savings has also been driven by stakeholders throughout the supply chain, including distributers, retailers and consumers. Compared to those stakeholders placing one-way packaging on the market, who typically only pay for a share of end-of-life management cost, those who place refillable containers on the market incur the full costs of refill and collection. This imbalance creates an economic incentive to use single-use packaging rather than reusables. Although, this could also be rectified somewhat

[139] Lee, D.P., Vaughan, P., Bartlett, C., Hollins, O., Bhamra, T., and Trimingham, R. (2008) Refillable glass beverage container systems in the UK

[140] Smithers (2018) *4 Trends That Will Change Packaging Industry by 2028*, accessed 24 June 2020, https://www.smithers.com/en-gb/resources/2019/feb/future-packaging-trends-2018-to-2028

by changes to EPR schemes, which are now required to cover the full net costs of packaging recycling under the 2018 revised WFD (and littering, under Directive 2019/904 on the reduction of the impact of certain plastic products on the environment), but would depend on the magnitude of the fee differential required.

Demand for cost-savings have also driven a shift by some producers to replace glass containers with more lightweight packaging. Lighter packaging made from more fragile materials can compromise the durability of the packaging and thus reduce its reusability. There is anecdotal evidence from DRS operators, for instance, that returnable glass bottles have become more fragile over time. With regards to RTP, a trend towards light-weighting has further contributed to the decline in reusability. As shown in Figure 23, the average weight of steel drums in Europe for example, has reduced by 9.6% from 18.3kg to 16.73kg (1992-2019) and the thickness has also reduced from 1.3mm to 1mm.[141] Light-weighting has primarily been driven by cost savings associated with reduced raw material requirement, as well as cheaper transport costs due to lighter products. However, light-weight transport packaging raises challenges for reconditioners as the packaging is more likely to be damaged during use.[142]

Figure 23. SEFA Average Steel Drum Weight, 1992-2018 (kg)



Source: European Association of Steel Drum Manufacturers (SEFA), 2019

Yet, return systems can also achieve economies of scale which make reuse cheaper than producing new packaging. This can be achieved through large-scale closed-loop or pool systems in which reusable packaging is standardised and leased to companies by a third party which manages the collection, washing and repair.

The Euro Pool Group, for instance, operates a pooling system for trays and returnable transport items across 27 countries in Europe. The Euro Pool System (EPS) is based on the rental and return of trays for fresh and packaged food. The lifespan of the trays is at least 7 years. EPS manages the traceability, collection, sorting,

[141] SEFA (2019) SEFA at a Glance: EIPA 12th Annual Meeting 2019-06-14.
[142] Personal communication with Serred.

washing and repair of the trays in 73 service centres in 18 countries. For example, in 2014, EPS established the Tesco Recycling and Service Units in the Czech Republic. Reusable trays for fresh food products were introduced, increasing from 14 million trays in 2014 to over 40 million in 2018.[143] In 2019, the EPS achieved a total of over 1.1 billion tray rotations across Europe.[144] Information sharing throughout the supply chain is a key component of the logistic service and it has resulted in increased efficiency and cost savings for retail partners.[145]

In conclusion, the evolving retail landscape and growing international distribution networks have exerted a downward pressure on reuse.

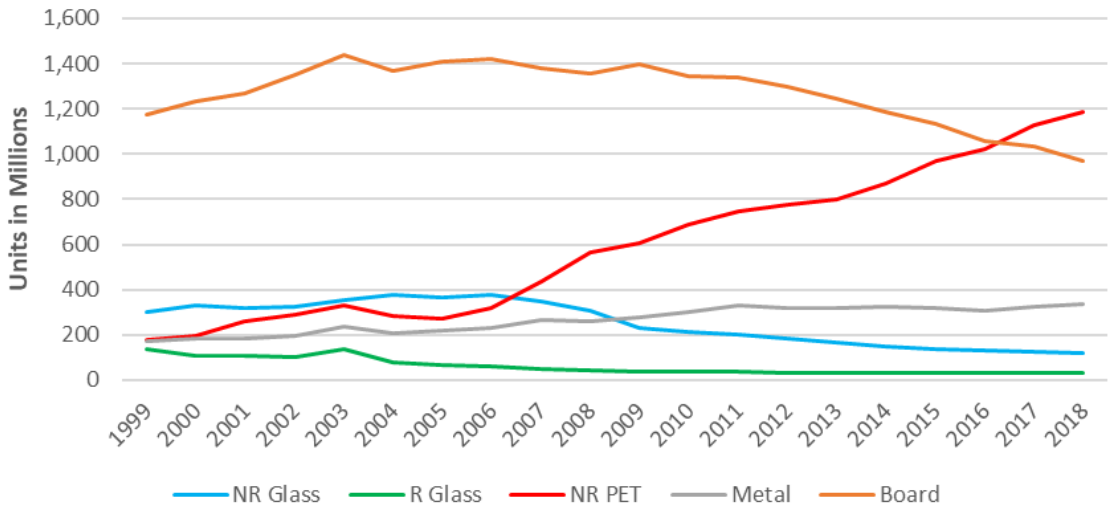
6.4.5.2. Consumption Drivers

Historically, the reuse of packaging was more commonplace. However, the rise in single-use packaging especially single-use plastic, such as PET for beverage bottles, has been ubiquitous and can be largely attributed to the low cost of plastic.

Figure 24 shows the decline in both glass and board beverage packaging compared to the steep increase in use of PET in France. Indeed, the market share of refillables in the juice and still drinks category fell from 7% in 1999 to 1% in 2018.

Figure 24 Sales of Juice/Nectar/Still Drinks by Material, France, 1999-2018

R = Refillables; NR = Non-Refillables



[143] Euro Pool System (2019) *Case Study Tesco*, accessed 30 June 2020, https://cdn2.hubspot.net/hubfs/5799001/Offers/Case-Study-Tesco.pdf?hsCtaTracking=e78961ca-d472-4ad8-9b20-8269c1ec3f3e%7C98ff85c4-a913-495e-823f-157332d28f74

[144] European Commission (2020) *EU Agricultural Outlook For Markets and Income 2019 - 2030*, accessed 30 June 2020, https://www.europoolsystem.com/about-us/euro-pool-system

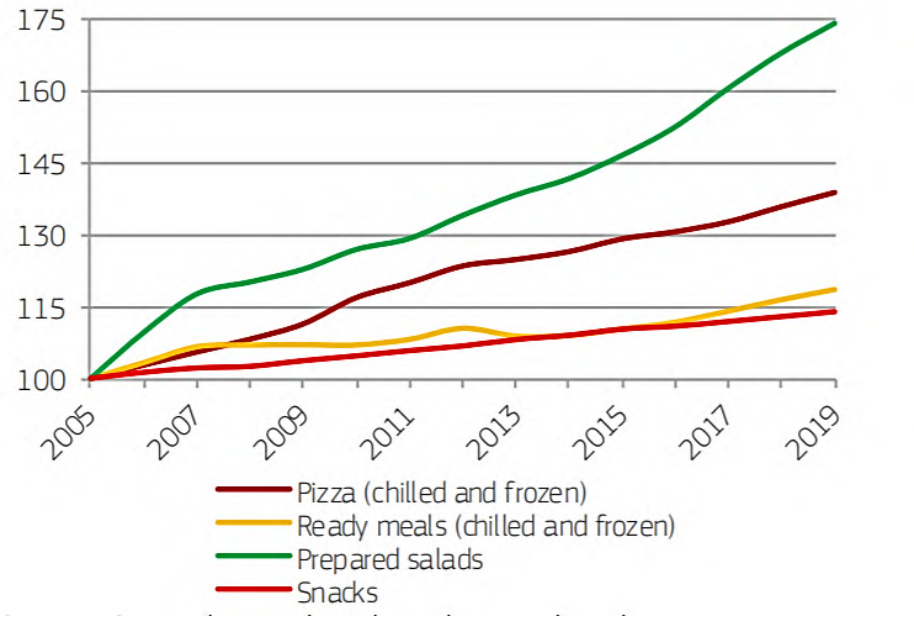
[145] Euro Pool Group (2018) *Tother Towards a Circular Economy: Sustainability Report 2018*, accessed 30 June 2020, https://www.europoolgroup.com/assets/files/EPG%20Sustainability%20Report%202018.pdf

Source: Reloop, GlobalData (2019)

A key driver of this trend has been the upsurge in on-the-go/convenience consumption of items such as food, drinks, as well as an increase in online and food takeaway markets. As more single-use plastic packaging has been placed on the market, there has been a shift towards the consumption of such packaging, which is more convenient and portable, in particular flexible plastics,[146] where the amount of flexible packaging placed on the market has grown significantly in recent years.

Indeed, a 2018 study by Nielsen, reports that 27% of consumers want products which make their lives easier, and 26% want them to be more convenient to use.[147] As shown in Figure 25, since 2005, there has been a significant increase in the sales of on-the-go food products such as ready meals, prepared salads and snacks.[148] With regards to snacks, there has been significant growth in the snack bar market, which reported revenues of over EUR3bn in 2016. Growth is set to continue at a Compound Annual Growth Rate (CAGR) of 4.9% between 2020 and 2025.[149]

Figure 25 Retail Volumes of Selected Products in Top 10 EU Markets (2005=100)



[146] Smithers (2018) *4 Trends That Will Change Packaging Industry by 2028*, accessed 24 June 2020, https://www.smithers.com/en-gb/resources/2019/feb/future-packaging-trends-2018-to-2028
[147] Nielsen (2018) *Six Factors Driving Consumers' Quest for Convenience*, accessed 24 June 2020, https://www.nielsen.com/eu/en/insights/article/2018/six-factors-driving-consumers-quest-for-convenience
[148] European Union (2019) *EU Agricultural Outlook: for Markets and Income 2019-2030*, accessed 24 June 2020, https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/farming/documents/agricultural-outlook-2019-report_en.pdf
[149] Mordor Intelligence (2020) *Europe Snack Bar Market- Growth, Trend and Forecasts (2020-2025)*, accessed 24 June 2020, https://www.mordorintelligence.com/industry-reports/europe-snack-bars-market-industry

Source: DG Agriculture and Rural Development, based on Eurobaromitor

In Germany for example, on-the-go/out-of-home consumption has increased significantly: sales in self-service restaurants grew by 110% between 2005 and 2015, while sales from snack bars and cafés nearly tripled.[150] Also, between 2009 and 2015, sales of on-the-go, disposable tableware and other packaging increased by around 16%.[151]

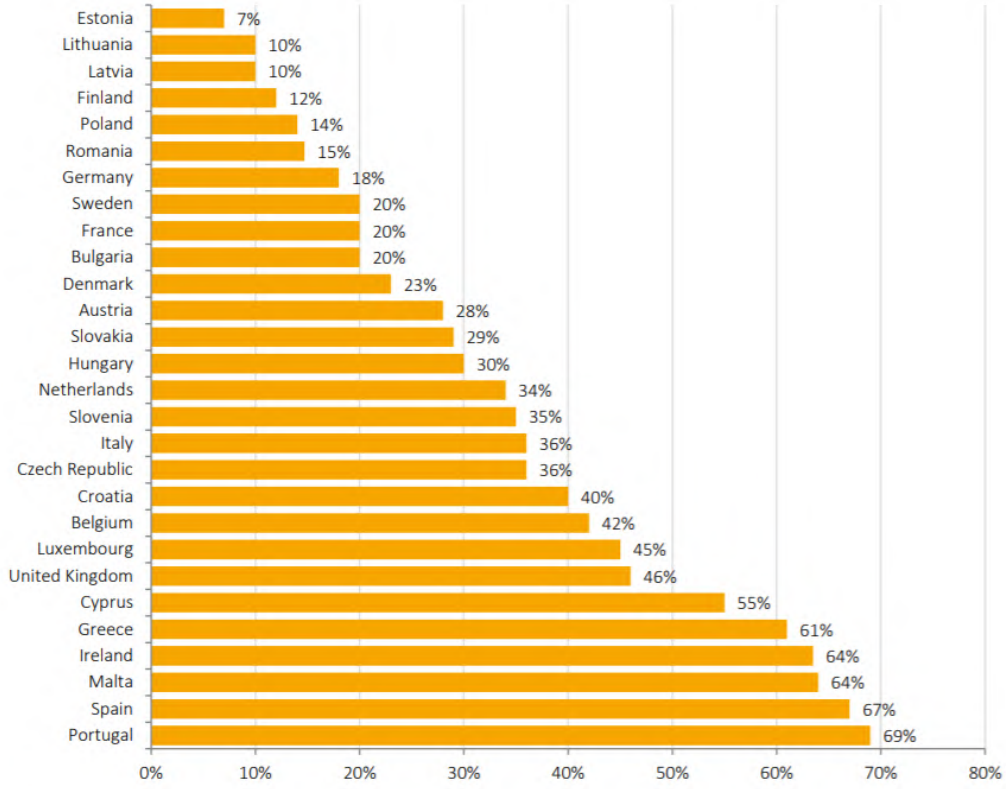
As previously noted, these consumption trends have been experienced to varying degrees and at different rates across Europe and between sectors. The slower decline in refillables in the beer sectors of certain countries, such as Germany and eastern and southern European countries, is partly attributable to the prevalence of local breweries as opposed to large scale national production, as well as the HORECA sector. Portugal, Spain and Malta for instance have the largest shares by volume (over 60%) of on-trade beer sales (beer sold in bars, restaurants, cafes etc), as shown in Figure 26.[152] The lowest are in the Baltic states. Higher on-trade consumption in certain countries reflects cultural traditions and deeper social norms, as well as the size of the tourism sector.

Figure 26 Beer consumption in hectolitres, on-trade share by country (2018)

[150] NABU (2018) *Einweggeschirr und To-Go-Verpackungen Abfallaufkommen in Deutschland 1994 bis 2017*, accessed 5 May 2020, https://www.nabu.de/umwelt-und-ressourcen/abfall-und-recycling/25294.html

[151] Gesellschaft für Verpackungsmarktforschung (2018) Abfallaufkommen durch Einweggeschirr und andere Verpackungen für den Sofortverzehr, Mainz, June 2018

[152] Europe Economics (2020) *Contribution made by beer to the European economy: EU Report, March 2020*, accessed 25 June 2020, https://brewersofeurope.org/uploads/mycms-files/documents/publications/2020/contribution-made-by-beer-to-EU-economy-2020.pdf



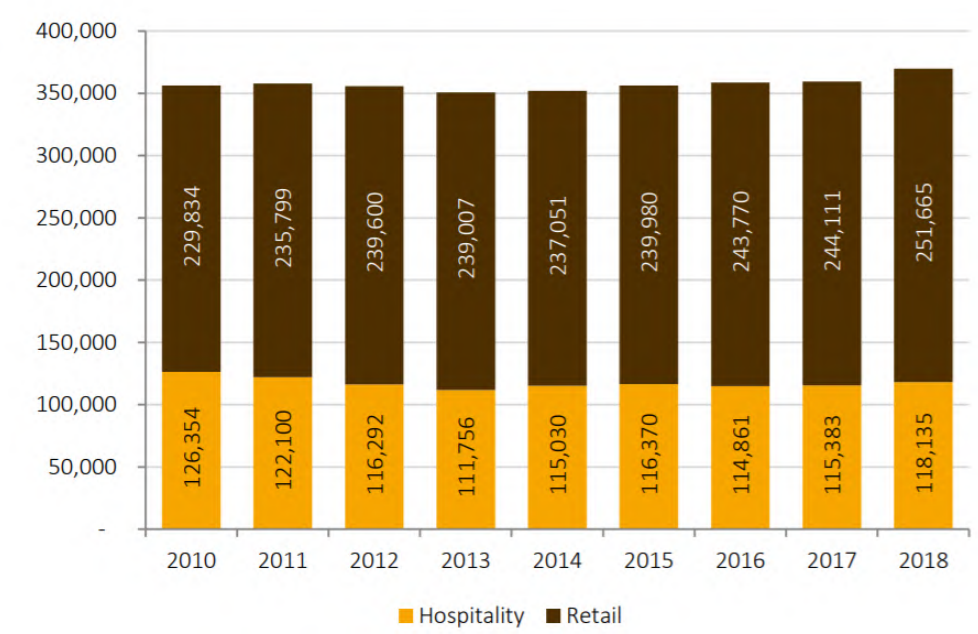
Source: Europe Economics (2020)

However, between 2010 and 2018, there has been a steady shift in Europe from the on-trade (bars, restaurants, cafes etc) to the off-trade market (retail outlets including supermarkets). In 2018, on-trade sales of beer was 34% of the market compared to 66% off-trade.[153] The consumption of beer in the hospitality sector decreased from 35% to 32% over the same period, as shown in Figure 27 However, total beer consumption in Europe has increased: from 356 million hectolitres in 2012 to 370 million hectolitres in 2018.[154]

[153] The Brewers of Europe (2019) *Beer Statistics - Statistics for Europe*, accessed 16 September 2020, https://brewersofeurope.org/site/countries/key-facts-figures.php

[154] The Brewers of Europe (2019) *Beer Statistics - Statistics for Europe*, accessed 16 September 2020, https://brewersofeurope.org/site/countries/key-facts-figures.php

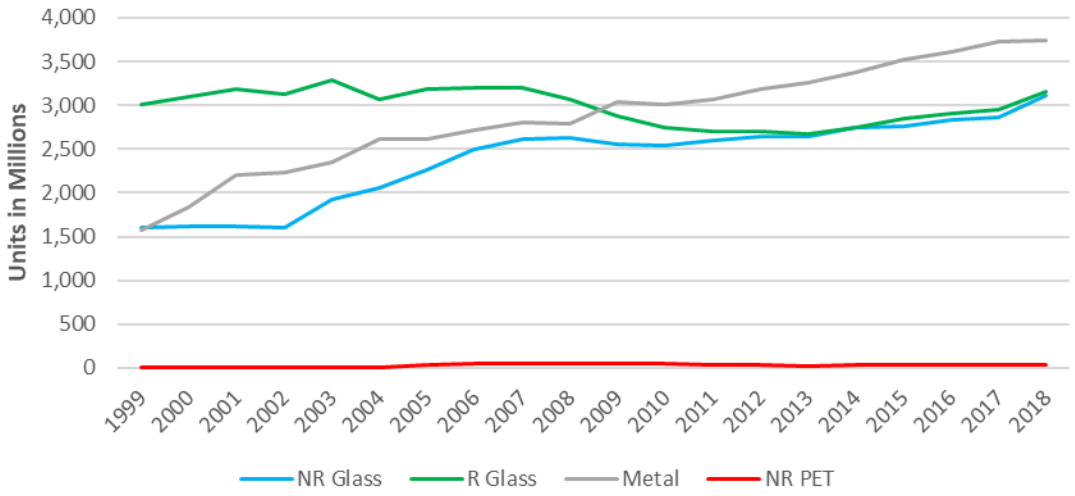
Figure 27 Beer consumption in hectolitres, on- and off-trade share, 2010-2018



Source: Europe Economics (2020)

The rise in off-trade consumption is in part due to a shift in preference of consumers for lower-priced products in retail/off-trade coupled with a rise in e-commerce which has facilitated home consumption. This shift was particularly noticeable during the economic downturn of 2007/8. As shown for Spain in Figure 28, in 2007/8 refillable sales started to fall. The financial crisis is a likely factor in the consumption of cheaper beer at home or other private spaces, rather than at bars and restaurants. As the economy of Spain has recovered, sales of refillables have improved again.

Figure 28 Sales of beer/cider by Material, Spain, 1999-2018



Source: Reloop, GlobalData (2019)

Although the overall direction for reusable packaging has been decline, there is some indication of a recent buck in this trend, albeit on a small scale. **There has been an EU-wide rise in public awareness regarding plastic pollution and climate change**. Indeed, Eurobarometer data from 2017 noted that 87% of citizens in the EU are worried about the impact of plastic production on the environment and 34% of Europeans avoided single-use plastic goods (other than plastic bags) or bought reusable plastic products.[155] Unilever further notes that in the UK, 62% of people say reuse is more important to them than recycling and 83% of people want access to more refillable products.[156] Notably in Germany, the decline in the share of reusables slowed from 2019-2020. In the bottled water market, for example, the share of glass reusable bottles rose by just over 5% in 2019, with SUP water bottles losing 10-11% market share. This reversal has been attributed to a rising anti-plastic consumer trend, combined with a cooler summer. The trend continued into the first quarter of 2020.[157]

Furthermore, package-free shops, reuse start-ups, trials and aisles in supermarkets have increased across Europe, not only in the food and beverage industry but also for cosmetics and household cleaning products. Recent reuse schemes and initiatives include:

- Coca-Cola's shift to returnable one litre glass bottles in retail stores in Germany;
- Unilever's 'Cif eco-refill' which enables customers to reuse Cif spray bottles;
- RePack - a reusable packaging service for e-commerce in Europe and North America;
- Loop - piloted in the US, France and the UK. Loop is a physical and online store selling a range of products from well-known brands in reusable packaging. The packaging includes a deposit to incentivise return. Loop manages the reverse logistics, cleaning and redistribution of products;
- ECOBOX- a reusable food container scheme in Luxembourg. Participating companies are identified through a logo and customers can take meals away in an ECOBOX for a deposit of EUR5. Consumers can then return the box to receive the deposit or exchange for another, professionally washed box, to take away another meal.
- ReCircle - an on-the-go DRS with 27 partner restaurants in Germany. Restaurants pay a EUR135 annual subscription, with 20 containers included. Customers identify participating restaurants using the ReCircle website, and pay a EUR10 deposit for a container. The deposit is refunded on return to the restaurant where it is washed.[158]
- MIWA - a pilot initiative in Prague in 2019. MIWA provides standard reusable capsules to producers who fill them and send them to retailers to install. Empty capsules are returned to MIWA for cleaning and redistribution.

[155] European Commission (2017) Special Eurobarometer 468 - October 2017 "Attitudes of European citizens towards the environment"

[156] Unilever (2019) Cif innovative at-home refill will remove 1.5 million plastic bottles from UK supermarkets, accessed 17 April 2020, https://www.unilever.com/news/press-releases/2019/cif-innovative-at-home-refill-will-remove-1-5-million-plastic-bottles-from-uk-supermarkets.html

[157] Personal communication with the Reusable Working Group, Mehrweg (2020).

[158] Bolger, M., Miller, S., and Copello, L. (2019) *Reusable solutions: How governments can help stop single-use plastic pollution*, Report for Oxford, UK, 2019, https://refill.org.uk/wp-content/uploads/2019/11/bffp_rpa_reusable_solutions_report.pdf

One other challenge of potential relevance, is consumers mistakenly putting reusable beverage packaging into the recycling system along with single-use beverage packaging.[159] Such behaviour reduces the efficiency of the reuse system, which depends upon the packaging being returned in the near future for re-sale. Efforts are being made to combat this through adequate product labelling and awareness raising with regards to the existence of deposit return schemes. For instance, in Germany, returnable packaging can be identified by the word 'Mehrweg' on the label, as well as return symbols such as the Blue Angel. Single-use beverage bottles subject to a deposit have a Deutsche Pfandsystem GmbH (DPG) label to signify inclusion in the nationwide return system for one-way beverage packaging.[160]

6.4.5.3. Regulatory drivers

Certain **aspects, or absences, of EU and national regulation have challenged packaging reuse**.

Notably: food and drink hygiene regulations, discrepancies in the application and interpretation of legal definitions of waste, reuse and preparing for reuse (as set out in the Waste Framework Directive) across Member States and regions, and the lack of a mandatory reuse target, reporting obligation and calculation methodology at the EU level. This section outlines the key national and EU level regulations and strategies, which have shaped the market and consumer behaviour, and their likely impact over the future decade.

Firstly, **the reuse of packaging has been both encouraged and stymied by specific packaging policies**. Finland, for instance, has experienced a sharp decline in market share of refillable beverage containers. In 2000, 98% of soft drinks, and 73% of the beer consumed, was purchased in refillable containers. Such high rates were largely attributed to the success of Finland's packaging tax, established in 1994. Participants in a registered DRS had a low tax rate for one-way containers, while refillable bottles in a DRS were exempt from the tax entirely. Since 2008, however, one-way containers are also exempt from the tax if in a DRS.[161] Consequently, in just one year, one-way PET containers came to dominate the carbonates and water markets as refillable PET bottles disappeared.

In comparison, the decline has been less severe in Member States with specific regulatory measures to encourage reusable packaging. For instance, since 1993, Germany has had a reusable beverage packaging quota which requires industry to maintain a minimum percentage of refillable containers for beer, soft drinks, fruit juice, wine and mineral water.[162] However, the quota has reduced, and currently stands at 43% compared to 72% when first implemented.

Secondly, **food and drink health and safety rules may have influenced packaging reuse to some extent**. Not only may food retailers and consumers be concerned about the spread of bacteria and viruses if food or

[159] Personal communication with DUH and the Reusable Working Group, Mehrweg (2020).
[160] Deutsche Pfandsystem GmbH *Labelling*, accessed 16 September 2020, https://dpg-pfandsystem.de/index.php/de/die-funktionsweise-des-dpg-einwegpfandsystem/getraenkehersteller-und-importeure/kennzeichnung.html
[161] DG Environment (2017) *Capacity building, programmatic development and communication in the field of environmental taxation and budgetary reform*, accessed 14 May 2020, https://ieep.eu/uploads/articles/attachments/de8980ef-e9cc-49f2-b66e-ac7a71be9e15/ETR%20and%20Civil%20Society%20Final%20Report%20191217%20FINAL.pdf?v=63680917736
[162] Container Recycling Institute (2020) *Germany*, accessed 5 May 2020, http://www.bottlebill.org/index.php/current-and-proposed-laws/worldwide/germany

drink passes through contaminated containers or dispensing units, but single-use packaging may be preferred by retailers in particular when seeking to comply with health and safety legislation. Regulation EC 852/2004 on the Hygiene of Foodstuffs sets out obligations for food business operators. This includes implementation of core hygiene procedures at all stages of production, processing and distribution, and requirements with regards to the safe production, cleaning and distribution of reusable packaging. Chapter V on equipment requirements notes that:

> *1. All articles, fittings and equipment with which food comes into contact are to:*
>
> *(a) be effectively cleaned and, where necessary, disinfected. Cleaning and disinfection are to take place at a frequency sufficient to avoid any risk of contamination;*
>
> *(b) be so constructed, be of such materials and be kept in such good order, repair and condition as to minimise any risk of contamination;*
>
> *(c) with the exception of non-returnable containers and packaging, be so constructed, be of such materials and be kept in such good order, repair and condition as to enable them to be kept clean and, where necessary, to be disinfected; and*
>
> *(d) be installed in such a manner as to allow adequate cleaning of the equipment and the surrounding area.*[163]

Although there is no explicit mention of unpacked food in this Regulation, this passage would apply to the use of reusable/refill containers in packaging free shops. What is more, the term 'bulk sales', i.e. goods sold without being pre-packaged (except for traditional "over the counter" businesses: delicatessen, caterer, bakery, fishmonger's, etc.) via self-service, is not subject to any legal definition in EU legislation.[164] Regulation (EU) No 1169/2011 of the European Parliament and of the Council of 25th October 2011 Council concerning consumers information on foodstuffs only contains provisions applicable to the sale of non-pre-packaged products in the context of traditional 'over the counter' businesses. [165] It does not include specific provision for self-service bulk sales.

In addition, it is worth considering Food Contact Materials (FCM) legislation in relation to single-use and reusable packaging. The EU framework on FCM is set through the regulation on FCMs (EC) 1935/2004, together with the EU Regulation on Good Manufacturing Practices for materials and articles intended to come into contact with food, Regulation (EC) 2023/2006. This is complemented by specific Commission

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[163] European Commission (2004) *Regulation (EC) No 852/2004 of the European Parliament and of the Council of 29 April 2004 on the hygiene of foodstuffs*, accessed 15 May 2020, http://data.europa.eu/eli/reg/2004/852/oj/eng

[164] Zero Waste Europe, Eunomia Research & Consulting, and Reseau Vrac (2020) *Packaging free shops in Europe an initial report*, accessed 7 July 2020, https://zerowasteeurope.eu/wp-content/uploads/2020/06/2020_06_30_zwe_pfs_executive_summary.pdf

[165] European Commission (2011) *Regulation (EU) no 1169/2011 of the European Parliament and of the Council of 25 October 2011*, accessed 13 July 2020, https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:304:0018:0063:en:PDF

Regulations, particularly Regulation (EU) No 10/2011 on plastic food contact materials and Regulation (EC) No 282/2008 on recycled plastic food contact materials.

In general, tableware and reusable food packaging in commercial systems is made from inert materials, while non-inert materials tend to be single-use, and often in complex multi-layered structures.[166] In Belgium for example, stainless steel boxes are used in the 'Tiffin' lunch box reuse scheme. Consumers reusing a Tiffin box for take-aways are entitled to a price reduction in certain restaurants across Belgium.[167] This is important given recent regulations, such as the SUP Directive, aiming to tackle issues related to plastic packaging and which have started to cause a shift towards single-use paper, cardboard and bamboo alternatives for instance, rather than to inert and reusable alternatives. Not only could this shift have impacts on packaging reuse, but also on human health.[168]

Thirdly, **there is currently little guidance on measures to promote reuse or how to design a reuse system to optimise the environmental impact**. Compounding this are the definitions of 'waste', 'reuse' and 'preparing for reuse' outlined in the Waste Framework Directive (WFD). As defined in Article 3 of the WFD, waste is:

> *"…any substance or object which the holder discards or intends or is required to discard;"*

Defining a material as waste determines how the material is handled, which administrative procedures apply to its transport and processing and what costs are borne by the waste handler. Moreover, under Article 3 of the WFD, reuse and preparation for reuse are defined as:

> *'reuse' means any operation by which products or components that are not waste are used again for the same purpose for which they were conceived;*
>
> *'preparing for reuse' means checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be reused without any other pre-processing.*[169]

Thus, if an item becomes waste and is then reused, it must undergo a 'preparing for reuse' process. The application and interpretation of waste, reuse and preparing for reuse varies across Member States and regions, leading to discrepancies in how re-usable packaging, especially transport packaging, is legally treated. This challenge is particularly pertinent to open-loop packaging systems. In schemes of this type, after the reusable packaging (e.g. a steel drum) is used, it is collected for reuse. However, the original seller

[166] Zero Waste Europe (2020) *Towards safe food contact materials in a toxic-free circular economy*, accessed 16 September 2020, https://zerowasteeurope.eu/wp-content/uploads/2020/05/towards_safe_food_contact_materials.pdf
[167] Tiffin (2018) *Tiffin, une lunchbox réutilisable pour vos plats à emporter !*, accessed 16 September 2020, https://tiffin.be/
[168] Zero Waste Europe (2020) *Towards safe food contact materials in a toxic-free circular economy*, accessed 16 September 2020, https://zerowasteeurope.eu/wp-content/uploads/2020/05/towards_safe_food_contact_materials.pdf
[169] European Parliament and the Council of the European Union (2008) Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on Waste and Repealing Certain Directives, 2008/98/EC

of the reusable packaging may be different from the reconditioner – the material is transferred from one actor to another. This is different from closed-loop reuse in which the reusable packaging is owned by one company, such as pallet pooling company, who provides the reusable packaging, collects it again after use and washes/refurbishes the packaging to be used again. In the open-loop system, due to the transfer of material between actors, some national jurisdictions have used the waste definition to classify such packaging as waste (even though it is subsequently reused, though this could be consistent if preparation for reuse occurred).[170,171] The resulting administrative burden and additional costs, such as from applying and re-applying for multiple waste licences, dissuades companies from reconditioning the transport packaging, often scrapping it instead.[172]

Moreover, no reuse target exists at the EU level. Instead, Member States can set quantitative and qualitative reuse targets: as required in Article 9 of the revised WFD (to encourage the re-use of products and the setting up of systems promoting repair and re-use activities); and under Article 5(1) of the PPWD (measures to increase the share of reusable packaging placed on the market). Also under the PPWD, Member States can calculate the recycling rate of packaging waste using up to 5% reusable packaging. This is outlined in Article 5(2) of the revised PPWD as given below:

> *2. A Member State may decide to attain an adjusted level of the targets referred to in points (f) to (i) of Article 6(1) for a given year by taking into account the average share, in the preceding three years, of reusable sales packaging placed on the market for the first time and reused as part of a system to reuse packaging. The adjusted level shall be calculated by subtracting:*
>
> - *from the targets laid down in points (f) and (h) of Article 6(1), the share of the reusable sales packaging referred to in the first subparagraph of this paragraph in all sales packaging placed on the market, and*
> - *from the targets laid down in points (g) and (i) of Article 6(1), the share of the reusable sales packaging referred to in the first subparagraph of this paragraph, composed of the respective packaging material, in all sales packaging composed of that material placed on the market.*
>
> *No more than five percentage points of such share shall be taken into account for the calculation of the respective adjusted target level.*[173]

The lack of a defined target, as well as no incentive to report more than 5% reusable packaging, constitutes a weak regulatory driver to increase reuse.

Looking to 2030, there are a number of existing and proposed policies, which go some way in encouraging packaging reuse. Notably, the 2018 revision of the WFD introduced more ambitious targets including 55%

[170] Communication with Reloop, 25th May 2020
[171] Communication with SERRED, 25th May 2020
[172] SERRED (2020) Serred policy positions
[173] European Parliament and the Council (2018) Directive (EU) 2018/852 of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste

of municipal waste to be recycled and prepared for reuse by 2025, 60% by 2030 and 65% by 2035. Article 9 of the WFD also requires Member States to take measures to:[174]

> *(b) encourage the design, manufacturing and use of products that are [...] re-usable [...];*
>
> *(d) encourage the re-use of products and the setting up of systems promoting repair and re-use activities, including [...] packaging [...];*

Article 5 of the revised PPWD, meanwhile, requires that by 2025, Member States take measures to encourage the use of reusable packaging, such as: using DRS, setting qualitative or quantitative targets, the use of economic incentives, or setting a minimum percentage of reusable packaging placed on the market annually for each packaging stream.[175] Member States must further ensure that EPR schemes are created for all packaging types at the latest by 2024.

The 'SUP Directive' is also likely to impact the materials, products and packaging markets. The Directive requires that Member States take measures relating to different product groups, including for beverage and food containers, and for packets and wrappers. The consumption reduction measures, item bans and proposals for EPR schemes fees to cover also the costs of littering and awareness raising measures (already included in some EPR schemes), could stimulate the reuse market by creating opportunities for reusable packaging to commercialise and develop economies of scale. What is more, the SUP Directive sets a precedent and strong policy direction such that the scope of these requirements could be extended to other packaging formats.

On the other hand, as has already been seen across Europe, the product bans – instead of promoting reuse - could cause a shift to the use of alternative materials for disposable packaging, such as bamboo, composite materials, aluminium, paper, coated paper and glass.[176] Moreover, approximately 40% of the items covered by the Directive are packaging, and only those types most commonly found on European beaches. Thus, the scope of the Directive in relation to the packaging market is relatively small (the total weight of waste material generated in scope of the Directive in 2017 was around 3.6 million tonnes per annum, this compares with around 77.5 million tonnes of total packaging waste generation ~4.5%). The proportion of grocery packaging would be higher, but is not yet known.

At the national level, some Member States are taking action to encourage reuse, possibly as implementation of the legal requirements in the revised WFD and PPWD. For instance:

- In Portugal, the proposed amendment of Decree-Law No. 152-D/2017 stipulates that from January 2022, all distributors/traders who sell soft drinks, juices, beers, packaged waters and table wines

[174] European Commission (2018) *Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste*, accessed 2 June 2020, http://data.europa.eu/eli/dir/2018/851/oj/eng
[175] European Parliament and the Council (2018) Directive (EU) 2018/852 of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste
[176] Deutsche Umwelthilfe (DUH) (2020) Policy recommendations to promote reusable packaging

(excluding those classified as regional wine and VQPRD) in non-reusable primary packaging, must also market the same category of products packaged in reusable primary packaging (up to 5 liters capacity);

- In Romania, from 1st January 2020, market operators who place packaged products on the market are required to sell a minimum of 5% of their goods in reusable packaging, and no less than the average percentage achieved between 2018 and 2019. Retailers will be required to provide the opportunity for consumers to choose reusable packaging and return it at the point of sale.[177] This excludes smaller retailers;
- In Germany, the German Packaging Act has a quantitative but not legally binding target for reusable beverage containers filled in Germany. One goal of the Packaging Act is that 70% of drinks covered by a deposit are filled in returnable bottles. Additionally, the Blue Angel label of the Federal Government can be used on reusable bottles and glasses, transport packaging and beverage cups. Currently, Germany has a mandatory deposit on one-way beverage containers and a voluntary deposit on reusable beverage containers;[178] and
- In Spain, Royal Decree 782/1998, which implements Law 11/1997 on Packaging and Packaging Waste, establishes the requirement to have a Company Prevention Plan (PEP) for waste for certain companies. The business plans for the prevention of packaging waste (developed by packers) must include an increase in the proportion of reusable packaging in relation to the amount of single-use packaging. The exception is when a life-cycle assessment can demonstrate that the environmental impact of the reuse of such packaging is greater than the impact of recycling or alternative recovery;
- In Ireland, Spain and the Slovak Republic, reusable packaging is a proposed component of Green Public Procurement (GPP). In the Slovak Republic for instance, the Waste Prevention Programme 2019-2015 proposes mandatory use of reusable beverage containers for all state administrative bodies (through the Act on Waste). The Programme also proposes to develop a methodological tool to support the implementation of package-free shops.
- In France, Law No. 2020-105 Regarding a Circular Economy and the Fight Against Waste, introduced in February 2020, focuses on the transition to a circular economy. The legislation includes several provisions to encourage reuse. The Law includes targets for 5% of packaging marketed in France to be reused in 2023, increasing to 10% in 2027. It also establishes a reuse observatory, to be created by January 2021. The observatory will be responsible for defining the national trajectory for increasing the share of reusable packaging placed on the market and to support organisations in achieving this objective. Additionally, under Article 58, guidelines for Green Public Procurement are set out, namely: by January 2021, the goods/services acquired by the State and local authorities must come from reuse, or incorporate recycled materials in proportions of 20% to 100% depending on the product. EPR schemes are also obligated to give at least 2% of their annual budget to supporting packaging reuse.[179]

Consultation with Member States showed mixed views regarding quantitative reuse target, although there was support overall. There were suggestions that targets should apply to certain sectors or packaging formats. Alternatively, some Member States respondents felt that targets should be voluntary.

Finally, in some Member States, reusable packaging is encouraged through exemptions from EPR obligations (for example Austria) or exemptions/reductions in EPR fees (Belgium, Germany, Ireland, Italy).

[177] Deutsche Umwelthilfe (DUH) (2020) Policy recommendations to promote reusable packaging

[178] European Parliament (2011) *A European Refunding Scheme for Drinks Containers*, accessed 16 September 2020, https://www.europarl.europa.eu/RegData/etudes/note/join/2011/457065/IPOL-AFET_NT(2011)457065_EN.pdf

[179] Legifrance (2020) *LOI n° 2020-105 du 10 février 2020 relative à la lutte contre le gaspillage et à l'économie circulaire*, accessed 16 September 2020, https://perma.cc/9YRB-SQGQ

Other initiatives include, for instance, the German Blue Angel label of the Federal Government, which indicates environmentally friendly products, and can be used on reusable bottles and glasses, transport packaging and beverage cups. The label enables consumers to distinguish between one-way and reusable beverage bottles and glasses.[180] Though according to DUH this is not the primary use of this label.[181]

Upscaling such labelling schemes raise important questions for harmonisation. Whilst an EU harmonised label for reusable primary packaging could stimulate and help upscale reuse systems by encouraging consumers, such labels if introduced at national level could also create a barrier to the internal market.

Furthermore, there was consensus from the responding Member States that certain packaging types are better suited to reuse. Packaging which is frequently used and partly standardised such as beverage bottles and transport packaging was identified as most viable for a reuse system. Generally, producer incentives, such as EPR fee modulation, were considered important, although it was also noted that EPR alone would not cause a significant shift to reuse. In addition, several Member State respondents were of the view that some form of standardisation at the EU level, or an EU level body for reuse would help address the challenges of packaging reuse in an open system. Information sharing and a common definition of a reuse system were considered important aspects of harmonisation in order to overcome barriers to reuse in the single-market.

6.4.6. Problem Evolution

In summary, data on packaging reuse across Europe is limited, but overall trends indicate a reduction in reusable primary packaging over the past two decades.

Notwithstanding, there have been recent signals, albeit on a small scale, that this decline of reusable primary packaging may be slowing in some areas and for some consumer packaging types. There is significant opportunity in this sector to build upon a rise in consumer awareness. Reusable transport packaging has shown more stability, although there are some material and sector-specific challenges.

As products, materials and consumption have evolved, there has been a significant rise in the use of one-way packaging, especially single-use plastic primary and secondary packaging; a trend which looks set to continue. What is more, the evolving retail landscape, with larger distribution networks, produced and packed on high-speed packaging lines, have combined to exert a downward pressure on reuse.

The current and proposed legislation discussed in the previous section indicates a policy direction which is attempting to promote packaging reuse through a number of different mechanisms. The recent 2018 waste

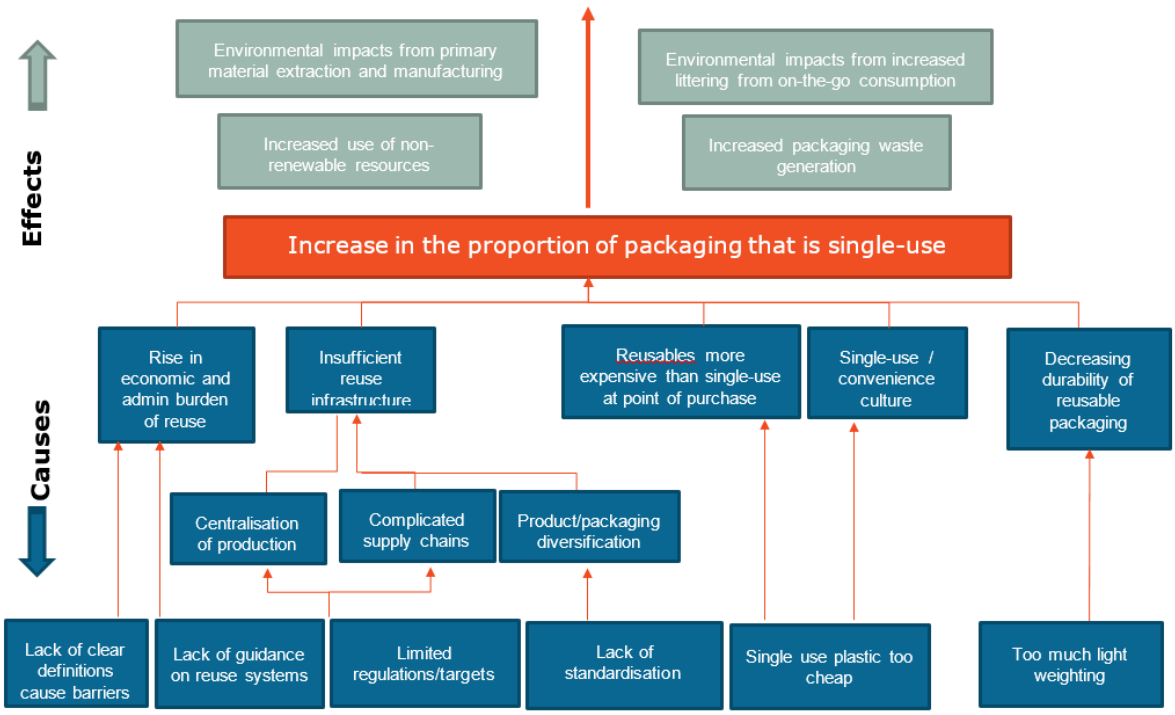
[180] Blauer Engel *Umweltschonende Mehrwegflaschen und -gläser*, accessed 24 June 2020, https://www.blauer-engel.de/de/produktwelt/gewerbe-kommune/mehrwegflaschen-und-glaeser

[181] Blauer Engel is used to label very different products in the German market which fulfill certain standards in terms of eco-friendliness. It is very well-known when it comes to paper and toilet paper, but also for electric devices. It never really established itself as a label for reusable (beverage) packaging in Germany, partly because it was feared that consumers would not understand the link to other products carrying the label. Therefore, just a few companies actually use it for reusable packaging.

legislative packaging (WFD, PPWD), European Green Deal, Circular Economy Action Plan and the SUP Directive provide a regulatory framework and impetus for Member States to take action on packaging waste prevention and packaging reuse.

On the whole, however, many of the market and consumer shifts which have driven the decline in reusables are set to continue over the coming decade. Recent increase in consumer demand for reusables represents a relatively small-scale shift compared to the continued trends in on-the-go consumption, convenience and the overall growth of the packaging market. Indeed, a further evolution, strengthening and enforcement of the policy drivers would be required to significantly reverse the trend in declining packaging reuse. The continued fall in packaging reuse presents a critical problem if the resource efficiency principles and greenhouse gas mitigation targets of the EU Circular Economy Action Plan and Green New Deal are to be achieved.

6.4.7. Problem Tree



6.5. Low levels of packaging recyclability

Data from both Eurostat and market data reports were assessed, which showed **increased use of packaging design characteristics that may inhibit, at present, reuse and recycling, and increasing these levels further in future.** These packaging characteristics are further outlined below, and include, for example, flexible composite (or multi-material) packaging(e.g., which has increased in tonnage placed on the market

by 16% over the 2003-2018 period.[182,183] In comparison, the quantity (tonnage) of rigid packaging placed on the European market increased by 13% over the same period.[184] This likely represents an even greater increase when resolved to number of units placed on the market given the low-weight of many flexible packages.

The European Green Deal states that:[185]

> *The Commission will develop requirements to ensure that all packaging in the EU market is reusable or recyclable in an economically viable manner by 2030*

The CEAP reiterates the commitment made in the Green Deal, and notes that to ensure this is achieved, the Commission will review Directive 94/62/EC to reinforce the mandatory Essential Requirements for packaging and consider other measures, with a focus on:[186]

> *Driving design for re-use and recyclability of packaging; considering reducing the complexity of packaging materials, including the number of materials and polymers used.*

The nCEAP further notes that the Commission will address emerging sustainability challenges by developing a policy framework on:

> *Use of biodegradable or compostable plastics, based on an assessment of the applications where such use can be beneficial to the environment, and of the criteria for such applications. It will aim to ensure that labelling a product as 'biodegradable' or 'compostable' does not mislead consumers to dispose of it in a way that causes plastic littering or pollution due to unsuitable environmental conditions or insufficient time for degradation.*

At present, however, there are a number of related challenges in respect of the recyclability of packaging. Environmentally, this has negative consequences, since the landfilling/ incineration of recyclable materials not only results in increased GHG emissions, but also supports continued reliance on virgin materials rather than recycled ones. Figure 29 displays the same chart as in Figure 8, but including the GHG emissions of the different end of life options for packaging, namely landfill, incineration and recycling. The chart shows how recycling contributes to lowering the net GHG emissions associated with packaging. However, as discussed in the following sections, there are challenges in respect of the recyclability of packaging, notably:

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[182] Classification covers FIBCs, bags, sacks, pouches, sachets, wraps and other flexible packages – not restricted to flexible plastic packaging.

[183] Transparency Market Research (2018) *Packaging Market - Europe Industry Analysis, Size, Share, Growth, Trends and Forecast, 2018 – 2026*, December 2018

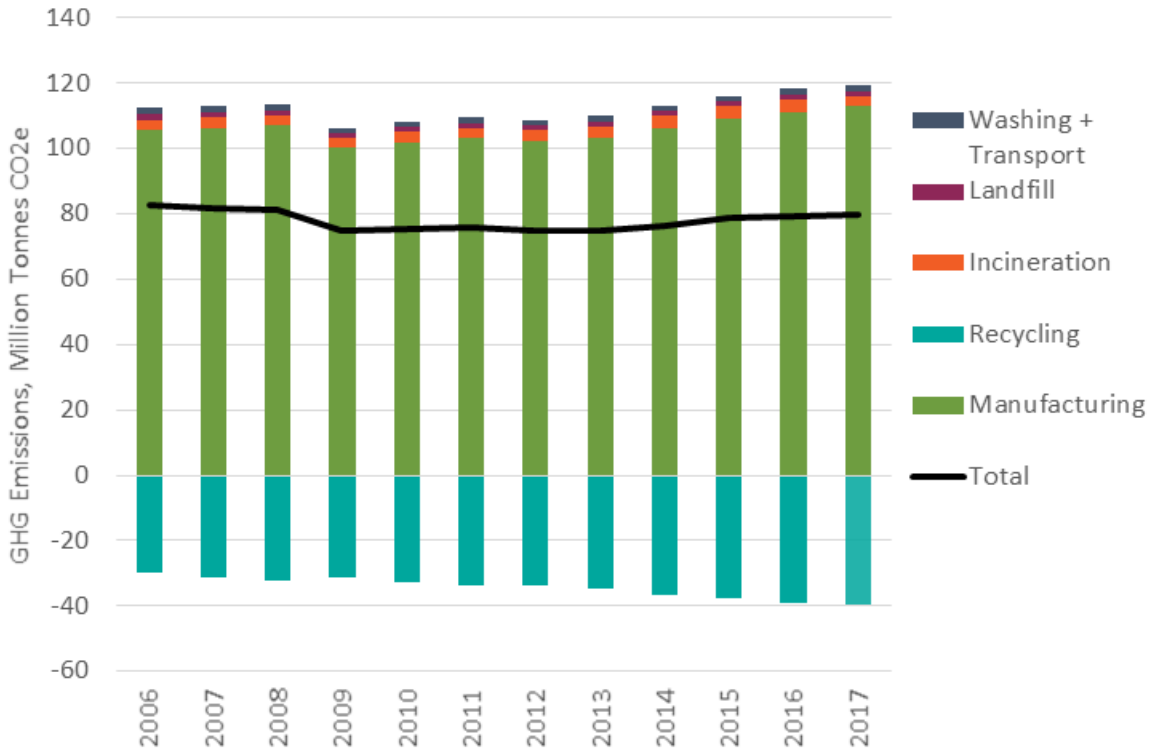
[184] Transparency Market Research (2018) *Packaging Market - Europe Industry Analysis, Size, Share, Growth, Trends and Forecast, 2018 – 2026*, December 2018

[185] European Commission (2019) The European Green Deal, COM(2019) 640, 11th December 2019, available at https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0002.02/DOC_1&format=PDF

[186] European Commission (2020) A new Circular Economy Action Plan for a Cleaner and more Competitive Europe, COM(2020) 98, 11th March 2020, available at https://eur-lex.europa.eu/resource.html?uri=cellar:9903b325-6388-11ea-b735-01aa75ed71a1.0017.02/DOC_1&format=PDF

- Increased use of packaging design features that inhibit recycling
- Increased use of compostable plastic packaging that can cause contamination
- A lack of information about substances in packaging that may be hazardous
- Inconsistent and confusing labelling of recyclable packaging

Figure 29. GHG emissions for the packaging manufacturing and end of life management routes



Source: Eunomia baseline report

6.4.1. Increased use of packaging design features that inhibit recycling

It is assessed that 17% of packaging is currently non-recyclable[187], of which 7% could become so in the future using the existing technology, but the remaining 10% only if there are further technological advancements. Under this estimation, it is assumed that all steel, glass and wooden packaging are fully recyclable, which may not be the case in practice. Particular challenge represents plastic packaging. According to the RecyClass methodology developed by the Plastic Recyclers Europe, 57% of plastic

[187] Annex I – RecyClass Applications: Statistics (Plastic Recyclers Europe)

packaging could be repartitioned in classes A, B and C[188] with the remaining 44% having significant or major design issues that highly affect its recyclability or make it unrecyclable. The average rate of plastic packaging recycled in 2019 as declared by the EU Member States was 40.6% (down from 41.4% in 2018); however, in most countries this refers to volumes collected for recycling, while the effectively recycled plastic packaging is estimated at only 14%[189].

Data from both Eurostat and market data reports[190] shows increased use of packaging design characteristics that may inhibit recycling.

In general 'unrecyclable' packaging types are those which:

- **The packaging is less likely to be collected by streams being subjected to sorting for recycling:**

    - Due to the package being especially small, flexible or lightweight, potentially causing the material to move around on the belt of the sorting equipment, get caught up in the air currents and be miss-sorted, create jams or clogs in the sorting equipment, etc. Or,
    - Due to the packaging being more likely to be highly contaminated with food (e.g. if the package is difficult to empty fully), or other residues (including inks, labels, etc.) that are difficult/ costly to remove relative to the quality/ quantity of material that can be recovered. Or,
    - As a result of the item being consumed on-the-go and the packaging being therefore less likely to enter into a recycling collection. Additionally, this could mean that the package is more likely to be littered. Or,
    - Due to relying on consumer compliance/actions for the package to enter the recycling stream in the correct way – e.g. if there are many parts which need to be separated by the consumer prior to being placed in a recycling collection. Or,
    - If a separate collection infrastructure does not exist or is not common for the item, due to a lack of final recycling options and end markets or insufficient volumes of waste material, which result in collections being economically unviable, e.g. for metallised plastic films such as those used in crisps packets and candy wrappers.

- **The packaging poses challenges to the majority of sorting systems, depending on the availability and quality of sorting infrastructure in the region or Member State in question:**

    - Packaging poses challenges to the majority of sorting systems if its parts are made from different materials which are not easily separable (either by hand or mechanically) or made from different polymers (e.g. composite packaging including multi-polymer plastic packaging, cardboard and aluminium laminates, etc.). Or,
    - If the use of one polymer, e.g. for labelling, is likely to lead to the packaging being mis-sorted into the wrong material stream and result in contamination. Or,

[188] RecyClass methodology: Class A: The package does not pose any recyclability issues and it can potentially feed a closed-loop scheme to be used in the same application. Class B: The package has some minor recyclability issues but could even potentially feed a closed loop scheme. Class C: The package has some recyclability issues that affect the quality of its final recyclate.
[189] https://plasticseurope.org/wp-content/uploads/2022/04/SYSTEMIQ-ReShapingPlastics-April2022.pdf
[190] Transparency Market Research (2018) *Packaging Market - Europe Industry Analysis, Size, Share, Growth, Trends and Forecast, 2018 – 2026*, December 2018

- If colouring used in the packaging results in it not being "seen" by NIR sorting machinery.[191]

- **The packaging poses challenges to recycling operations**

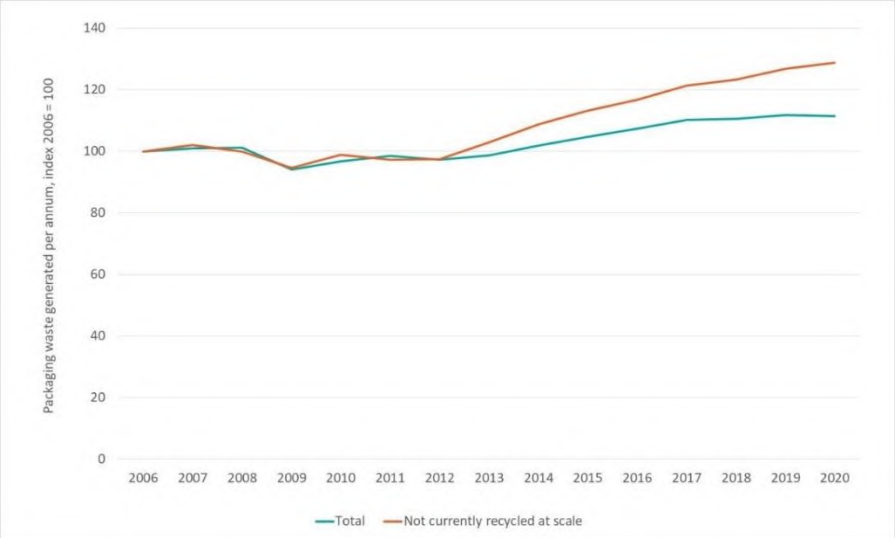
  - If additives to the packaging result in the polymer (for plastic packaging) behaving differently in industry standard separation tests, such as the float-sink test. Or,
  - If the extent of other materials or other polymers included in the packaging is above the tolerable limit for the process. E.g. in paper reprocessing there is generally a tolerable limit of ~3-5% for non-pulpables entering the stream which if exceeded is detrimental to recycling process. An example of such a non-pulpable is the plastic windows in envelopes which are part of paper packaging. Or,
  - If the packaging is economically unfeasible to reprocess, for example, the item can technically be recycled but there is a lack of demand for it as secondary material/end markets are lacking. This could also be the case where the packaging item is particularly small and yield per item is decreased, because the share of the market for a packaging item is so small that it is not economically viable to set up recycling infrastructure. Or,
  - If it is difficult to incorporate secondary material into new packaging, due to certain technical and regulatory constraints e.g. use for food contact packaging. This is linked to the above as it is important to generate end markets for recycled packaging by creating demand for recycled materials in high quality applications.

All of the above are magnified when these packaging types (i.e. those that pose challenges to existing sorting and recycling operations) are increasing in market share relative to other more easily recyclable packaging.

For around the last decade, the amount of packaging that inhibits recycling has been increasing at a greater rate than total packaging waste generated, showing that the problem has been increasing, as show in Figure 30.

Figure 30 Change in total and packaging that inhibits recycling, index 2006 = 100

[191] This is not an exhaustive list of factors which results in a package posing challenges to the majority of sorting systems, but is indicative of the sorts of considerations made.



Source: Eunomia baseline model

Many of these packaging types are *technically* recyclable, though the processes associated with their collection and sorting (including washing and decontamination) can be costly and inefficient, associated with relatively low quality/ quantity of useful output and, historically, a lack of sufficient demand in end markets.

In some cases, the switch to high barrier (designed to extend the shelf life of products), lightweight, and low-cost packaging design can also result in an increase in the generation, distribution and persistence of litter in the natural environment. These packaging types pose greater requirements on reprocessors, who must either increase their sorting and recycling capabilities, or, as is more likely in the short term, reject these types.

It is noted also that while packaging recycling rates have steadily improved since the 1990s, this trend has historically been attributed to the targets established by the Waste Framework and Packaging Waste Directives. Moving forward, increasing targets, accompanied by a new recycling calculation methodology, is likely to make it more challenging, and thus more costly, for Member States to meet these requirements in the absence of further regulatory and economic incentives for producers to make packaging more recyclable.

Based on the above factors, characteristics of packaging that inhibit recycling have been identified through a review of guidelines, protocols and best practice documents developed by industry to promote improved packaging design in order to maximise recyclability, and through consideration of other sources, such as the 2016 Ellen MacArthur Foundation report[192] and previous work on beach/marine litter[193].

[192] Ellen MacArthur Foundation (2016) *The New Plastics Economy: Rethinking the Future of Plastics*, March 2016, https://www.ellenmacarthurfoundation.org/assets/downloads/EllenMacArthurFoundation_TheNewPlasticsEconomy_15-3-16.pdf
[193] ICF and Eunomia for the European Commission (2018), *Plastics: Reuse, Recycling and Marine Litter*, 30 May 2018, https://op.europa.eu/en/publication-detail/-/publication/3cdca2d1-c5f2-11e8-9424-01aa75ed71a1/language-en

Interviews with industry stakeholders were also conducted. Table 10 contains a list of some of the packaging characteristics that may inhibit recycling. For each of the examples in the table, the most common challenges posed to collection, sorting, and recycling operations are also identified. It is noted that the table is not comprehensive, but rather, provides an illustration of some of the key packaging types that pose challenges to the recycling process, and the nature of these challenges.

Sources used to inform this table were:

- Design of Rigid Plastic Packaging for Recycling (WRAP)[194]
- Plastic Packaging Recyclability by Design (ReCoup)[195]
- Refined methods and Guidance documents for the calculation of indices concerning Reusability / Recyclability / Recoverability, Recycled content, Use of Priority Resources, Use of Hazardous substances, Durability (JRC)[196]
- Recyclability of Paper Based Products (Eco Paper Loop / European Commission)[197]
- The Association of Plastics Recyclers Design Guide for Plastics Recyclability (APR)[198]
- Design Guidance: Best Practices for Recyclable Products and Packaging (Healthcare Plastics Recycling Council)[199]
- Confederation of Paper Industries (CPI) Guidelines – Paper and Board Packaging Recyclability Guidelines[200]
- Ten Common Rules of Design for Recyclability (DfR) for Plastic Packaging[201]
- RecyClass Recyclability Tool for Plastic Packaging (Plastic Recyclers Europe)[202]

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[194] Foster, S., Morgan, S., and East, P. (2013) *Design of Rigid Plastic Packaging for Recycling - Guidance Document*, 2013
[195] BTF and RECOUP (2017) *Recyclability by design*, 2017, http://www.recoup.org/p/130/recyclability-by-design
[196] Fulvio, A., Mathieux, F., European Commission, Joint Research Centre, and Institute for Environment and Sustainability(2012) *Integration of resource efficiency and waste management criteria in European product policies - second phase: refined methods and guidance documents for the calculation of indices concerning reusability Report n° 3. Report n° 3.*, Luxembourg: Publications Office
[197] EcoPaper Loop (2014) *Recyclability of Paper based Products - Guideline Document*, 2014
[198] Association of Plastic Recyclers (2018) *Full APR Design Guide: APR Design Guide for Plastic Recyclability*, 2018, https://plasticsrecycling.org/images/pdf/design-guide/Full_APR_Design_Guide.pdf
[199] *Design Guidance | HPRC*, accessed 19 February 2019, https://www.hprc.org/design-guidance
[200] Confederation of Paper Industries (CPI) (2019) *Paper and Board Packaging Recyclability Guidelines*, 2019, https://paper.org.uk/PDF/Public/Publications/Guidance%20Documents/CPI%20Recyclability%20Guidelines%20Final.pdf
[201] Borealis, and MTM Plastics (2018) *Ten Common Rules of Design for Recyclability (DFR) for Plastic Packaging*, 2018

Table 10. Table of some of the key characteristics of packaging that may inhibit recycling

Packaging Type and Exemplar items	Reasoning
Multi-Material Packaging	
Metallised plastic films: **Crisp Packets** **Pet food pouches**	**Less likely to be collected by streams being subjected to sorting for recycling**: On the go consumption may make this difficult for crisp packets. In many places there is no recycling collection for these items **Poses challenges to recycling operations:** Multi-material composite where the constituent materials are difficult to separate.
Plastic coated, or metallised cardboard: **Beverage cartons** **Coffee cups**	**Poses challenges to recycling operations**: Provides a challenge to separate the plastic and metal layers from the fibre, such that all materials can be fully recycled. Technically feasible in specialised plants, not all pulping plants across the EU have the necessary equipment. Reprocessing can be hampered by inks and adhesives, water soluble inks and adhesives and paper coating agents. This increases expense of the process. CEPI guidance states: Two-sided laminates such as beverage cartons and hard to recycle coffee cups should be collected and reprocessed separately.
Small Multi-Material Packages: **Yoghurt Pots** **Blister Packs**	**Less likely to be collected by streams being subjected to sorting for recycling**: Relies on consumers separating/sorting components E.g., for yoghurt pots there is a foil lid, paper/fibre label and rigid plastic pot. **Poses challenges to the majority of sorting systems**: For blister packs, foil covering bound to plastic backing with adhesive. **Poses challenges to recycling operations**: Small size, less efficient and economical to reprocess, so less revenue from recycling per item collected.
Plastic Packaging	
Multi-Polymer flexible film	Less likely to be collected by streams being subjected to sorting for recycling: Collections for this material are limited at

[202] RecyClass Design for Recycling Tool (accessed 18th December 2019), https://recyclass.eu/

Packaging Type and Exemplar items	Reasoning
packaging: **PET/PE Laminate** **PET/OPP/CPP Laminate** **Snack pouches** **Spouted pouches**	present. **Poses challenges to the majority of sorting systems**: Difficult to separate the constituent polymers (e.g., PE/PET). **Poses challenges to recycling operations**: If PE is reprocessed with PET the lower melt point causes imperfections in the finished product which can result in rejections or lower quality output. Increasing in market share
Black Plastic: **(Also to a lesser extent, dark coloured plastic which isn't black)** **Black plastic food trays**	**Poses challenges to the majority of sorting systems**: Carbon black pigment prevents the pack being 'seen' by NIR technology. **Poses challenges to recycling operations**: Non-carbon black dark pigments still have low value and limited end markets compared to clear or light coloured rigid plastics (n.b. some end markets such as plant trays exist).
Biodegradable plastics: **Biodegradable rigid plastic food container** **Biodegradable films**	**Less likely to be collected by streams being subjected to sorting for recycling:** Potential for consumers to place in the wrong collection containers if they are unsure whether a piece of packaging is biodegradable or not.[203] **Poses challenges to recycling operations:** There is low tolerance for contamination with biodegradables. Biodegradable plastics have an immediate effect when the plastic is melted as they melt faster and create black spots in the film. Longer term, if included in products such as thick construction film, they may biodegrade during use. Recycling of a pure stream of some biodegradable plastics is technically feasible if correctly separated, but is not being practically implemented in Europe at a large scale at present (barring small scale PLA recycling in Belgium). Increasing in market share.
Plastic Packaging with PVC components and all-PVC packaging: **PET packaging with PVC sleeve** **PVC packaging**	**Poses challenges to the majority of sorting systems:** Similar in appearance to PET and overlapping densities make separation difficult. **Poses challenges to recycling operations:** If not separated PVC generates acidic compounds during reprocessing which cause problems – ester depolymerisation reactions.

[203] The likelihood of this issue does depend on the nature of the collection services and composting plants in a given Member States, for some this is not as significant a problem, however, stakeholder input suggests that this is an issue in the majority of Member States.

Packaging Type and Exemplar items	Reasoning
	Packaging which is all PVC is not widely recycled.
Shallow or flattened plastics: **Items more two dimensional than three dimensional e.g. thin trays**	**Poses challenges to the majority of sorting systems:** Very shallow or flattened plastics may be mis-sorted in automatic sorting facilities with paper/cardboard fractions, and subsequently never enter further plastic sorting/ recycling stages. **Poses challenges to recycling operations:** If mis-sorted it can contaminate the paper fraction. Mis-sorting also reduces plastic reprocessing yield and economic efficiency of plants.
Additives which alter sorting: **Foamers/Fillers/additives which change density** **Sleeves with more than 60% coverage**	**Poses challenges to the majority of sorting systems:** Plastic regrind is sorted in a float/sink test based on density. Additives which change density to the extent of opposite behaviour in the float/sink test will lead to mis-sorting, contamination of streams etc. Sleeves with more than 60% coverage can lead to errors in identification of the material used for the container.
Plastics with optical brighteners	**Poses challenges to recycling operations:** Optical brighteners are detrimental to recycling as they create an unacceptable fluorescence when reprocessed.
Additions to Plastic Bottles: **Paper labels on plastic bottles (e.g. PET/PP/HDPE)** **Metal Caps on plastic bottles**	**Poses challenges to recycling operations:** Paper labels on PET bottles can pose challenges to recycling operations in some cases as paper becomes pulp in a caustic hot wash and is difficult to filter from the liquid. Individual fibres which travel through will degrade the quality of recycled PET. Metal caps and rings may not be easily separable and aluminium processed in a caustic wash will form aluminium hydroxide and contaminate the batch. In the case of PET this prevents use for food-grade applications.
Glass Packaging	
Glass bottles with additional parts made of different materials **Perfume bottles**	**Poses challenges to the majority of sorting systems:** Parts made from different materials may be difficult to separate. **Poses challenges to recycling operations:** Small springs from sprays can become jammed in recycling machinery where these are used (this is also true for plastic spray bottles with trigger

Packaging Type and Exemplar items	Reasoning
	mechanisms).
Paper Packaging	
Paper products cured with UV varnish or varnish which breaks down into small or microplastic particles	**Poses challenges to recycling operations:** Not readily removed by conventional de-inking process, and for those which break down into microplastics – can pollute waste water released.
Paper products with adhesives which plasticise	**Poses challenges to recycling operations:** Some adhesives on tape/labels and in binding of packaging have potential to soften or plasticise in heat and form "stickies" which end up on the finished paper and spoil performance.
Waxed Papers	**Poses challenges to recycling operations:** Wax cannot be removed by mill cleaning systems and passes onto the finished product. Silicone, greaseproof and glassine papers cannot be pulped and pass into the mill waste stream.
Metal Packaging	
Aluminium foils with high levels of food contamination such as post consumer food trays/ containers/ sheet foil	**Poses challenges to the majority of sorting systems** High levels of organic contamination can be costly and difficult to clean, making recycling economically unattractive.
Wood Packaging	
Wood packaging with material/ chemical contaminants (e.g. medium density fibreboard with paint/ plastic coating/ urea formaldehyde)	**Poses challenges to recycling operations:** Wood fibres not readily separated from resins/ additives by conventional shredding process, with potential toxic dust release/ accumulation in recycled products.

6.5.2. Consequences

The impacts of the heightened use of packaging design features that inhibit recycling (including separate collection and sorting) **are felt across the packaging value chain**. While there are clear economic advantages for producers associated with the use of several of the design features described above, their use makes the proper separation for disposal of such items at the end of life challenging for consumers and subsequent sorting and recycling costly for waste managers. In some cases, the switch to high barrier (e.g., multi-material films and pouches described in the table above, which are designed to extend the shelf life of products), lightweight, and low cost packaging design can also result in an increase in the generation, distribution and persistence of litter in the natural environment. This is due to the fact that such packaging is both lightweight, and therefore easily transported as litter, as well as highly durable and non-biodegradable, resulting in its persistence as litter if not subsequently picked up. In addition, the fact that such packaging is often designed to allow products to be consumed on the go, and has little, or no value to consumers, means they may be more susceptible to being littered.

Increased generation of waste associated with such difficult to recycle packaging types also puts greater requirements on reprocessors, who must either increase their sorting and recycling capabilities, or, as is more likely in the short term, reject these types. In the latter case, driven by the lack of clarity in the Essential Requirements, this packaging waste is likely to be either incinerated, and result in the associated greenhouse gas emissions; or be exported abroad for reprocessing, where it is difficult to verify whether all of the material is actually reprocessed, incinerated, or mismanaged. The demand for, and use of, such difficult-to-recycle design features can therefore have a negative environmental impact by driving a switch to packaging that has higher greenhouse gas emissions (GHGs), is less easily recycled or is more likely to be littered through the course of its entire lifecycle.

In summary, this situation, particularly related to the increased use of packaging that, as noted above:

- can lead to higher GHGs at the end of life,
- is less easily recycled in an economically viable way, and/or
- is more likely to be littered,

is contrary to the stated aims of the Commission's Green Deal (no net GHG emissions by 2050), and the supporting Circular Economy Action Plan as regards packaging (which aims to ensure that all packaging on the EU market is reusable or recyclable in an economically viable way by 2030).

The carbon impacts from the baseline model related to the estimated proportion of 'unrecyclable' packaging were calculated. This is shown below in **Error! Reference source not found.**. What this indicates is that whilst overall GHG emissions start to fall by 2030, the contribution from 'unrecyclable' packaging is actually increasing, and the rate of increase grows. This highlights the nature of the problem. The reason is that a large proportion of unrecyclable packaging is plastic, and as the management of residual waste shifts from landfill to thermal recovery plants, the GHG emissions from managing the plastic waste stream increase.

6.5.3. Problem Drivers

6.5.3.1. Market Drivers

Demand for lightweight, high barrier and composite packaging

Linked to the rise in flexible plastic (e.g., films, pouches, wrappings etc) and composite packaging, **the packaging market has seen an increase in demand for high barrier materials** (those that provide a high degree of barrier protection for gas, moisture and grease), **driven by demand for food packaging which can increase the shelf life of products.**[204]

Composite, or multilayer, flexible packages can offer such additional properties and be tailored to requirements as modified atmospheric packaging, through controlled release of packaged content, or other 'smart' packaging concepts which can be applied – increasing the functionality of the package beyond protecting and containing a product.[205] Materials used for flexible packaging can be integrated with other materials or additives to alter or enhance their barrier properties, something which may be especially valuable in the packaging of food products.[206,207] For example, active food contact materials can be used to either absorb or release substances to extend shelf life, while intelligent food contact materials are used to monitor the condition of the packaged food – the use of both these in food contact packaging is regulated. In addition, some advanced packaging approaches for food contact materials such as modified atmospheric packaging (MAP) and vacuum skin packaging (VSP) are only possible with the use of high barrier films which maintain the modified gas ratio inside the package, or which prevent gas permeability. Vacuum skin packaging is popular for meat and seafood products, as well as for ready meals.[208,209]

As such, there is increasing demand for packaging materials and formats which enhance barrier properties, many of which currently pose challenges to sorting and recycling operations (e.g., composite packaging containing aluminium foil, Ethylene-vinyl alcohol (EVOH), or polyamide). Composite and multilayer materials can offer additional benefits such as good strength to weight ratio, and meet functional requirements which cannot be met with a single material.[210] The wide range of uses of flexible packaging therefore supports the expansion of the flexible packaging market with faster growth compared to the rigid

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[204] Transparency Market Research (2018) *Packaging Market - Europe Industry Analysis, Size, Share, Growth, Trends and Forecast, 2018 – 2026*, December 2018

[205] *Get Ready for Smart Packaging | CPI*, accessed 26 April 2019, https://www.uk-cpi.com/blog/get-ready-for-smart-packaging

[206] Transparency Market Research (2018) *Packaging Market - Europe Industry Analysis, Size, Share, Growth, Trends and Forecast, 2018 – 2026*, December 2018

[207] *Flexible Packaging Applications | Pouch Partners*, accessed 26 April 2019, https://pouchpartners.com/flexible-packaging/applications/

[208] Stella, S., Bernardi, C., and Tirloni, E. (2018) *Influence of Skin Packaging on Raw Beef Quality: A Review*, accessed 26 April 2019, https://www.hindawi.com/journals/jfq/2018/7464578/

[209] *Vacuum Packaging - an overview | ScienceDirect Topics*, accessed 26 April 2019, https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/vacuum-packaging

[210] (2014) *Design Smart Material Guide - Composite Packaging*, 2014, http://www.helenlewisresearch.com.au/wp-content/uploads/2014/03/Composite-DSMG-082013.pdf

packaging market.[211] However, these functional properties can come at a cost as they are posing challenges to the majority of sorting systems and reprocessing systems at the point of recycling.

Flexible packages such as pouches can be appealing to manufacturers, offering a higher filling and sealing speed when compared to rigid packaging. This can decrease the energy requirement at this stage of the process.[212]

Flexible packaging has additional benefits for transportation due to its low weight and can require 70% less material (by weight) when compared to rigid packaging for the same quantity of goods.[213] In addition, size and shape of the package can reduce shelf space and transit space requirement. Combined, this has the potential to reduce the number of transport units required for transport of packaged goods and reduce the total weight transported.[214]

As such, flexible packaging may offer manufacturers an economic advantage when compared with a rigid packaging alternative. Alongside these factors, it is noted that in general, the Essential Requirements have added little in terms of design for recyclability precisely because they are not written to promote one form of recovery over another.

6.5.3.2. Regulatory Drivers

Lack of Effectiveness of EN 13430 (Requirements for packaging recoverable by material recycling)

Harmonised European Standards such as EN 13430 provide a presumption of conformity with certain aspects of the PPWD. With regards to flexible and composite packaging in particular, Annex II of the PPWD states that "*Packaging must be manufactured in such a way as to enable the recycling of a certain percentage by weight of the materials used into the manufacture of marketable products, in compliance with current standards in the Community. The establishment of this percentage may vary, depending on the type of material of which the packaging is composed*." However, the meaning of this requirement is unclear and has a number of possible interpretations: it could relate to the market as a whole and recycling targets for each material type, or it could refer to composite packaging and the percentage of components that are recyclable.

EN 13430 states that suppliers must declare the percentage by weight of the packaging unit that is suitable for recycling – recognising that it may comprise some components **that are not recyclable. There is, however, no minimum percentage or guidance as to what this could be and there seem to be no**

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[211] Transparency Market Research (2019) *Europe Packaging Market: Industry, Size, Share, Growth, Trends and Forecast, 2003(A)–2018(E)*, 2019

[212] Transparency Market Research (2018) *Packaging Market - Europe Industry Analysis, Size, Share, Growth, Trends and Forecast, 2018 – 2026*, December 2018

[213] Transparency Market Research (2018) *Packaging Market - Europe Industry Analysis, Size, Share, Growth, Trends and Forecast, 2018 – 2026*, December 2018

[214] University, H.-W. (2018) *Ban on plastics could increase damage to planet*, accessed 26 April 2019, https://www.hw.ac.uk/about/news/2018/a-plastic-ban-could-increase-damage-to.htm

requirements for the non-recyclable components. **Nor is it clear to whom suppliers must make this declaration**; there is a suggested compliance statement in Annex C of the Standard, but this is only advisory and it seems unlikely that suppliers have routinely been asked to submit such a declaration to the regulatory authorities.

The Standard also outlines the impact of each lifecycle phase on recyclability, with the design, manufacturing process, use, post-use collection and sorting affecting both the ability to recycle the packaging, and the packaging's impact on the recycling process. It sets out how the end user must be able to empty the packaging of the product. The design process must therefore "take into account" materials that are likely to create technical problems in the recycling process or in collecting and sorting, or to affect the quality of the recycled material, and whether components are separable. This does not, however, impose any conditions – strictly speaking, *considering* these impacts does not necessarily mean that the impacts *must be avoided*. Selected materials should not cause "significant problems in recycling technologies"; however, recycling facility operators are, arguably, best placed to judge this and interpretations of "significant problems" could vary.

The Standard does refer to another Standard CR 13688:2000 (Packaging – Material Recycling – Report on requirements for substances and materials to prevent a sustained impediment to recycling). **CR 13688 provides guidance on materials and substances that may cause sustained impediment to the material recycling of the functional unit of packagin**g. Contamination of the packaging by contact with extraneous materials in the collection and sorting processes, or by residues of the packaging content, even after cleaning, are not considered as impediments to the material recycling. EN 13430 states that inter alia CR 13688:2000 is an indispensable for the application of this document, **however this is out of date**. Having been updated in 2008, **it would not reflect the most up to date knowledge on recycling processes or more recent packaging innovations**. It also adds to the possible bureaucracy and costs for producers, by requiring them to purchase and refer to another document. [The use of this standard and its status will be reviewed during the assessment phase of the study when new standards for defining what is not recyclable packaging will be assessed with industry stakeholders].

Further, EN 13430 recognises that the introduction of new materials and types of packaging to the market "may precede the introduction of appropriate recycling technologies", and that the "development and expansion of such recycling processes may take a period of time". The supplier consequently needs to be able to demonstrate that development is underway, and that there will be "industrial recycling capacity within a reasonable period of time" for their packaging to be classed as recyclable. The "reasonable period of time" is not defined so the interpretation of suppliers, Member States and the European Commission may vary. This could, for instance, apply to composite beverage packaging or to black plastic, which are theoretically recyclable, but for which the roll out of suitable recycling infrastructure in some Member States is limited. This does not indicate who is responsible for ensuring that this actually happens, and monitoring whether the planned capacity is ultimately delivered. It simply states that developments in relevant technology should be monitored and recorded, but it is not clear whose responsibility this is, or whether the absence of such technology for a given period should trigger some form of action (none is specified).

Essential Requirements Fail to Reflect the Waste Hierarchy

In terms of the trends identified at the start of this section, the increasing recycling rates are more likely to be linked to the explicit targets in the PPWD and the WFD rather than changes in design motivated by the Essential Requirements. The Essential Requirements have, however, arguably facilitated a situation in which plastic has the lowest recycling rate of the 4 material types, given that all plastic packaging – by virtue of its high calorific value – is classified as recoverable under the Essential Requirements. The decline in glass, meanwhile, indicates a decline in reusable packaging (although other packaging types are also reusable).

These trends are therefore the result of one of the most critical weaknesses of the Essential Requirements, being that, in pre-dating the WFD, **the Essential Requirements fail to reflect the waste hierarchy**. The 2018 amendment to Annex II– which added "in line with the waste hierarchy" to the section on reuse and recovery – could be interpreted to simply highlight that reuse and recovery should be prioritised over disposal; there is no recognition that reuse takes precedence over recovery, or that recycling is preferable to energy recovery. Although the 2018 amendment referred to above has not yet been operationalised, it is noted that the latter point regarding recovery is particularly relevant in view of the fact that the Essential Requirements specific to recoverable nature of packaging do not implement this hierarchy.

This is true of both Annex II and the Standards, with EN 13427 (Requirements for the use of European Standards in the field of packaging and packaging waste) simply requiring compliance with any one of the three Standards relating to recovery, implying that all forms of recovery are equal. In addition to allowing packaging to be designed so that it can be incinerated, EN 13431 (Requirements for packaging recoverable in the form of energy recovery, including specification of minimum inferior calorific value) does not reflect the classification of recovery operations in the WFD. Annex II of Directive 2008/98/EC (WFD) on Recovery Operations, specifies that incineration facilities dedicated to the processing of municipal waste must have an energy efficiency of at least 0.60 or 0.65 (depending whether they were permitted before or after 31st December 2008). These WFD provisions mean that not all incineration is classed as energy recovery, but there is no reference to this in the Essential Requirements or in the Standard.

Further, underlining the pre-eminence of reuse and recycling, Article 8a of the WFD on extended producer responsibility refers to design for recyclability and publishing information on "the extent to which the product is re-usable or recyclable" – notably excluding other forms of recovery. **These EPR provisions and promotion of modulated fees in the WFD reinforce the perspective that there are degrees of recyclability, in contrast to the Essential Requirements, which present recyclability as a binary status** – i.e. packaging (or a proportion of it) can either be theoretically recycled or not; there is nothing relating to whether it is cost-effective to recycle or would produce high quality recycled material, let alone a recognition that it is preferable to have a packaging unit that is 100% recyclable. **Nor do the Essential Requirements reflect the changes to Article 6 of the PPWD, which no longer includes any targets for energy recovery, and sets more ambitious *recycling* targets for 2025** (a minimum of 65%) **and 2030** (a minimum of 70%) compared to the situation when the Essential Requirements were first implemented.

With regards to litter, despite the provisions of Article 9 of the Waste Framework Directive, the Plastics Strategy and the Single Use Plastics Directive (Directive (EU) 2019/904), the **Essential Requirements more generally do not include any consideration of how packaging design** could affect the ease with

which the packaging (or specific parts thereof) is littered and **could remain in the terrestrial/ marine environment.**

Finally, **within the Essential Requirements, there is little guidance over how to address potential conflicts and contradictions**. For instance, some packaging that has been re-designed to be lighter weight is also less easily recycled, but there is no indication in the Essential Requirements as to which should take precedence when waste prevention and recycling are mutually exclusive. Similarly, reusable glass packaging needs to be thicker – and consequently heavier – than glass packaging designed for single use. While the wording of Annex II arguably implies that discretion is to be used in interpreting the "minimum adequate amount", the Essential Requirements and EN 13427 do not fully reflect the trade-off between weight and reusability/ recyclability.

In summary, by providing both weak and vague criteria to be classed as recyclable and implicitly allowing all plastic packaging to be designed for energy recovery, the Essential Requirements have arguably facilitated the situation described in the Plastics Strategy: "Today, producers of plastic articles and packaging have little or no incentive to take into account the needs of recycling or reuse when they design their products." As such, the Essential Requirements do nothing to support the transition to a circular economy and the Commission's commitments in the Plastics Strategy: for all plastic packaging placed on the market in the EU to be designed so it is "either reusable or can be recycled in a cost-effective manner" by 2030. [215]

Essential Requirements unenforceable in practice

In terms of effectiveness, the Essential Requirements are difficult to implement and enforce because they leave so much to interpretation. While the Essential Requirements in theory provide rules on what types of packaging can be placed on the market across the EU, their vague nature could potentially mean they pose a barrier to the functioning of the internal market, as interpretations could differ between Member States. There is, however, little evidence to suggest this is a problem because there is so little enforcement activity.

For example, while packaging is not always of the minimum volume and weight, the indeterminate caveats (such as allowing for "consumer acceptance" and "other issues") make it difficult to demonstrate that a packaging item could be non-compliant. Additionally, packaging that is not suitable for reuse, recycling, biodegrading or composting – predominantly plastics that cannot be recycled – will be suitable for energy recovery. This means that all packaging types arguably comply with the Essential Requirements or, perhaps more pertinently, cannot be proven to be non-compliant. This does not necessarily mean that the Essential Requirements have been ineffective, but rather that the requirements have been formulated too imprecisely to be enforceable.

The **presumption of conformity seems to have been interpreted differently in various Member States**, with markedly more enforcement activity in a limited number of Member States than in most. **The**

[215] European Commission (2018) *A European Strategy for Plastics in a Circular Economy*. 16th January 2018.

harmonised Standards do not seem to have been extensively relied upon by either producers or enforcers, and a review of their content indicates that they do not provide the necessary degree of clarity to support the Essential Requirements and make them more concrete, operational, implementable and enforceable.

By assigning responsibility for enforcement of the essential requirements to Member States in Article 9 (Essential Requirements) and with the presumption of conformity the responsibility for actual compliance with the standards is shared among the Member States and packaging producers, however **there is no enforcement guidance for Member States and, along the supply chain, there is no explicit division of responsibility**. Meanwhile, the role of other entities along the supply chain who are ultimately responsible for placing packaging on the market, such as food retailers – who may rely on disposable packaging – is largely overlooked.[216]

The limited compliance and reporting procedures associated with the Essential Requirements contrasts with Article 37 of the WFD and the amended Article 12 of the PPWD. These provisions detail Member States' reporting requirements, including annual reporting to the Commission on reuse and recycling. Additionally, Article 38 WFD promotes information exchange and the sharing of best practice. Although Article 12 and Annex III of the PPWD require reporting on implementation of requirements and attainment against targets, including monitoring of non-compliance (in terms of quantities of municipal/ packaging waste generated, reused, recovered and disposed of), neither the Essential Requirements nor the harmonised standards include any such reporting requirement on the implementation of their requirements or incidence of non-compliance. Instead, the Essential Requirements rely on the use of the harmonised standards, which should enable a "presumption of conformity" with the requirements which can subsequently be monitored and verified, although, in reality, the lack of clarity in and enforceability of the standards and the lack of clarity on the procedures and authorities responsible to enforce them, have rendered this ineffective. This, potentially, also hinders sharing of best practice, which has been identified in the past as an area that could be improved.[217]

European (an organisation representing the packaging industry) reported a decade ago that 77% of companies had implemented the CEN Standards in some form.[218] It seems, however, that this was often a more informal approach of reflecting the ethos of the Standards in their internal procedures, rather than strictly and explicitly following the letter of the Standards. Tellingly, it was noted that "often companies do not even realise they are complying with the Essential Requirements and the harmonised standards", indicating that Member States' promotion of the standards and compliance inspections were limited.[219] This would seem to suggest that any positive action from producers cannot be attributed to the Essential Requirements and harmonised standards. Indeed, at a workshop conducted for a 2018 study to inform the Commission's Plastics Strategy, a packaging expert working in the packaging supply chain reported that

[216] ICF & Eunomia (2018) *Plastics: Reuse, Recycling and Marine Litter.* Final Report for the European Commission. 30th May 2018.
[217] Arcadis (2009) *A Survey on Compliance with the Essential Requirements in the Member States*. Final Report for the European Commission.
[218] ibid.
[219] ibid.

they were not aware of the Essential Requirements.[220] This may indicate that little progress has been made in the last decade, and seems to suggest that the Essential Requirements risk being a misnomer. Member States responding to the survey for the Scoping Study commented that the Essential Requirements have had little influence on packaging design, with one respondent explaining that the Essential Requirements "are not so well known or used". While some stakeholders contacted during the preceding Scoping Study, particularly producers, perceived this as beneficial, Member States, such as Belgium, reported that the Standards have had no effect.[221]

Moreover, packaging recycling performance varies significantly between Member States, although this is attributed primarily to variations in waste collection and management systems as opposed to large differences in packaging design for recycling across Member States. However, the recycling performance will get more and more harmonised as the Member States implement recycling systems to meet the increasing recycling targets under the WFD and PPWD. The sortability of packaging plays a key role in the efficiency of their collection and recycling. Indeed, in theory, packaging design with respect to both sortability and recyclability is already harmonised across all Member States, which are responsible for ensuring compliance with the PPWD and the Essential Requirements (and associated Standards). However, as noted in the preceding section, **the Essential Requirements and the associated Standards are not widely used in reality**.

By 2009, only the UK, France, the Czech Republic and Bulgaria had developed enforcement procedures, but they did not have accompanying measures to monitor the effectiveness of these procedures.[222] Another study for the European Commission in 2011 concluded that "*No Member States have demonstrated that all packaging on their market is compliant with the Essential Requirements, and no Member States have been able to provide evidence that they do not need an enforcement mechanism*." It was, however, noted that industry had launched some voluntary initiatives, including integrating the Essential Requirements into product development.[223]

The 2019 survey responses received as part of the Scoping Study corroborated the impression that there is little by way of Member State enforcement. Many Member States either did not answer the question relating to enforcement, or replied that they have no enforcement mechanisms in place. The survey responses indicated that, generally, the Essential Requirements are accorded a low priority and have had little influence on packaging design. Sweden commented that the Essential Requirements "are not so well known or used" and "are hard to use because of their complexity". Finland has previously commented that evaluating compliance with the Essential Requirement is "challenging and sometimes also open to various

[220] ICF & Eunomia (2018) *Plastics: Reuse, Recycling and Marine Litter.* Final Report for the European Commission. 30th May 2018.
[221] O-KOM (2019) Remuneration structure for ensuring compliance with the obligation to return and recover packaging waste through EKO-KOM, available at https://www.ekokom.cz/uploads/attachments/Klienti/Poplatky/EKOKOM_fees_valid_from_1_1_2019.pdf
[222] Arcadis (2009) *A Survey on Compliance with the Essential Requirements in the Member States*. Final Report for the European Commission.
[223] BIO IS (2011) *Awareness and Exchange of Best Practices on the Implementation and Enforcement of the Essential Requirements for Packaging and Packaging Waste.* Report for the European Commission. 3rd August 2011.

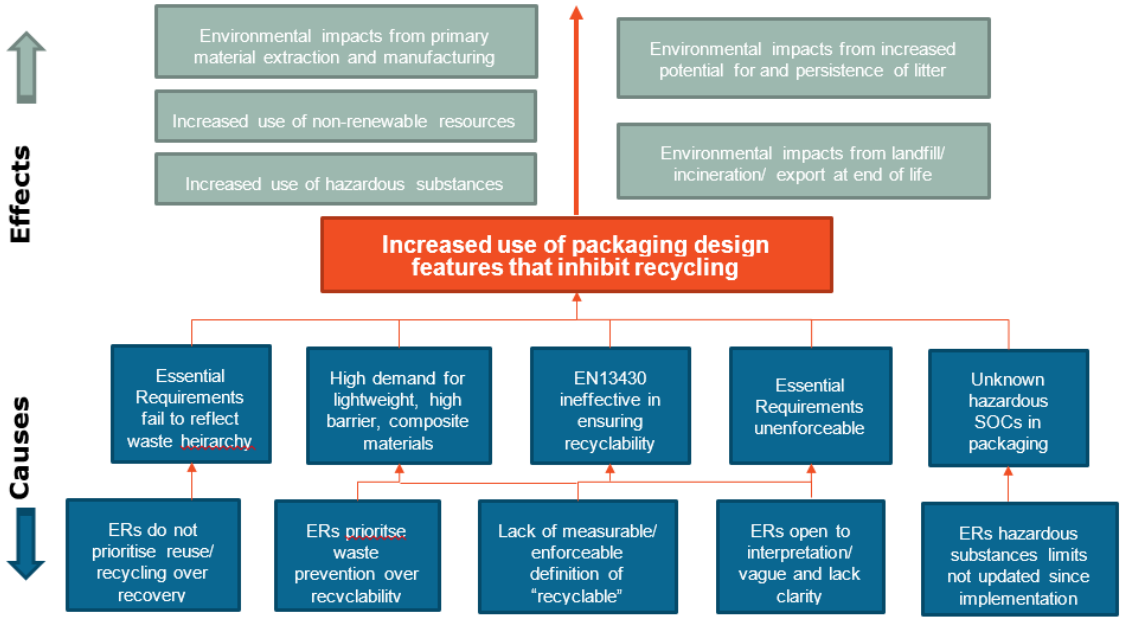
interpretations". Where enforcement does take place, this usually refers the concentration of hazardous materials in packaging, rather than the recyclability of packaging.

6.5.4. Problem Evolution

It is likely that the trend towards the use of design features that inhibit recycling will continue in the future in the absence of action. **The packaging market** (particularly for plastics) **is a dynamic one,** with new packaging formats, material combinations and recycling technologies continually arising. **However, the pace at which new packaging formats are introduced exceeds that at which local recycling infrastructure is able to adapt to manage these new formats/ compositions**, suggesting a need for active coordination. In addition, **the significant economic advantage of adopting such design features to producers and retailers at present suggests that this trend will continue** in the absence of clear drivers to the contrary.

It is noted also that while packaging recycling rates have steadily improved since the 1990s, this trend has historically been attributed to the targets established by the Waste Framework and Packaging Waste Directives. Moving forward, increasing targets, accompanied by a new recycling calculation methodology, is likely to make it more challenging for Member States to meet these requirements in the absence of further regulatory and economic incentives for producers to make packaging more recyclable.

The Commission's Plastics Strategy and the SUP Directive already provide the overall policy direction in support of limiting formats that inhibit recycling. In addition, the Commission's Green Deal and the Circular Economy Action Plan support the transition to a climate-neutral, resource-efficient, and therefore circular economy. However, there is an absence of binding measures to tackle these issues in the packaging sector, with the measures that are in place usually having a very narrow focus on specific items/ materials at present. There is therefore a need for additional action to support the implementation of these requirements, accompanied by clear guidance to assist in ensuring compliance. Improved clarity, consistency and enforceability in the Essential Requirements and harmonised standards will go a long way in providing this.



6.6. Cross-contamination of conventional and compostable recycling streams

The demand for bio-based and compostable plastics has grown substantially over the past 15 years, a trend which is expected to continue going forwards as they are used in new applications, in many of which fossil-based plastics are already ubiquitous. In Europe, such packaging has grown from 48,700 tonnes placed on the market in 2003, to 283,000 tonnes in 2018.[224] This represents an almost five-fold increase over the fifteen year period, although their total share of the plastic packaging market remains small at 1%.

The increase is proportionally large given the relatively small quantity of these materials consumed in 2003. This growth is expected to continue with European Bioplastics forecasting that the *global* market for *all* bio-based and compostable plastics will grow by 20% over the next five years.[225] Packaging does however make up the largest field of application for these materials, representing 65% of the *global* market in 2018 (~1.2 million tonnes).[226] Bio-based, non-biodegradable plastics, including bio-based PE, PET and PA made up ~56% of total global bioplastics production in 2017. Going forwards, additional capacity is due to come online in Europe in the coming years and will increase production of bio-based PE.[227] Consumption of bio-based plastics have been driven recently by a few large users, notably, Coca-Cola using bio-PET in its Plant Bottle.[228]

This application of compostable plastic materials alongside more conventional plastics in consumer packaging has led to confusion about the correct end of life management of such packaging,

[224] Transparency Market Research (2018) *Packaging Market - Europe Industry Analysis, Size, Share, Growth, Trends and Forecast, 2018 – 2026*, December 2018
[225] Hoffmann, C. *Global market for bioplastics to grow by 20 percent*
[226] European Bioplastics *New market data: The positive trend for the bioplastics industry remains stable* https://www.european-bioplastics.org/new-market-data-the-positive-trend-for-the-bioplastics-industry-remains-stable/
[227] Rosenheim, H., De, I., and Hyvedemm, S. *Bioplastics market data 2017*, Report for European Bioplastics, https://docs.european-bioplastics.org/publications/market_data/2017/Report_Bioplastics_Market_Data_2017.pdf
[228] Coca-Cola's 100% Plant-Based Bottle | Packaging Gateway https://www.packaging-gateway.com/projects/coca-cola-plant-based-bottle/

exacerbated by the fact that in most cases, the compostable plastic alternatives are, in appearance, very similar to their conventional counterparts.[229] Consequently, waste operators have reported an increase in instances of non-compostable plastic packaging being disposed of in food waste, and, conversely, of compostable plastic packaging being separated for recycling alongside other plastic packaging. In both cases, the result has been an increase in the contamination levels in both these streams, resulting in alower quantity and quality of material recycled.[230] These also include the risks of more plastics in compost and ultimately in soils.

At present, food packaging, disposable tableware and bags are the largest end use segment for such materials, and the major growth driver for biodegradable and compostable polymer consumption.[231] Some countries encourage the use of compostable single-use carrier bags and smaller bags used in shops for fruit and vegetables in bio-waste collections. The aim here is to reduce the amount of contamination in these collections that would otherwise arise from the inappropriate use of conventional plastic carrier bags. In this way, compostable plastics may also play a potential role in reducing contamination levels in bio-waste collection and treatment systems.

While the range of packaging placed on the EU market is largely consistent across all Member States, the systems for packaging waste collection and treatment at the end of life differ widely. This is true of systems for the end-of-life management of compostable/ bio-based packaging as well, and includes not only the scope of targeted materials and the systems for their collection (kerbside, door-to-door, bring, etc.), but also the infrastructure and technology used for composting, including both home composting and industrial composting. These differences can result in the situation in which a particular item of compostable packaging may be correctly separated and subsequently composted in an industrial facility in one Member State, but identified as contamination and disposed of as a part of residual waste from composting in another. In many cases, these variations in collection systems exist even within Member States, with different systems adopted in different municipalities or regions.

Inconsistent labelling practices across the EU, and in many cases, within Member States, causes consumer confusion regarding the correct disposal options for compostable packaging at the end of life, making their correct sorting challenging, and increasing cross-contamination between packaging streams. This inconsistency in part reflects the lack of harmonised/ consistent collection practices between municipalities and across Member States, and further exacerbates the problem.

Continued use of compostable plastics will, in the absence of dedicated collection and treatment infrastructure, continue to negatively affect the efficiencies of operating recycling services and ultimately negatively impact recycling rates.

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[229] Eunomia & Mepex (2018) Bio-Based and Biodegradable Plastics. An Assessment of the Value Chain for Bio-Based and Biodegradable Plastics in Norway. Report for the Norwegian Environment Agency. 30th November 2018. https://www.miljodirektoratet.no/Documents/publikasjoner/M1206/M1206.pdf

[230] European Commission (2018), *Behavioural Study on Consumers' Engagement in the Circular Economy*, October 2018, https://ec.europa.eu/info/sites/info/files/ec_circular_economy_final_report_0.pdf

[231] *Demand For Biodegradable Plastics Expected To Surge | CleanTechnica*, accessed 26 February 2019, https://cleantechnica.com/2018/07/31/demand-for-biodegradable-plastics-expected-to-surge/

In addition, consumers might confuse compostable packaging (which needs to be collected in order to biodegrade) with biodegradable plastics in the open environment, with a risk for increased littering, as consumer expect these compostables to biodegrade in the open environment[232].

The following box contains a case study about Italy, which collects significantly more food waste than any other European country. Through a series of policy measures, quantities of conventional plastic contamination have been reducing annually in recent years, whilst the amount of compostable plastic has significantly increased – quantities of the latter entering composting plant tripled from between 2016 and 2019. The most recent data indicates that Italy is on track to meet its target of 50% of compostable plastic bags being treated via the biowaste collection system. Contamination levels of compostable plastic in conventional plastic remain relatively low, at an estimated 6,000 tonnes per annum in 2019.

Case Study: Italy

Italy collects significantly more food waste than any other European country, with over 6 million tonnes collected in 2015 and amounts steadily rising since. The contamination of food waste by conventional plastic carrier bags was a significant problem. In response to this issue, Assobioplastica – the Italian Association of Bioplastics and Biodegradable and Compostable Materials – was set up in 2011, and it brought together the bioplastics sector with the entities responsible for managing bio-waste plant to consider industry-wide solutions. Alongside this, a ban on conventional plastic carrier bags was introduced in 2010, with retailers required to offer only compostable plastic carrier bags, or paper bags. More recently, a similar ban came into force for smaller fruit and vegetable bags made of plastic. These bans have not yet completely prevented the contamination of compost by conventional plastic carrier bags, as it has not been possible to fully enforce the ban at a national level. But quantities of conventional plastic contamination have been reducing annually in recent years, whilst the amount of compostable plastic has significantly increased – quantities of the latter entering composting plant tripled from between 2016 and 2019.

Compositional assays indicate that the compostable carrier bags are the items made of compostable polymer that are the most frequently used to collect food waste – these accounted for nearly 40% of the compostable plastic in 2019, more than double that of the caddy liners, and significantly more than the fruit and vegetable bags that have been more recently introduced.

The most recent data indicates that Italy is on track to meet its target of 50% of compostable plastic bags being treated via the biowaste collection system. Contamination levels of compostable plastic in conventional plastic remain relatively low, at an estimated 6,000 tonnes per annum in 2019.

[232] European Commission (202), *Relevance of biodegradable and compostable consumer plastic products and packaging in a circular economy*, https://op.europa.eu/en/publication-detail/-/publication/3fde3279-77af-11ea-a07e-01aa75ed71a1/language-en/format-PDF

Sources: https://www.polimerica.it/articolo.asp?id=24090; https://www.packagingnews.co.uk/news/italy-bans-plastic-carrier-bags-04-01-2011; http://www.assobioplastiche.org/index.html; CIC (2020) Food Waste Collection and Recycling in Italy, presentation to the BBIA, available from https://bbia.org.uk/wp-content/uploads/2020/06/RICCI-BBIA-FW-Collection-IT-Webinar-2020-0514.pdf

6.6.1. Consequences

As mentioned above, increased use of bio-based plastics has resulted in **an increase in contamination of both organic waste streams and recyclable plastic streams leading**, in turn, **to a reduction in the quality and quantity of recycled materials**. This is due to the proliferation of compostable/ bio-based alternatives in applications in which conventional plastics are already ubiquitous. [233] In some cases, this has resulted in entire loads of recyclables being discarded, which further undermines consumer confidence in source segregation efforts and those perceived to be responsible for recycling.[234, 235] Though this is currently not a significant issue due to the relatively small proportion of such materials in use in the packaging sector, the strong growth projections for bio-based and compostable materials in packaging suggest that the problem may become a more significant barrier to recycling in the next 5-10 years. As noted in the Commission's Plastics Strategy: "in the absence of clear labelling or marking for consumers, and without adequate waste collection and treatment, [the increasing market shares of plastics with biodegradable properties] could aggravate plastics leakage and create problems for mechanical recycling".

Waste operators must ultimately bear the costs associated with additional sorting, washing and disposal requirements, as well as lower prices and fewer end markets for the resulting low quality of recyclate that results. Environmentally, this has negative consequences, since the landfilling/ incineration of recyclable materials not only results in increased GHG emissions, but also supports continued reliance on virgin materials rather than recycled ones. In the case of biodegradable packaging, the difficulty in sorting these materials has sometimes led to the misconception that such waste packaging can be discarded as litter – with long-lasting negative impacts on terrestrial and marine environments.[236]

Alongside of the above, bio-waste treatment system operators will also bear the costs of increased contamination from conventional plastic bags arising from the inappropriate use of these products in bio-waste collection systems.

6.6.2. Problem Drivers

Inconsistency and Shortcomings in Collection/ Sorting Infrastructure

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[233] Eunomia & Mepex (2018) Bio-Based and Biodegradable Plastics. An Assessment of the Value Chain for Bio-Based and Biodegradable Plastics in Norway. Report for the Norwegian Environment Agency. 30th November 2018. https://www.miljodirektoratet.no/Documents/publikasjoner/M1206/M1206.pdf

[234] Viridor (2018), *UK Recycling Index 2018*, https://www.viridor.co.uk/siteassets/document-repository/recycling-index/viridor-uk-recycling-index-2018.pdf

[235] European Commission (2018), *Behavioural Study on Consumers' Engagement in the Circular Economy*, October 2018, https://ec.europa.eu/info/sites/info/files/ec_circular_economy_final_report_0.pdf

[236] https://op.europa.eu/en/publication-detail/-/publication/3fde3279-77af-11ea-a07e-01aa75ed71a1/language-en/format-PDF

While the range of packaging placed on the EU market is largely consistent across all Member States, the systems for packaging waste collection and treatment at the end of life differ widely. This is true of systems for the end of life management of compostable/ bio-based packaging as well, and includes not only the scope of targeted materials and the systems for their collection (kerbside, door-to-door, bring, etc.), but also the infrastructure and technology used for composting, including both home composting and industrial composting. These differences reflect a range of economic, geographic and regulatory considerations, exacerbated by the lack of standards for industrial composting processes/ home composting at present (as recognised in the previous amendments to the PPWD), which can result in the situation in which a particular item of compostable packaging may be correctly separated and subsequently composted in an industrial facility in one Member State, but identified as contamination and disposed of as a part of residual waste from composting in another.

In many cases, these variations in collection systems exist even within Member States, with different systems adopted in different municipalities or regions. It is also noted that given the rapid growth in this sector and the increasing number of applications to which bio-based/ compostable packaging are being applied, outdated/ insufficient collection/ sorting infrastructure or related funding underlies this problem – a situation which may be improved by EPR system requirements on one hand, and ongoing trials to introduce "smart" sorting infrastructure on the other (e.g. digital watermarking/ trackers/ tracers/ product passports, etc.).The latter, in particular, would support increased accuracy in the identification and subsequent separation of compostables in the plastic packaging stream, or vice versa, allowing for their removal in a more efficient manner to prevent contamination.

Shortcomings in approach to relying on presumption of conformity with a harmonised standard EN 13432

A key underlying issue that drives the inconsistency in labelling of bio-based/ compostable plastic packaging, and, in turn, the contamination of the composting/ plastic recycling stream, is the shortcomings in the harmonised standard EN13432. The standard is meant to satisfy the requirements set out in Annex II of the PPWD, that packaging intended for composting should be "*of such a biodegradable nature that it does not hinder the separate collection and the composting process*", while biodegradable packaging should be "*capable of undergoing physical, chemical, thermal or biological decomposition*", producing "*carbon dioxide, biomass and water*". The PPWD as revised in 2018 strengthened the language slightly by requiring that the compostable packaging "does not hinder" the separate collection and composting process rather than indicating that it "should not hinder" the process. The amendment also specified that oxo-degradable plastic does not count as biodegradable.

However, this has not been the case in reality. For example, despite stating that the packaging should not damage the composting process or affect the quality of the resulting compost, biodegradable bags that are currently compliant with EN 13432 can cause problems for biogas plants as they do not breakdown within the average treatment period. For this reason, and to avoid risk of confusion with conventional plastic bags, some plants automatically remove all types of bag from food waste – regardless of what they are made from

and whether they are compostable – prior to treatment.[237] In this regard, the Standard is not proving effective and, arguably, it is not for the packaging supplier to determine in test conditions whether the packaging has "any observable negative effect on the [waste treatment] process", as the treatment facilities themselves may be better placed to judge this.

The essential shortcoming at the root of this is that Standard EN 13432 makes clear that it covers mainly only biodegradability in industrial treatment plants. This means that packaging is tested and certified as compostable in conditions that are not necessarily replicated in real-life conditions once it is placed on the market. As there are no standards for industrial composting processes, they will vary across plants and across Member States (as discussed in the section above). The Standards are also generous in allowing six months for full biodegradation. In reality, this will vary between Member States, but plants' active phases could be just 3-6 weeks, while the post-composting stabilisation phase may be 2-3 months.[238] In the case of anaerobic biodegradation, it is not guaranteed that there will be a second, aerobic, phase even though the Standard assumes there will be. EN 13432 therefore assumes certain conditions or practices as present in the laboratory testing will be used within the composting processes, but there are no accompanying standards for composting processes themselves, so there is no guarantee that these conditions will be met and the evidence is that these conditions are not replicated in actual composting facilities or AD plants. Eunomia has completed a separate study for the European Commission investigating the gaps between assumptions about composting in the Standards and practice in reality[239].

Additionally, in terms of biodegradability and composting for instance, EN 13432 does not apply to home-composting, despite Article 22 of the Waste Framework Directive requiring Member States to encourage home composting. This means that home composting is likely to become increasingly relevant but it is not necessarily clear to consumers (or indeed packaging manufacturers and retailers) that packaging designed to be composted in line with the requirements of EN 13432 and put on the market labelled as 'compostable' is not suitable for home composting. France has previously reported that "EN 13432 is insufficient"; it has consequently developed its own standards on domestic composting, and indicated support for the development of an equivalent European standard.[240] As the Standard only relates to test conditions, compostable or biodegradable packaging that is littered is not necessarily any different to all other packaging that is littered; as such, the Standard is meaningless for the proportion of packaging that ends in any marine or terrestrial environment, despite this being an increasing concern to EU citizens and Member States.

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[237] Eunomia & Mepex (2018) Bio-Based and Biodegradable Plastics. An Assessment of the Value Chain for Bio-Based and Biodegradable Plastics in Norway. Report for the Norwegian Environment Agency. 30th November 2018. https://www.miljodirektoratet.no/Documents/publikasjoner/M1206/M1206.pdf

[238] Eunomia & Mepex (2018) Bio-Based and Biodegradable Plastics. An Assessment of the Value Chain for Bio-Based and Biodegradable Plastics in Norway. Report for the Norwegian Environment Agency. 30th November 2018. https://www.miljodirektoratet.no/Documents/publikasjoner/M1206/M1206.pdf

[239] Eunomia for the European Commission (2020), *Relevance of Biodegradable and Compostable Consumer Plastic Products and Packaging in a Circular Economy*, March 2020, https://op.europa.eu/en/publication-detail/-/publication/3fde3279-77af-11ea-a07e-01aa75ed71a1/language-en?WT.mc_id=Searchresult&WT.ria_c=41957&WT.ria_f=5702&WT.ria_ev=search

[240] Professional Management (2018) *Implementation of PPWD in Eleven Selected EU Countries.* Report for the Swedish EPA. 19th October 2018.

As the European Commission's Fitness Check of five Waste Stream Directives noted, Annex II of the PPWD (the Essential Requirements) could create confusion – for Member States, suppliers and consumers – by not clearly differentiating between compostability and biodegradability.[241]

Lack of requirement to demonstrate added value for bio-based/ compostable packaging

The increasing use of bio-based/ compostable plastic material use in the packaging sector, particularly in applications in which conventional plastics are already widely in use, is underpinned by the lack of a requirement for compostable/ bio-based plastics to prove the added value of such material use in these applications, relative to reuse, recycling and other recovery operations of their conventional counterparts. This would include any agronomic benefits associated with the use of compostable plastic in compost/ digestate, as well as any particular applications in which the use of compostable/ bio-based plastic materials improve the quality/ quantity of recycling/ reuse. A previous study by Eunomia for the Commission reviewed the case for compostables from this perspective, finding that "the evidence is weak in favour of any particular agronomic benefit associated with compostable plastic material in compost or digestate and therefore material choices for products and packaging should prioritise recyclability over compostability. Exceptions to this are where the use of compostable plastic have proven 'added benefits' such as increasing the collection of organic waste and its diversion from residual waste or reduction in plastic contamination of compost."[242] It is therefore very likely that the lack of such a requirement is enabling packaging made of compostable/ bio-based plastics to continue to be placed on the market with no clear benefit, and indeed, resulting in contamination of existing waste streams.

Confusing Labelling for Bio-based/ Compostable Packaging

Inconsistent labelling practices across the EU, and in many cases, within Member States, causes consumer confusion regarding the correct disposal options for compostable/ bio-based packaging waste at the end of life, making their correct sorting challenging, and increasing cross-contamination between packaging streams. This inconsistency in part reflects the lack of harmonised/ consistent collection practices between municipalities and across Member States, which is a result of variations in the available infrastructure and technology for such packaging waste sorting and recycling.

A recent study by the One Planet Network provides a global assessment of the potential problems with standards, labels and claims on plastic packaging that reduce the probability of their being correctly sorted and subsequently recycled – among these, bio-based and compostable plastic packaging are both highlighted in the study as being problematic, as summarised in Table 11 below[243]:

Table 11. Overview of Findings from One Planet Network Claims Assessment

[241] http://ec.europa.eu/environment/waste/packaging/index_en.htm; https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014SC0209&from=EN

[242] https://op.europa.eu/en/publication-detail/-/publication/3fde3279-77af-11ea-a07e-01aa75ed71a1/language-en/format-PDF

[243] One Planet Network (2020), *Can I Recycle This – A Global Mapping and Assessment of Standards, Labels and Claims on Plastic Packaging*, https://www.oneplanetnetwork.org/sites/default/files/unep_ci_2020_can_i_recycle_this.pdf

Biobased	• **Consumers may misinterpret as biodegradable.** • **Not all biobased sources are sustainable and responsible.**
Compostable and Biodegradable	• **Significant discrepancy between labelling and available composting infrastructure (industrial/ home composting)** • **Labels for marine, soil, or water biodegradability risk giving consumers the false impression that it is acceptable to dispose of plastic packaging in those environments**

The study concluded that: *"consumers generally do not understand the difference between biobased, biodegradable and compostable and the implications of these claims. It is therefore important that these claims include instructions on how to properly dispose of these types of plastic packaging. In a recent study*

of German consumers comparing correct disposal of recyclable fossil-fuel based plastics and biobased plastics, despite the perceived environmental benefit of biobased plastics, consumers were more likely to dispose of them incorrectly than fossil-fuel based plastic packages (Taufik 2019)".

Ultimately, packaging labelling is an important source of information for consumers and is a key component of recycling habits. This is true of compostable packaging as well, for which labelling intended to provide consumers with disposal information is often incorrect, or misleading. In order to understand the extent to which this labelling is misleading, Eunomia analysed such packaging across Europe.[244] The results found that the majority of labels assessed have certifications and state whether they are biodegradable/ compostable, however they often do not clearly distinguish between home and industrial composting. The majority of labels also do not clearly state which waste stream the product should go in, and, perhaps most worryingly, they do not define the environments they biodegrade in (if labelled as biodegradable). Further bad practice examples involved encouraging irresponsible behaviour such as littering, and mistranslation. Not only is the messaging around compostability complex, but this is compounded by the fact that the messaging is also likely to be very regionally specific which is problematic for products sold across Europe (e.g. translations from one language to another result in different interpretations, etc.).

There are also issues with using the term 'biodegradable' on packaging when no further information about the environments they degrade in is provided. Given the relative infancy of biodegradable packaging in the market, there are a lack of consumer studies on the topic. Of the existing studies, the potential link between biodegradability labelling and littering tends to be highlighted, although there is a lack of conclusive empirical evidence that correlates the marketing of biodegradable plastics with an increase in the tendency to litter. This is because no such studies have been undertaken, rather than evidence being present to the contrary. Several studies do however point towards a perception amongst consumers that 'biodegradable' is a virtuous aspect of a product and that littering such an item would be less impactful.[245],[246]

6.6.3. Problem Evolution

The problems associated with the reduced sortability of bio-based and compostable plastic packaging waste - and therefore the increased contamination of packaging waste streams with non-target materials - **is likely to persist**. Furthermore, issues of contamination in bio-waste collection systems are likely to worsen as European countries introduce more food waste collection systems. The issue may worsen in the absence of intervention, as a consequence of the dynamic nature of the plastic and compostable packaging industries. Both **industries include a large and increasing number of constituent materials, formats, and applications for which adequate labelling is not in place to ensure consumer understanding of end of life disposal options**. In addition, - in the event that current trends for the increase of bio-based plastics

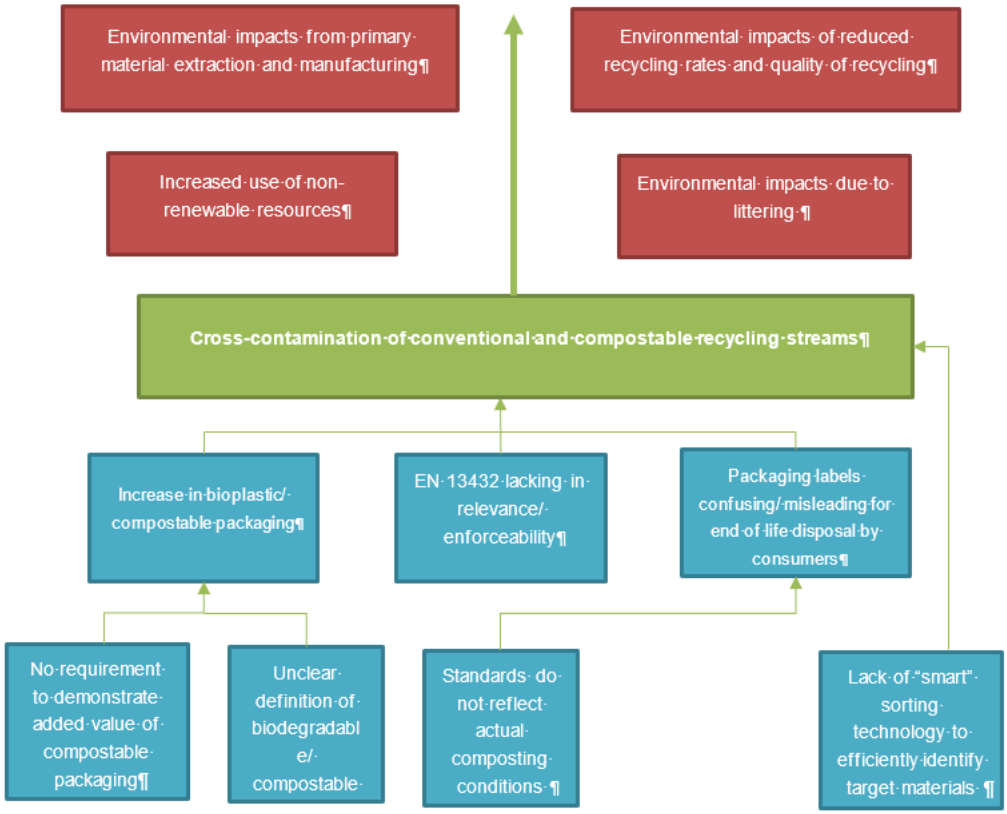
[244] Eunomia (2019) *Relevance of Biodegradable and Compostable Consumer Plastic Products and Packaging in a Circular Economy*, Draft Report to DG Environment of the European Commission

[245] Keep Scotland Beautiful (2007) Public attitudes to litter and littering in Scotland, *cited in* Brook Lyndhurst (2013) *Rapid Evidence Review of Littering Behaviour and Anti-Litter Policies*, Report for Zero Waste Scotland, 2013, http://www.zerowastescotland.org.uk/sites/files/zws/Rapid%20Evidence%20Review%20of%20Littering%20Behaviour%20and%20Anti-Litter%20Policies.pdf

[246] Brook Lyndhurst (2015) *Public Perceptions and Concerns around Litter*, Report for Zero Waste Scotland, 2015, http://www.zerowastescotland.org.uk/sites/files/zws/Litter%20Insights%20final%20web%20March%2015.pdf

continue - waste operators will be increasingly unlikely to be able to continue to bear the added sorting and cleaning costs associated with such packaging. Increased use of these materials will ultimately increase the inefficiencies associated with operating recycling service and negatively impact recycling rates after a point, despite the role of EPR in shifting this cost burden to producers themselves. Various regulatory and industry-led initiatives have been launched to address these issues, including, among others, the Commission's Green Claims initiative (which includes a call for standardised methods for quantifying the environmental footprint of products). However, it is noted that **while the green claims initiative may prevent "greenwashing"** (inaccurate claims regarding a packaging item's environmental credentials), **it will not necessarily tackle the root cause of the reduced sortability in bio-based and compostable packaging**, i.e. inconsistent/ unclear labelling, underpinned by the limitations of Standard EN 13432, and a lack of consistent collection/ sorting/ treatment infrastructure for this material stream.

6.6.4. Problem Tree



Lack of mechanism in Essential Requirements for addressing changes in use of chemicals in packaging

In the Chemicals Strategy for Sustainability[247] the Commission recently committed to '*minimise the presence of substances of concern in products by introducing requirements, also as part of the Sustainable Product Policy Initiative, giving priority to those product categories that affect vulnerable populations as well as those with the highest potential for circularity, such as textiles, packaging including food packaging, furniture, electronics and ICT, construction and buildings*.[248]'

The PPWD restricts the use of four heavy metals in packaging, but it does not provide for any further specific restrictions on the use of chemicals. Pursuant to Article 11 of the PPWD, the sum of concentration levels of lead, cadmium, mercury and hexavalent chromium present in packaging or packaging components must not exceed certain thresholds.

In addition, Annex II laying down Essential Requirements on the composition of packaging requires the following:

> *"Packaging shall be so manufactured that the presence of noxious and other hazardous substances and materials as constituents of the packaging material or of any of the packaging components is minimized with regard to their presence in emissions, ash or leachate when packaging or residues from management operations or packaging waste are incinerated or landfilled."* (Annex II, Section 1, 3rd indent)

This raises two issues:

1. First, **the term 'noxious and other hazardous substances and materials' is not defined** and therefore **open for interpretation**.

2. Second, the **minimisation is not required per se but only "with regard to their presence in emissions, ash or leachate** when packaging or residues from management operations or packaging waste are incinerated or landfilled".

The first point causes a lack of legal certainty. The term 'noxious' is neither used in the REACH Regulation nor in the CLP Regulation which can be considered as the two central building blocks of EU chemicals legislation. Rather than referring to 'materials' REACH and CLP refer to 'substances' and 'mixtures'. The REACH Regulation refers to the classification as hazardous under the CLP Regulation. If a substances or mixture fulfils certain criteria laid out in the CLP Regulation, it is considered as hazardous. As a rule, manufacturers, importers or downstream users have to self-classify (and label) such hazardous substances.

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[247] European Commission, Chemicals Strategy for Sustainability Towards a Toxic-Free Environment, COM(2020) https://ec.europa.eu/environment/pdf/chemicals/2020/10/Strategy.pdf

[248] ibid.p.6. According to footnote 16, 'substances of concern' include "primarily those related to circular economy, substances having a chronic effect for human health or the environment (Candidate list in REACH and Annex VI to the CLP Regulation) but also those which hamper recycling for safe and high quality secondary raw materials. "

On the second point, by only requiring manufacturers to minimise hazardous substances with regard to their presence in emissions, ash etc. when incinerated or landfilled the Directive does not address the handling by humans during the lifetime of the packaging or at the recycling stage and the resulting potential exposure of humans to hazardous substances contained in the packaging, where applicable.

The Directive, drafted long before the Circular Economy Action Plan and the Plastics Strategy were adopted **falls short of requiring packaging to be kept free from hazardous substances** to ensure hazardous substances are not kept in the loop through recycling.

The lack of legal certainty in relation to the wording of Annex II, Section 1, 3rd indent PPWD is problematic. Addressees of EU legislation must be able to understand what is required from them to be compliant.

Furthermore, the question whether the content of hazardous substances in packaging (waste) is problematic and what the scale of the problem is, based on the currently available data, not easy to assess. **There is little information on the use of hazardous substances in packaging and packaging components.**

Recent research has identified a significant lack of information on the use of chemicals in plastics manufacturing (i.e., which substances are used in which application and in what quantities, and at which level they are present in final products).[249] The researchers identified the lack of publicly accessible comprehensive registries for chemicals used in plastic packaging as a major challenge hampering the identification of chemicals associated with plastic packaging. While a problem in terms of 'recyclability' the uncertainty in relation to the presence of hazardous substances also poses concerns in respect of the uptake of recycled content.

Based on these limited sources, Groh et al. (2019) showed that the use of hazardous chemicals in plastic packaging is suspected to be extensive. The authors identified and included in the CPPdb 4 283 substances that are likely or possibly used during the manufacturing and/or present in the final products. Of the 906 chemicals identified as being likely to be associated with plastic packaging, 63 rank highest for human health hazards and 68 for environmental health hazards according to their harmonised hazard classifications under CLP. Examples include monomers such as bisphenols, acrylamide, melamine or formaldehyde, fire retardants, colorants, biocides, plasticisers like chlorinated paraffins or phthalates, solvents); seven substances are classified in the European Union (under the REACH Regulation) as persistent, bioaccumulative, and toxic (PBT), or very persistent, very bioaccumulative (vPvB) (e.g. some PFAS, or stabilizers such as Benzotriazol), and 15 as endocrine disrupting chemicals (EDC) (e.g. some phthalates, or BPA)[250]. Those figures relate to all plastic packaging, including packaging covered by the FCM legislation. However, non-food plastic packaging still represents a significant share of plastic packaging. According to Groh et al. (2019), around 60% of all plastic packaging is used for food and beverages, while 40% covers

[249] Groh KJ, Backhaus T, Carney-Almroth B, Geueke B, Inostroza PA, Lennquist A, Maffini M, Leslie HA, Slunge D, Trasande L, Warhurst M, Muncke J. 2018. *Chemicals associated with plastic packaging: Inventory and hazards.* PeerJ Preprints

[250] Groh KJ, Backhaus T, Carney-Almroth B, Geueke B, Inostroza PA, Lennquist A, Maffini M, Leslie HA, Slunge D, Trasande L, Warhurst M, Muncke J., Overview of known plastic packaging – associated chemicals and their hazards, 2018.

non-food applications, such as healthcare, cosmetics, consumer, household, apparel, and shipment packaging[251].

Overall, the study sheds light on three important issues, one being a lack of harmonised toxicological information on many substances used in plastic packaging, second an extensive use of hazardous substances in plastic packaging that may potentially constitute a risk for human health during manufacture, handling and recycling, as well as the environment mainly at the end-of-life, and thirdly a significant lack of information concerning the use of hazardous substances in plastic packaging.

A study by Wiesinger et al[252] identifies more than 2,400 substances of potential concern used in plastics including the caveat that the number may be a low estimation because it is only based on reported hazard classification. The authors agree with other studies pointing at a general lack of transparency regarding substances present in plastics[253]. In addition, they highlight the need to identify and understand the group of non-intentionally added substances (NIAS)[254].

The lack of adequate information on the chemical content of products has also been highlighted by the Commission in relation to the implementation of the circular economy package[255], and the "*significant uncertainties on hazard characteristic and on releases from plastic matrices*" of additives used in plastics has been a reason for ECHA to launch an initiative developing a method for comparing the release potential of different additives[256]. Additives are chemical compounds added to improve the performance, functionality and ageing properties of the polymer. Additives in plastics have also been in the focus of a study by COWI and DTI. The study highlights the fact that most hazardous substances used as additives for plastics are able to migrate to the surface of the plastic where they may come into contact with human skin[257].

Another study, authored by Hahladakis et al.[258], assesses on emission/leaching of 'potentially toxic substances'[259] (PoTSs) during recycling processes for all kinds of plastics. It stresses that several PoTSs could potentially be released during recycling and that some additives may have a direct impact on the recyclability of plastics or even might support the degradation of plastics[260]. Considering the potential

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[251] ibid.
[252] Wiesinger H., Wang Z., Hellweg S., Deep Dive ito Plastic Monomers, Additives, and Processing Aids, Environmental Science and Technology, 2021 55(13), 9339-9351.
[253] ibid. H.
[254] ibid. H.
[255] COM(2018) 32 final, Section 3.1.
[256] ECHA, Plastic additives initiative, 2016-2019.
[257] COWI, DTI, Hazardous substances in plastic materials, TA 3017 (2013), p.5.
[258] Hahladakis J.N., Velis C.A., Weber R., Iacovidou E., Purnell P., An overview of chemical additives present in plastics: Migration, release, fate and environmental impact during their use, disposal and recycling, Journal of Hazardous Materials 344(2018) 179-199.
[259] This term is considering that if a hazardous substance remains within the plastic is has a lower risk since it needs to be leached or released or emitted first, before any toxicity can have an impact.
[260] Hahladakis et al. p.195.

negative impact on the environment and human health the authors conclude that some of the additives should be substituted with more 'green' and sustainable chemicals[261].

A study by Eriksen et al. found that waste plastic contains metals, including Al, As, Cd, Pb, Ti, and Zn in varying concentrations, in particular in plastic samples from household waste in elevated concentrations. The authors conclude that since some metals are potentially harmful and toxic and that a continuous increase in recycling rates may lead to even higher metal concentrations in the future[262].

The study by Groh et al. (2019) also briefly refers to findings in relation to imports in the US where most of the non-compliant packaging items identified appeared to be imported, often from China.

Similar research on the use of chemical substances in other types of packaging (metal, glass, cardboard, etc.) could not be identified which is a finding in itself: a lack of information on hazardous substances used during the manufacture of and/or contained in non-plastic packaging.

6.7. Inconsistent/ confusing labelling of recyclable packaging

Consumers play a key role in the effectiveness of any packaging recycling system in improving recycling rates and quality, by segregating recyclable waste at source. While recycling targets increase in ambition, recycling rates have grown relatively sluggishly and a number of studies point to consumer confusion around labelling as a primary factor.

A number of studies[263] point to consumer confusion around labelling as a primary factor for used packaging not being discarded in a way that maximises its chances of being recycled. This issue is particularly pronounced for plastic packaging, given the wide range of polymers and components in such packaging.

Consumers are confronted with a large amount of information on their packaging, some of which is targeted at non-consumers (e.g., packaging materials, production/ stock barcodes/ serial numbers), some of which relates to their consumption of the product in question (particularly around nutritional/ health and safety information), and some of which conveys information regarding recyclability, end of life disposal routes, EPR membership, and other environmental claims. This information can be confusing, and contradictory, especially in the absence of further guidance around the meaning of specific symbols and scope for verification of claims. Sources of confusion include both the number of labels, some of which look similar but do not mean the same thing, and symbols providing potentially misleading information.

A more recent study by the One Planet Network provides a global assessment of the potential problems with standards, labels and claims on plastic packaging that reduce the probability of their being correctly sorted and subsequently recycled – these are summarised in Table 12 below[264]:

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[261] ibid.

[262] Eriksen M.K., Pivnenko K, Olsson M.E., Astrup T.F., Contamination in plastic recycling: Influence of metals on the quality of reprocessed plastic, Waste Management 79 (2018), p. 595-606.

[263] More details in Appendix A – Problem Definition, as an example: RECOUP (2017) *Plastics Recycling Consumer Insight Research, An International Comparison*, November 2017, http://www.recoup.org/p/275/publications

Table 12. Overview of Findings from One Planet Network Claims Assessment

Claim	Key Findings
Made from Recycled Plastic	***Different ways of calculating make comparability difficult.*** ***Can be confused with recyclable.***
Made from Ocean Plastic	***Lack of consistent use of terminology and definitions.*** ***Brings awareness to the problem in a way that connects with consumers' concerns.*** ***Emphasises a lower-priority solution.***
Recyclable	***Use of universal recycling symbol is not regulated.*** ***Actual recyclability relies on accessibility of infrastructure, which is not universal.***

Sources of confusion include both the number of labels, some of which look similar but do not mean the same thing, and symbols providing misleading information.

Figure 29. Common symbols on plastic food and drink packaging

Symbol	Meaning
	The On-Pack Recycling Labels (OPRL) tell you whether you can recycle packaging in the UK. They are based on local councils' recycling collections and services.
	The Mobius Loop is an international symbol that simply tells you that somewhere in the world it is possible to recycle the packaging material. If there's a number in the centre this gives the recycled content of the packaging.

[264] One Planet Network (2020), *Can I Recycle This – A Global Mapping and Assessment of Standards, Labels and Claims on Plastic Packaging*, https://www.oneplanetnetwork.org/sites/default/files/unep_ci_2020_can_i_recycle_this.pdf

	The Green Dot is not a recycling symbol. It's used in some European countries to show that the producer has paid a tax towards recovering and recycling packaging.
	The 'Seedling' is a European-wide label which tells consumers that the material is a bio-plastic which can be composted by industrial processors.

Source: OPRL

- The Green Dot: RECOUP's 2019 study into consumer plastic recycling behaviour found that all respondents were misled by the Green Dot, incorrectly referring to the logo as meaning that the packaging was recyclable.[265] The Green Dot is used across Europe to show that producer has paid a tax towards recovering and recycling packaging. It is possible therefore for an item of packaging to be labelled as 'Not recyclable' but to also bear the Green Dot (because it's also sold in Germany for example).

- The Mobius Loop: an international icon which shows that at item can be recycled somewhere in the world but may not actually relate to the consumer's local area. The Mobius Loop however, can be confused with Resin Identification Codes for plastic packaging, which were designed for recycling centres, not consumers.[266] In a UK survey by the consumer group Which?, 26% of respondents did not know what to do with packaging bearing the Mobius Loop.[267]
- In 2015, the 'Triman' icon was also introduced in France in order to harmonise separate collection systems and show items which household packaging items are covered by an EPR recovery chain.[268] The logo consists of three parts: a human silhouette which represents the consumer; three arrows which symbolise sorting to allow for better waste treatment; circular background which symbolises recycling.
- The Tidyman logo: developed by Keep Britain Tidy, the logo encourages people to pick up litter, yet is often mistaken for a sign of recyclability. The symbol of a man putting a bottle in a bin surrounded by a triangle however, marks glass which should be recycled.[269]

[265] RECOUP (2019) *Research Study Into Consumer Plastic Recycling Behaviour*, accessed 11 November 2019, https://www.mrw.co.uk/download?ac=3153941

[266] Szaky, T. (2015) *Consumers are confused about recycling, and here's why*, accessed 11 November 2019, https://www.packagingdigest.com/sustainable-packaging/consumers-are-confused-about-recycling-and-heres-why150223

[267] Walsh, H. (2019) *The plastic people still recycle incorrectly – and does it really matter? – Which? News*, accessed 11 November 2019, https://www.which.co.uk/news/2019/09/the-plastic-people-still-recycle-incorrectly-does-it-matter/

[268] The Connexion (2015) *Do you know what this icon means?*, accessed 11 November 2019, https://www.connexionfrance.com/French-news/Do-you-know-what-this-icon-means

[269] Adams, C., and Knapton, S. (2019) *Bring in laws to force companies to make recycling labels simpler, MPs told*, accessed 11 November 2019, https://www.telegraph.co.uk/news/2019/07/03/bring-laws-force-companies-make-recycling-labels-simpler-mps/

6.7.1. Consequences

The non-harmonised and misleading labelling practices across the EU, and in many cases, within Member States, causes consumer confusion regarding the correct disposal options for packaging waste at the end of life, making their correct sorting challenging and increasing cross-contamination between packaging streams. Unclear and non-harmonised labelling can result in reduced capture of recyclable materials as well as increased contamination of, and increased costs. In some cases, this has resulted in entire loads of recyclables being discarded, which further undermines consumer confidence in source segregation efforts and those perceived to be responsible for recycling.[270, 271]

This is exacerbated by the increase in packaging design features that inhibit recycling and the absence of a clear and consistent definition for packaging that is recyclable across the EU.

This can result in reduced capture of recyclable materials (if consumers wrongly dispose of recyclables in residual waste or as litter), as well as increased contamination of, and increased costs, associated with the cleaning of recyclable materials that do get captured (if consumers wrongly dispose of materials that are not recyclable or not recyclable in another stream). In some cases, this has resulted in entire loads of recyclables being discarded, which further undermines consumer confidence in source segregation efforts and those perceived to be responsible for recycling.[272, 273]

Waste operators must ultimately bear the costs associated with additional sorting, washing and disposal requirements, as well as lower prices and fewer end markets for the resulting low quality of recyclates. Although the revised EPR rules in the WFD will reduce this cost burden on public authorities, environmentally, this still has negative consequences, since the landfilling/ incineration of recyclable materials not only results in increased GHG emissions, but also supports continued reliance on virgin materials rather than recycled ones. Additionally, the uptake of recycled materials is reliant on the availability of high quality recyclates, particularly in food contact packaging applications. High quality recyclates prevent downcycling and the potential loss of value in materials.

Case Study: Nordic Pictograms

The common (Nordic) pictogram system consists of a number of symbols that are used in connection with waste sorting – making it easier for citizens and business to sort their waste better. The aim for the system is to guide people in the same way visually on how to sort waste everywhere: at home, the workplace, in holiday homes, at the recycling stations, in public and

[270] Viridor (2018), *UK Recycling Index 2018*, https://www.viridor.co.uk/siteassets/document-repository/recycling-index/viridor-uk-recycling-index-2018.pdf
[271] European Commission (2018), *Behavioural Study on Consumers' Engagement in the Circular Economy*, October 2018, https://ec.europa.eu/info/sites/info/files/ec_circular_economy_final_report_0.pdf
[272] Viridor (2018), *UK Recycling Index 2018*, https://www.viridor.co.uk/siteassets/document-repository/recycling-index/viridor-uk-recycling-index-2018.pdf
[273] European Commission (2018), *Behavioural Study on Consumers' Engagement in the Circular Economy*, October 2018, https://ec.europa.eu/info/sites/info/files/ec_circular_economy_final_report_0.pdf

urban spaces, on packaging, at events – concerts, festivals, cinemas etc.

Denmark legally introduced national sorting criteria and requirements for the use of identical pictograms to be used for the municipal collection of household waste from 2021 (it was implemented into the national waste legislation). This means that all waste bins are required to wear the pictograms.

The symbols for waste sorting can also be used on packaging. A symbol on a packaging design ensures a visual link between the empty packaging and the waste container. This aids the consumer sorting their packaging waste correctly. 150+ private users have already voluntary adopted the pictograms on their products and packaging including producers and manufactures, music festivals and public events, universities, schools etc., museums and cultural institutions, railway services and public transportation and hospitals.

In addition, Denmark introduced the system to the Swedish, Finnish and Norwegian municipal waste associations in 2018. In Sweden, Norway and Iceland the pictogram system is being rolled out voluntarily.

6.7.2. Problem Drivers

Inconsistency and Shortcomings in Collection/ Sorting Infrastructure

While the range of packaging placed on the EU market is largely consistent across all Member States, the systems for packaging waste collection and recycling at the end of life differ widely. This is true not only of the scope of targeted materials and the systems for their collection (kerbside, door-to-door, bring, etc.), but also the infrastructure and technology used for collection, sorting and recycling. These differences reflect a range of economic, geographic and regulatory considerations, and result in the situation in which a particular item of packaging may be separated and subsequently recycled in one Member State, but disposed of as a part of residual waste in another (e.g., household PE films). It is also noted that in some cases, outdated/ insufficient collection/ sorting infrastructure or funding relative to the fast-paced, dynamic nature of packaging product innovation underlies this problem – a situation which will be improved as Member States implement new recycling systems that will support the achievement of the 2025 and 2030 recycling targets under the PPWD and WFD.

The fragmentation of the collection practices and infrastructures in the Single Market, i.e. almost as many instructions for disposal as localities in charge of collection, also prevents economies of scale and greater efficiencies that would arise from simplified and more harmonised practices and infrastructures across the EU (including in terms of communication and awareness raising campaigns).

Lack of Clear/Harmonised Definition for Recyclable Packaging

The challenges associated with a clear, harmonised system for the labelling of packaging as recyclable (or not recyclable) have also stemmed from continued confusion and inconsistency in the definition of what is

considered recyclable in the first place. In this regard, waste sorters and recyclers frequently complain that choices in the design and composition of packaging do not take account of the difficulties and costs of treatment as waste afterwards, and the consequences for the quality, purity and cost of recyclates (secondary raw materials). In terms of labelling, this has meant that labelling of what is recyclable to date has tended to focus on technical feasibility of recycling, as opposed to whether the packaging actually gets recycled or not in existing systems. A more enforceable definition for what is considered recyclable, which takes into account existing systems of waste management and which can be applied consistently across Member States would therefore reduce some of the ambiguity in the labelling of such packaging.

Too much Information

A further driver for consumer confusion regarding the labelling of packaging as recyclable is the number of labels on packaging at present, several of which relate to the end of life management of packaging, but not all of which are relevant to consumers in terms of their ability to accurately sort their packaging for recycling. This includes several labels which look similar, but do not mean the same thing, as well as some symbols providing misleading information.

Altogether, this results in a situation in which consumers are confronted with a large amount of information on their packaging, some of which is targeted at non-consumers (e.g. production/ stock barcodes/ serial numbers), some of which relates to their consumption of the product in question (particularly around nutritional/ health and safety information), and some of which conveys information regarding recyclability, end of life disposal routes, EPR eligibility, and other environmental claims. This information can be confusing, and contradictory, especially in the absence of further guidance around the meaning of specific symbols and scope for verification of claims. The use of the OPRL labelling system in the UK has been identified as an improvement in some regards, providing greater clarity than visual symbols alone (though this can cause linguistic barriers in some cases). The use of QR codes to allow consumers to access additional information, and the development of smart technologies like digital watermarking may suggest the potential for further improvements in the streamlining of packaging labelling more widely.

6.7.3. Problem Evolution

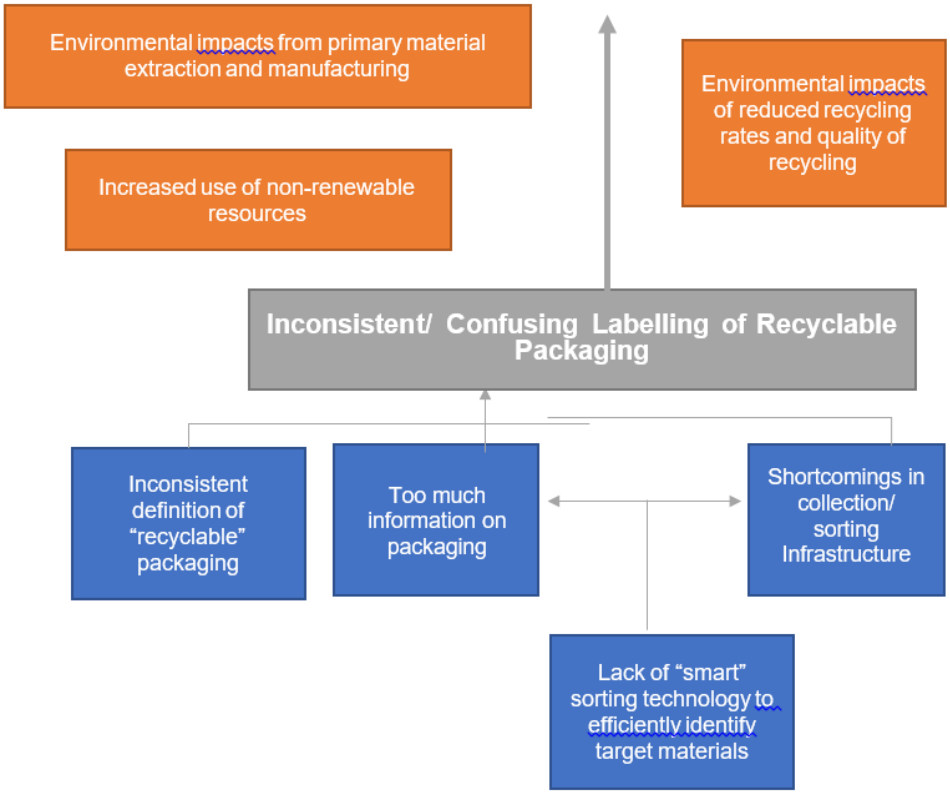
The problems associated with inconsistent/ confusing labelling on recyclable packaging are likely to persist, and possibly worsen in the absence of intervention. This is because of the dynamic nature of the packaging industry, which include a large and increasing number of constituent materials, formats, and applications for which adequate labelling is not in place to ensure consumer understanding of end of life disposal options in their MS/ local contexts. In addition, waste operators are unlikely to be able to continue to bear the added sorting and cleaning costs associated with such packaging, which will become inefficient and negatively impact recycling rates after a point.

Various regulatory and industry-led initiatives have been launched to address these issues, including, among others, the Commission's Green Claims initiative (which includes a call for standardised methods for quantifying the environmental footprint of products), and the revision of the food contact material regulations (to include considerations around consumer information on food contact materials). In addition, the scope of the revised EPR requirements, including the modulation of fees on the basis of whether

packaging is recyclable or not, to address this issue is currently unclear. However, they are likely to have some impact in terms of removing some forms of unrecyclable packaging from the market, and reducing the cost burden on public authorities associated with sorting, cleaning and decontamination.

Industry action via the Circular Plastics Alliance (CPA), committed to a number of actions including the development, update and revisions of design for recycling guidelines for all plastic products, the contribution to the work of CEN and industry on recyclability and other related standards, and the uptake of recycled material. However, it is noted that while the green claims initiative may prevent "greenwashing" (inaccurate claims regarding a packaging item's environmental credentials), it will not necessarily tackle the proliferation of inconsistent/ unclear labelling and the underlying lack of consistent collections for recycling. In addition, while there is likely to be overlap between the objectives of the CPA to increase the share of recyclable plastic products and the uptake of plastic recyclates in new plastic products with the objectives of the proposed revisions to the PPWD and Essential Requirements to make all packaging placed on the market recyclable or reusable by 2030 (which would eliminate the confusion regarding packaging recyclability altogether), the former are voluntary, and are therefore unlikely to either be applied consistently across the EU market, or with the same level of ambition and scrutiny – the need for a legal backstop in order to ensure that the Commission's objectives are met therefore remains.

6.7.4. Problem Tree



6.8. Low levels of uptakes of recycled content in packaging

This section presents the current state of play of recycled content uptake, and associated trends, across different packaging materials in the EU (plastic, paper and card, aluminium, steel, glass and wood).

Firstly, it should be noted that in general, **there are significant challenges associated with measuring the amount of recycled content in packaging**, and, **at present, there is no recognised standard methodology for doing so**. It is therefore likely that recycled content measurement methods vary between organisations and across products. When interpreting the (limited) recycled content data that exists, it is important to bear in mind **that datapoints are unlikely to be directly comparable or entirely accurate, but they do still give an indication of current level of recycled content uptake** in different packaging materials / formats.

The main challenges associated with measuring recycled content are as follows:

- **There is no agreed definition of what constitutes recycled content in packaging**. The material that can be included or excluded from calculations is therefore open to interpretation, though some international standards do suggest principles that should be followed. For example, ISO 14021 (Environmental labels and declarations) states that "reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it" should not be considered recycled content.[274] This avoids material produced from manufacturing process inefficiencies being masked as recycled content.

- **It is not possible to analyse an item of packaging directly and determine the amount of recycled content present**. This is a view backed up by the European Committee for Standardization (CEN) which states that "at present there are no reliable technologies for an analytical determination of the recycled content in a material or product".[275] Therefore, any approach to the measurement of recycled content is likely to rely on a chain of custody approach whereby materials are traced from at least the last point at which it is known that the content is from a secondary source to incorporation into final product. This has its challenges, as supply chains can be complex – particularly for plastics – as, for example in the case of plastics, polymer manufacturers tend to blend virgin and recycled material to meet certain specifications on a batch-by-batch basis, thereby leading to batch-wise variability, and complicating traceability.

It should also be noted that as part of the implementation of the Single Use Plastics Directive (EU) 2019/904 on the reduction of the impact of certain plastic products on the environment (Article 6.5), the European Commission has committed to develop a method for calculating and verifying recycled content in SUP bottles by 1st January 2022. The availability of data relating to recycled content in packaging is likely to improve after this date.

Plastic packaging

According to the EU Plastics Strategy, the demand for recycled plastics accounts for only around 6% of total plastics demand in Europe.[276] The main application for plastics in Europe (EU 28 + Norway + Switzerland) in 2018 (the latest year of available data) was packaging (accounting for ~40% of total demand in that year)

[274] ISO 14021:2016 Environmental labels and declarations — Self-declared environmental claims (Type II environmental labelling)
[275] EN 14343:2007, Plastics. Recycled plastics. Plastics recycling traceability and assessment of conformity and recycled content.
[276] European Commission (2018) *A European Strategy for Plastics in a Circular Economy*, January 2018, http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1516265440535&uri=COM:2018:28:FIN

[277], so it can be inferred from this data that the uptake of recycled content in plastic packaging is low. The few specific datapoints that exist relate primarily to recycled content in PET bottles, and support this conclusion:

1 European Plastic Converters (EUPC) estimate that the average recycled content of PET bottles in the EU is 11.7%.[278] There are exceptions to this, however, with some brands committing to a transition to PET bottles made from 100% recycled PET in the near future (e.g. Coca-Cola Great Britain GLACÉAU Smartwater bottles, Nestle water brand Valvert in Belgium), though whether or not these commitments are achieved, and maintained, remains to be seen.[279, 280]

2 The UK Plastics Pact reported that 10% of Pact members' plastic packaging by weight was comprised of recycled content in 2018, though the data was not broken down further by polymer or pack format. [281]

3 Analysis by ICIS suggests that the quantity of colourless rPET currently produced is only enough for European packaging and beverage firms to include ~16% rPET content as an average across the industry (and that is if the packaging industry has a 100% market share of the total European rPET market, which it does not).[282]

4 A recent study published by PRE estimated levels of recycled content in PE non-food films for packaging, with findings summarised in the figure below[283]

[277] Plastics Europe (2019) *Plastics- the Facts 2019*, accessed 2 October 2020, https://www.plasticseurope.org/application/files/9715/7129/9584/FINAL_web_version_Plastics_the_facts2019_14102019.pdf

[278] European Plastics Converters *Packaging Statistics*, accessed 6 October 2020, https://www.plasticsconverters.eu/project-1

[279] Coca-Cola *Coca-Cola Great Britain moves to 100% recycled plastic in all GLACÉAU smartwater bottles | Press and news centre | Coca-Cola GB*, accessed 20 October 2020, https://www.coca-cola.co.uk/our-business/media-centre/coca-cola-great-britain-continues-sustainable-packaging-drive-with-move-to-100-recycled-plastic-in-all-glac-au-smartwater-bottles

[280] https://www.hbmedia.info/petplanet/2019/07/11/first-100-rpet-bottle-launch-from-nestle-europe/

[281] WRAP (2019) *UK Plastics Pact Report 2018-19*, 2019, https://www.wrap.org.uk/sites/files/wrap/The-UK-Plastics-Pact-report-18-19.pdf

[282] Victory, M. *Europe R-PET content targets unrealistic*, accessed 20 October 2020, https://www.icis.com/explore/resources/news/2019/01/31/10313630/europe-r-pet-content-targets-unrealistic

[283] Eunomia for PRE (2020), Flexible Films Market In Europe: State Of Play, accessible at https://743c8380-22c6-4457-9895-11872f2a708a.filesusr.com/ugd/dda42a_a45684734c764933a2bc752e54e97212.pdf

Figure 30. Estimated levels of recycled content in PE non-food films for packaging

	Flexible PE Films Demand 2018, kt, est.	Recyclates Used 2018, kt, est.	Recycled Content, 2018
Film and foil (non-food)	3,410,000	400,000	12%
Bags/sacks (refuse)	440,000	300,000	68%
Carrier bags	110,000	100,000	91%
Bags/sacks (others)	1,540,000	200,000	14%
Building film	180,000	100,000	56%
Agricultural film	536,000	118,800	22%
TOTAL NON-FOOD	**6,216,000**	**1,218,800**	**20%**

TABLE 1: Use of Recyclate in Key Flexible Film Products, EU28+2 in kt (source: Market Expert)

For plastic packaging, the uptake of recycled content tends to vary significantly by polymer, packaging type and application. For example, the British Plastics Federation (BPF) states that when food contact grade HDPE is added to virgin HDPE at levels above 45%, the removal of volatiles and additives from the material mix during the final stages of the recycling process can cause degradation issues (therefore, the inclusion of recycled content is limited). In contrast, the same source states that PET packaging can incorporate up to 100% recycled content without any technical issues.[284]

Regulatory restrictions related to food contact materials in the EU pose an additional challenge to increasing recycled content in food and drink packaging, which makes up around 40% of all plastic packaging placed on the market at present.[285] This is particularly true for polymers aside from PET. Furthermore, there are geographical factors to consider. In some Member States, it has been noted that a significant portion of plastic packaging is produced in the country where it is sold (see Figure 31 which indicates that 70% of the PET bottles / preforms produced in Germany are used domestically), though the extent to which this is true across all Member States is unclear at present.[286] If this is the case, then, given the wide variations in waste collection and recycling processes between Member States, increasing uptake of recycled content in the packaging production process may be difficult for some producers who have limited access to the required recycled materials. Equally, producers in those Member States that have relatively advanced systems in place for plastic packaging collection and processing are more likely to find it feasible to increase recycled content uptake. For example, ten Member States have deposit refund schemes (DRS) for rPET bottles in

[284] British Plastics Federation (2020) Recycled Content Used in Plastic Packaging Applications
[285] ING Economics Department (2019) *Plastic Packaging in the Food Sector*, accessed 20 October 2020, https://think.ing.com/uploads/reports/ING_-_The_plastic_puzzle_-_December_2019_(003).pdf

place, which boosts the recycling rate for rPET and the quality of PET available (the highest performing schemes achieve return rates >90%).[287,288]

DRS schemes can provide a consistent supply of high quality food-grade rPET, since the returned beverage containers are not mixed with other types of plastic packaging (they are therefore responsible for a disproportionate share of bottle-to-bottle material). **Evidence suggests that there is a higher proportion of recycled content in PET food and beverage packaging produced in Member States with a DRS.** For example, analysis by GVM indicates that ~26% of PET used in the domestic production of rPET bottles in Germany is PET (see Figure 31), which is higher than the average 11.7% suggested by EUPC.[289,290] The existence of closed loop recycling systems via deposit refund systems for plastic beverage bottles has also been cited by Coca Cola as the one of the enabling factors underpinning their 100% rPET bottle commitments in Norway and the Netherlands.[291]

A further consideration is that downcycling (i.e., recycling of waste in cases where the recycled material is of a lower quality and functionality than the original material) is relatively common with recycled plastic, and this sometimes limits the potential for it to be used again multiple times, resulting in a situation in which seemingly high recycling rates can mask the environmental benefits that recycling delivers.

Figure 31. PET Bottle - Material Flows (Germany, 2017)

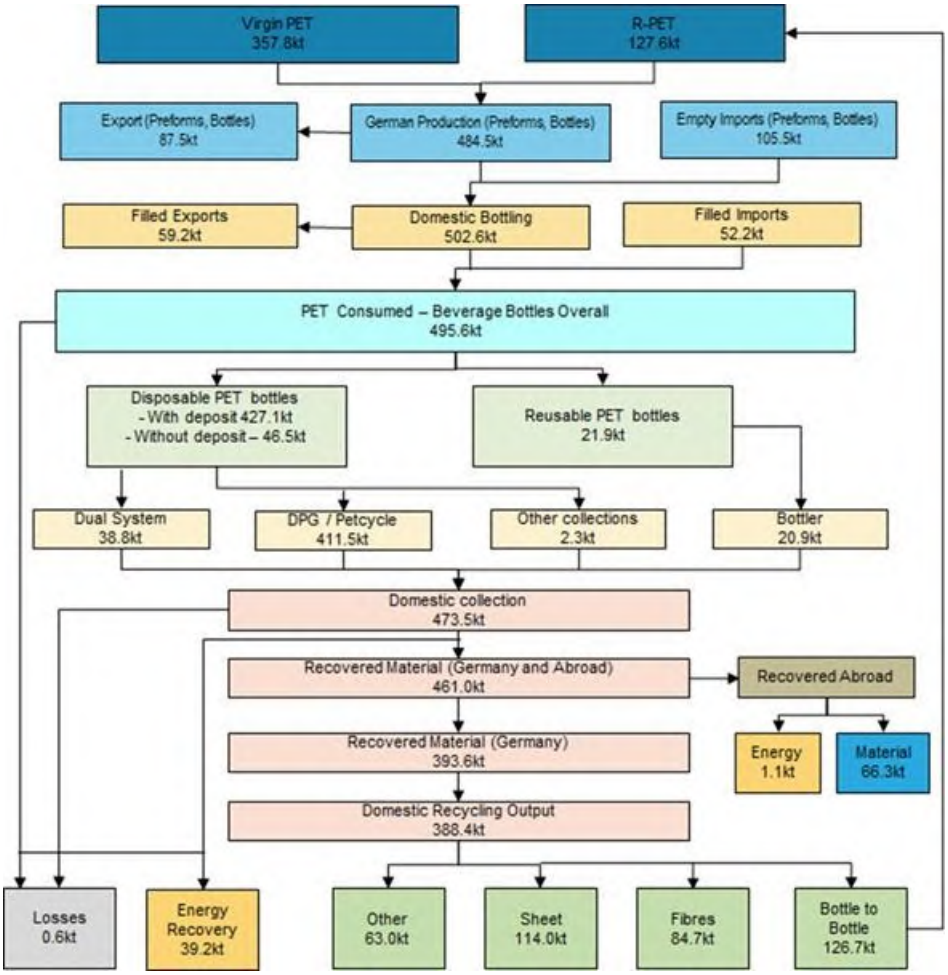
[287] Croatia, Denmark, Estonia, Finland, Germany, Iceland, Lithuania, Netherlands (bottles larger than 0.5L in volume only), Norway, Sweden

[288] CM Consulting & Reloop (2018) *Deposit Systems for One-Way Beverage Containers: Global Overview 2018*, 2018, https://www.reloopplatform.org/wp-content/uploads/2018/05/BOOK-Deposit-Global-27-APR2018.pdf

[289] GVM (2018) *Aufkommen und Verwertung von PETGetränkeflaschen in Deutschland 2017*, accessed 29 October 2020, https://www.forum-pet.de/rs/u/files/2018_09_19_Verwertung%20PET-Getr%c3%a4nkeflaschen%202017_Kurzfassung.pdf

[290] European Plastic Converters *Packaging Statistics | eupc*, accessed 20 October 2020, https://www.plasticsconverters.eu/project-1

[291] https://www.cocacolaep.com/media/news/2020/coca-cola-in-western-europe-transitions-to-100-recycled-plastic-rpet-bottles-in-two-more-markets/



Source: GVM (2018)

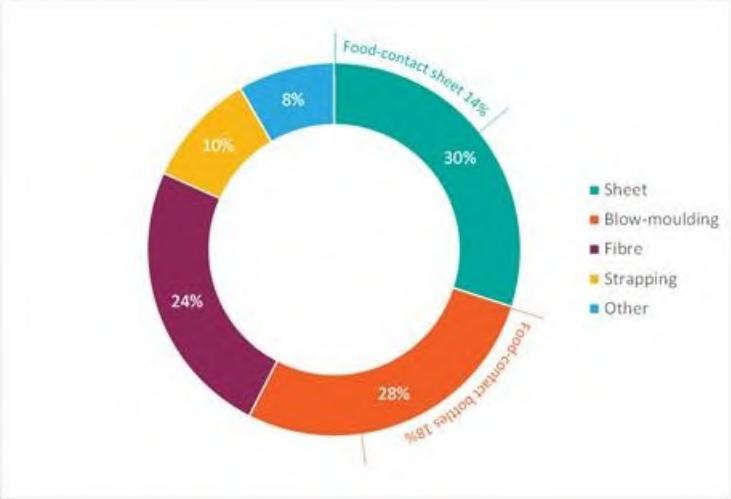
As the quantity of packaging placed on the market continues to increase, this indicates an ongoing reliance on virgin resources. The **lack of uptake of (and therefore demand for) recycled content** in applications that retain high material values additionally restricts growth in the recycling sector, prolonging our dependence on other waste management methods such as landfilling and incineration, and the negative environmental externalities these disposal routes entail relative to recycling. For example, PET bottles make up the majority of the input into Europe's PET reprocessing facilities, but less than a fifth rPET is used to manufacture new bottles; most rPET is used in other applications such as trays and sheets, fibre and strapping (see Figure 32).[292] These applications cannot always be recycled as effectively as PET bottles, if at all. For example, PET trays are more brittle than PET bottles, and tend to fragment during the grinding and washing process, meaning that material loss rates in the recycling process can be very high. [293]

[292] EFBW, Petcore Europe and Plastics Recyclers Europe (2020) *PET Market in Europe - State of Play: Production, Collection and Recycling Data*, 2020

[293] Hogg (2020) *PET and the hidden complexities of plastic recycling*, accessed 12 October 2020, https://www.isonomia.co.uk/pet-and-the-hidden-complexities-of-plastic-recycling/

When downcycling (i.e., where the recycled material is of a lower quality and functionality than the original material) occurs, it is therefore more likely that material is effectively being lost from the packaging system, and must be replaced with virgin resin. This limits the overall amount of recycled content that can be incorporated into plastic packaging.

Figure 32. End Markets for rPET (EU28+2) in 2018 based on PRE survey respondents



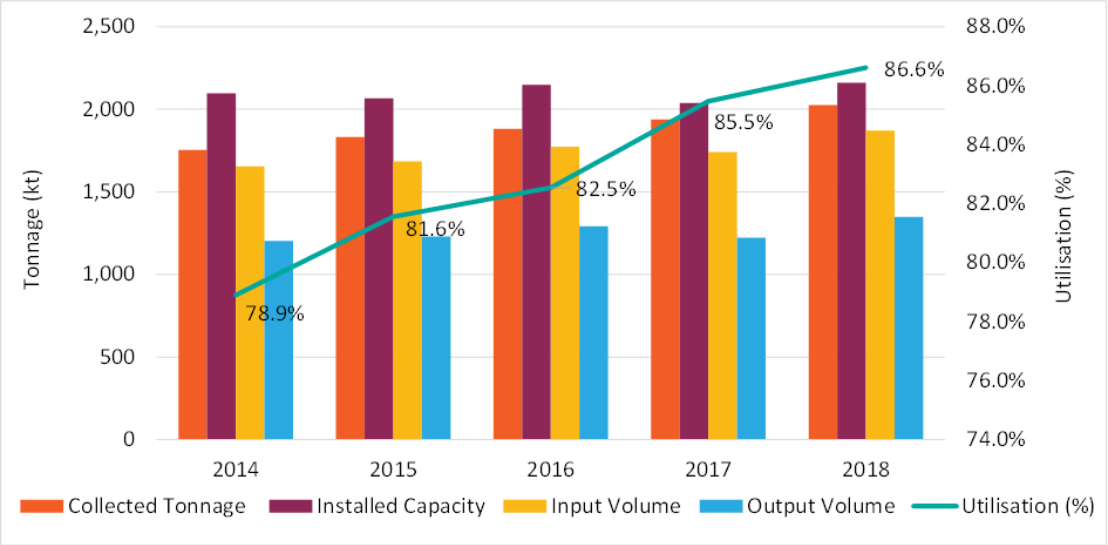
Source: EFBW, Petcore Europe and Plastics Recyclers Europe (2020)

To the best of our knowledge, there are no reliable data on trends in recycled content uptake in the EU plastic packaging market over time. However, trends in recycled content can be inferred from other, related datasets. These relate primarily to PET packaging, and are discussed below.

Since 2014, although there has been relatively little growth in reprocessing capacity for PET in Europe, there has been growth in input volumes, driven by increased collections, and a corresponding increase in utilisation and output volumes (see Figure 33).[294] The main end market for rPET is packaging, specifically bottles for food and drink (18% of rPET sold) and bottles for non-food (10%), as well as trays and sheets (14% food and 16% non-food).[295] Therefore, it could potentially be inferred that the use of rPET in the packaging sector has been increasing since at least 2014 (note though, that there is no guarantee that the increased rPET output has been going into the packaging sector). Furthermore, an increase in the use of rPET in the packaging sector does not necessarily mean there has been an increase in the recycled content within each packaging item; increased use of rPET could instead be a reflection of an increase in the plastic packaging volume overall.

[294] EFBW, Petcore Europe and Plastics Recyclers Europe (2020) *PET Market in Europe - State of Play: Production, Collection and Recycling Data*, 2020
[295] EFBW, Petcore Europe and Plastics Recyclers Europe (2020) *PET Market in Europe - State of Play: Production, Collection and Recycling Data*, 2020

Figure 33. Change in European (EU28+2) PET Reprocessing over time



Source: EFBW, Petcore Europe and Plastics Recyclers Europe (2020)

Recent trends in rPET prices also signify increased demand for recycled plastic content in packaging. As shown in

Figure 34, the price of food-grade rPET pellets has been increasing since 2017, and continued to rise in late 2018 / early 2019 even when the price of virgin PET resin significantly declined (due to high virgin stocks and relatively weak demand).[296]

Similarly, Figure 35 shows that in the past, non-food grade rPET flake has tracked below the price of virgin PET, but in mid-2018/early 2019 remained stable, despite a sharp decline in the price of virgin PET. This indicates that demand for recycled plastic content is largely decoupled from the price of virgin resin, likely driven by consumer demand, linked to brand commitments to recycled content in packaging, as well as the need to meet future targets set in EU legislation (see Section 6.8.4 for more detail on drivers).

Tightening of waste export markets has also had an impact on the European plastic recycling market, and the availability of recycled materials therefrom. For example, China's "National Sword" policy, enacted in 2018, banned the import of most low-grade/ mixed plastics (and other materials such as mixed, unsorted paper), spurring a number of other traditional export markets to do the same. Prior to the Chinese ban, a significant portion of plastics collected in Europe had been exported to China. This has resulted in calls for more domestic plastic recycling capacity in Europe, and recognition of the need for end markets for the secondary materials that have been produced.

[296] S&P Global (2019) *Plastics Recycling: PET and Europe Lead the Way*, 2019, https://www.spglobal.com/platts/plattscontent/_assets/_files/en/specialreports/petrochemicals/plastic-recycling-pet-europe.pdf

Figure 34. Price relationship –vPET and food-grade rPET

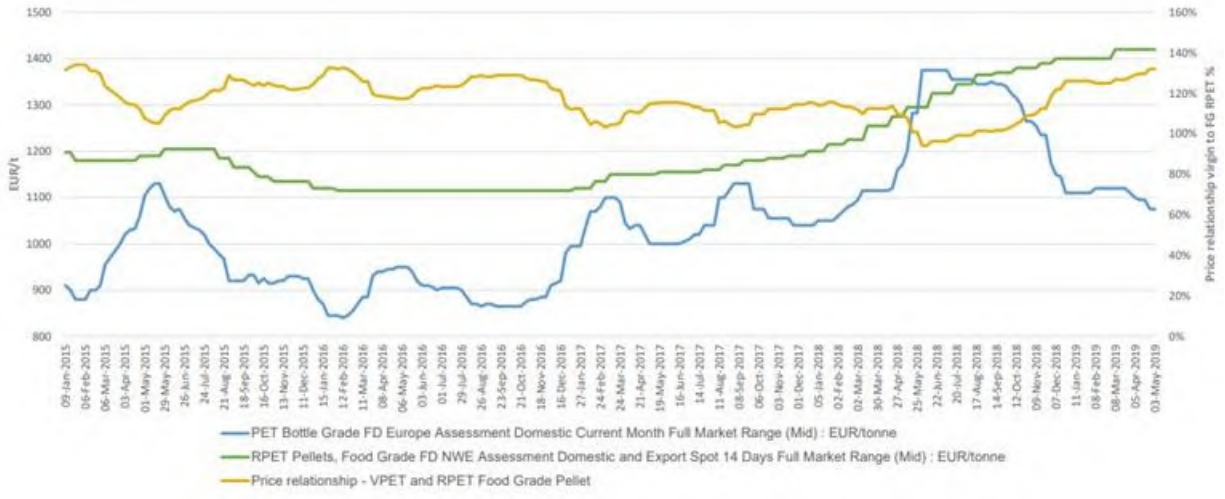
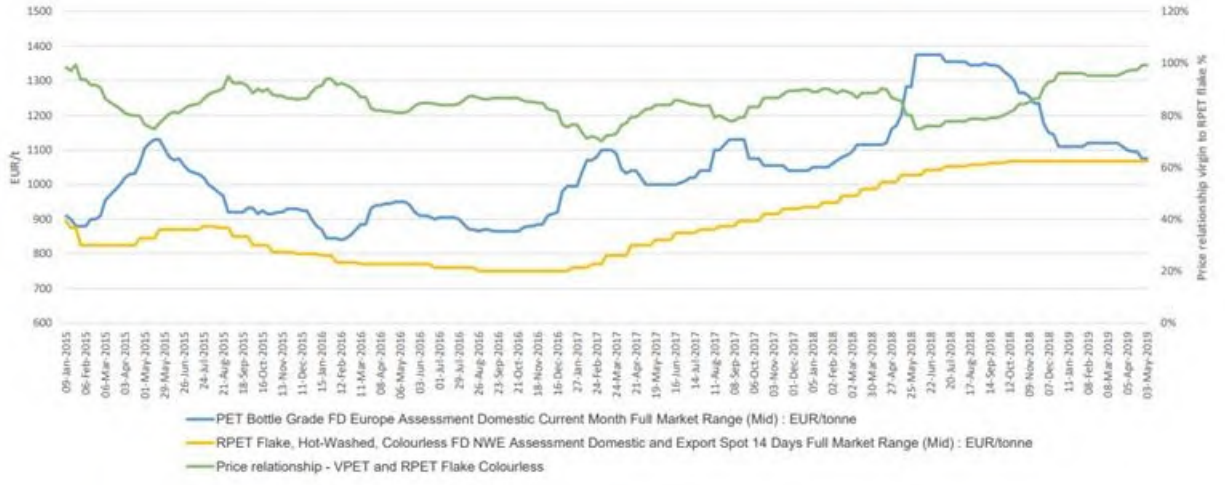


Figure 35. Price relationship - vPET and colourless rPET flake



Source: ICIS, 2019 Paper and card packaging

Paper and card packaging generally contains a high proportion of recycled material, for example:

- The European Corrugated Packaging Association (FEFCO) estimated that the average recycled content used in corrugated cardboard packaging in 2018 was 89%.[297]
- The Confederation of European Paper Industries (CEPI) estimates that the average recycled content in cartonboard packaging at present is 50%.[298]

[297] Communication with FEFCO, May 2020
[298] Communication with CEPI Cartonboard, May 2020

The exception to this is beverage cartons, for which technical limitations means that current levels of recycled content are 0%.[299] Relatively high levels of recycled content uptake are possible in most other paper/ card packaging applications because recycling rates for paper and card packaging are high in the EU (84.6% in 2017), meaning there is a good supply of secondary material.[300]

In terms of demand for secondary paper/ card, it is noted that in most cases, it is technically possible to include a significant proportion of recycled content in paper and cardboard packaging, although, the recycling process does gradually shorten and weaken the fibres, and so for certain applications virgin fibres must also be used to achieve the performance requirements of the packaging. As a general estimate, fibres can be recycled between 4 and 7 times before they can no longer be used in the paper manufacturing process.[301]

There are health and safety considerations that must be considered if recycled paper or card is used in food packaging, which can limit the uptake of recycled content in certain applications. Depending on the source of the recycled fibre (i.e. whether it was originally used for food or non-food packaging), and the way it was prepared and treated, it is possible for recycled paper and cardboard to contain substances (e.g. residues from inks) at concentrations that are unsuitable in materials that come into contact with food.[302] This limitation can be overcome to some extent by the use of functional barriers such as polymer films or coatings, metallised polymers and / or aluminium foil which prevent the migration of substances, though these additions can pose challenges to the waste collection / sorting / recycling process at the end of life stage. [303]

As noted, levels of recycled content in paper and card packaging appear to already be relatively high (though, data is limited). Consumer demand for recycled content should continue to drive up levels of recycled content in the future, until a technical or supply side barrier is reached. Specific targets for recycled content in paper and card packaging are not in place at present.

Aluminium packaging

According to the European Aluminium Association, aluminium as a material is fully recyclable without loss of quality or change in properties – recycled aluminium cannot be distinguished from virgin material and so there are no technical or health and safety barriers to its incorporation in aluminium

[299] Valpak (2012) *PackFlow 2017*, March 2012

[300] EUROSTAT *Recycling rates for packaging waste*, accessed 20 October 2020, https://ec.europa.eu/eurostat/databrowser/view/ten00063/default/table?lang=en

[301] Australian Packaging Covenant *Design Smart Material Guide: Fibre-Based Packaging*, accessed 19 October 2020, https://www.australianpackagingassessment.com.au/wp-content/uploads/2017/11/2.-Fibre_DSMG.pdf

[302] FoodDrinkEurope (2016) *FoodDrinkEurope Guidelines on the safe use of paper and board made from recycled fibres for food contact use*, 2016, https://www.fooddrinkeurope.eu/uploads/publications_documents/FoodDrinkEurope_Guidelines_safe_use_of_paper_and_board_made_from_recycled_fibres.pdf

[303] The term "functional barrier" is defined in Commission Regulation (EU) No 10/2011 on plastic materials and articles intended to come into contact with food (See Article 3 (15)). Article 3, section 15 reads: " *"functional barrier" means a barrier consisting of one or more layers of any type of material which ensures that the final material or article complies with Article 3 of Regulation (EC) No 1935/2004 and with the provisions of this Regulation;*"

packaging.[304] In theory an aluminium packaging item could be made from 100% recycled content. **However**, as outlined below, supply and **demand dynamics associated with recycled aluminium act as a barrier to the uptake of recycled content in packaging**.

There is an economic incentive to recycle as much aluminium as possible because the value of the secondary aluminium output is high enough to offset the costs of recycling it.[305] This is reflected in relatively high recycling rates for aluminium packaging. For example, the European Aluminium Foil Association (EAFA) reports that the estimated average recycling rate in Europe for packaging with a dominant aluminium component is ~65%.[306] This includes aluminium beverage cans, which are relatively simple to collect and recycle, and for which the average recycling rate is even higher at 75% (ranging from 99% in Germany to 30% in Malta).[307] Although this suggests that there is strong supply of recycled aluminium material from the packaging sector, **it is noted that aluminium foils are made using different alloys, and can pose issues for collection and recycling due to their small, often highly contaminated nature**. The proportion of post-consumer aluminium foil that is separately collected is therefore often too contaminated, too light and of too low value to attract viable end markets as new foil. Foil collected alongside cans, despite being of a different alloy, is often treated a form of contamination that is unlikely to affect can recycling and is therefore often smelted alongside cans, although this reduces the share of secondary aluminium foil on the market. In addition, many forms of aluminium foil packaging are sold in multi-layer formats, which are not recycled widely. Recycling of aluminium foil is therefore limited, with any recycled materials often used in the automotive industry rather than the packaging sector.

Despite high recycling rates in the packaging sector, it is noted that the available quantities of recycled aluminium do not meet the current demand across all sectors, limiting the uptake of recycled content in all applications, including packaging. Corresponding to this, there is therefore competing demand for recycled aluminium packaging across multiple end-markets (e.g. packaging, automotive, construction), all of which have experienced growth in recent years. As with plastics, the incorporation of secondary aluminium material in applications which cannot be easily recycled, or which have a much longer life-cycle than packaging (e.g. applications in the automotive / construction sectors), limits the amount of recycled content that can be incorporated in aluminium packaging, because the material that is lost (or locked up) in the system must be replaced with virgin material. The use of recycled aluminium from cans in engine blocks, for example, or other applications removes the potential for using secondary aluminium in closed loops since the aluminium in engine blocks is likely to remain 'in stocks' for a decade or so, whilst the production and consumption of cans has a much faster turnover. The specificity of aluminium alloys for particular purposes also means that the loss of can-based materials from the system requires the relevant alloying elements to be added to the feedstock. The same is true for recycled steel.

[304] European Aluminium Foil Association (2019) Aluminium Foil and Recycled Content - Explanatory Note
[305] ibid.
[306] European Aluminium Foil Association *Recycling & Recovery*, accessed 19 October 2020, https://www.alufoil.org/en/sustainability/recycling-and-recovery.html
[307] Metal Packaging Europe *Aluminium beverage can recycling in Europe hits record 74.5% in 2017 | Metal Packaging Europe*, accessed 19 October 2020, https://www.metalpackagingeurope.org/article/aluminium-beverage-can-recycling-europe-hits-record-745-2017

In terms of the uptake of secondary aluminium in the packaging sector, EAFA estimates that in Europe ~50% of the aluminium produced (both packaging and non-packaging) originates from recycled materials.[308] More specifically, it is estimated that the average recycled content in European aluminium beverage packaging is 47%, though the underlying data to support this is not publicly available at present.[309] There is little information available about the average recycled content in other aluminium packaging applications such as foil trays, aerosols, bottle tops and wrapping foil (the EAFA does not report recycled content figures at a product level), though there are examples of specific products being marketed with high levels of recycled content. For example, Technocap introduced a portfolio of aerosols with 100% recycled content in early 2020.[310]

Steel Packaging

The situation for recycling and recycled content for steel packaging mirror those of aluminium packaging. **Steel is fully recyclable without loss of quality or change in properties**.[311] There are therefore no technical barriers to the incorporation of recycled steel content in packaging, with levels of up to 100% achievable.

As with aluminium, **the high value of steel scrap means there is a strong economic incentive to recycle it, and its magnetic properties mean that once collected, it is relatively easy to recover from the waste stream**. As a result, the recycling rate for steel packaging in Europe reached 82.5% in 2018, making it the most recycled packaging material.[312]

There is significant demand for recycled steel from multiple end-markets (e.g. packaging, automotive, construction), all of which have experienced growth in recent years; and as with aluminium, demand therefore currently outstrips supply. Currently, the Association of European Producers of Steel for Packaging (APEAL) reports that the average recycled content in the EU for steel packaging is 58% (based on data from 2017, and validated by the European Commission in 2020).[313] The discrepancy between the 82.5% recycling rate for steel packaging, and the estimated average recycled content of 58% suggests that some steel packaging recycled material is directed to non-packaging applications, which are potentially in use for much longer than an item of packaging. The packaging industry must therefore replaced this "lost" recycled material with virgin material.

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[308] European Aluminium Foil Association (2019) Aluminium Foil and Recycled Content - Explanatory Note

[309] Geographical *Don't bottle it: why aluminium cans may be the answer to the world's plastic problem - Geographical Magazine*, accessed 19 October 2020, https://geographical.co.uk/people/development/item/3560-aluminium-cans

[310] Packaging Europe (2020) *Tecnocap introduces 100% recycled aluminium cans and bottles*, accessed 19 October 2020, https://packagingeurope.com/api/content/8463fcfa-4283-11ea-9933-1244d5f7c7c6/

[311] APEAL *STEEL PACKAGING RECYCLING IN EUROPE REACHES 79,5%*, accessed 22 October 2020, https://www.apeal.org/news/steel-packaging-recycling-in-europe-reaches-795/

[312] APEAL *The recycled content of steel for packaging?*, accessed 19 October 2020, https://www.apeal.org/news2/recycled-content-of-steel-for-packaging/

[313] APEAL *The recycled content of steel for packaging?*, accessed 19 October 2020, https://www.apeal.org/news2/recycled-content-of-steel-for-packaging/

In addition, existing infrastructure for steel processing in the EU includes long-life blast oxygen furnaces (BOF), the process for which places strict limits on the amount of scrap that can be included (~25%-30%) relative to electric arc furnace (EAF) technology. Despite advances in the applications for which EAF technology is now suitable, therefore, given that it is economically unviable to upgrade all BOF plants, the resulting continued reliance on BOF technology may limit the potential for RC uptake in steel in applications including packaging. Finally, the presence of contaminants in scrap steel also pose issues (explaining the controls placed on scrap steel levels in BOF plants). In the case of steel packaging, this includes post-consumer contamination including food, paint, chemicals, etc., but also contaminants from the steelmaking process itself, in the form of alloying elements, coatings, etc. which can be difficult to remove, and which tend to accumulate each time the scrap steel is recirculated. While this does not pose problems for some applications (e.g. large structural shapes such as bars, beams, and columns, and other steel products that have more lenient residual element restrictions produced in EAF processes), for other small, light applications (including mainly flat products, such as rolled steel used to make automobile bodies and steel studs), contamination must be carefully controlled – this is likely to be the case for steel packaging as well.

Glass Packaging

As with metals, glass can technically be recycled in a closed loop without any loss of quality, and while remaining safe for food contact use. European packaging manufacturers use recycled glass due to the associated environmental benefits and lower production costs, with the French Packaging Council stating that cullet accounts for as much as 63% of material used in the glass industry.[314] However**, there are a few factors which make 100% recycled content difficult to achieve:**

- **Colour requirements:** Glass composition must be carefully controlled to ensure colour consistency within and between production runs. Colour sorting technology has improved significantly over time, but some contamination is inevitable. Usually some virgin material is required to achieve the desired colour results. Tolerance for colour contamination is very low for clear glass, while there is slightly more leeway for green glass. Amber glass requires the most careful control of the composition – any contamination from plastic or food can alter the chemical reaction which creates the amber colour.[315]
- **Defects from inclusions:** Cullet can contain contaminants in the form of non-container glass (e.g. ovenware, tableware), ceramics, and pyro-ceramics. These are difficult to remove from post-consumer waste streams, do not melt and therefore cause inclusions in finished products (i.e. bubbles, particles, foreign particles). Such products are usually identified in post-production quality checks, so do not impact customers, but do reduce the manufacturer's productivity. [316] It is worth noting that glass collected in mixed streams requires significantly more cleaning and processing until furnace ready cullet is produced than separately collected glass.
- **Supply of high quality cullet:** Glass manufacturers may not always be able to acquire cullet of the necessary quality at a cost that allows their selling price to remain competitive. Various factors influence the pricing and availability of glass cullet. For example, in some markets there can be a mismatch between the colours of glass collected and the colours required by glass manufacturers. In

[314] French National Council (2019) *Recycled materials and packaging: State of play, Advantages, obstacles, issues and prospects*, February 2019, https://conseil-emballage.org/wp-content/uploads/2019/02/Recycled-materials-and-packaging.pdf

[315] British Glass (2019) *Recyced Content in Glass Packaging*, accessed 19 October 2020, https://www.britglass.org.uk/sites/default/files/00016-E2-2019_Recycled_content_in_glass_packaging_WEB.pdf

[316] British Glass (2019) *Recyced Content in Glass Packaging*, accessed 19 October 2020, https://www.britglass.org.uk/sites/default/files/00016-E2-2019_Recycled_content_in_glass_packaging_WEB.pdf

the UK, a large proportion of the glass packaging collected for recycling is green (imported wine and beer), yet a large proportion of the glass packaging produced is clear (e.g. spirits in clear bottles).[317]

Recent data on the average recycled content for glass packaging in Europe, by colour, is presented in Table 13. As would be expected, flint (i.e. no colour) has the lowest recycled content, while green has the highest, as manufacturers of green glass can tolerate more contaminated cullet.

Table 13. Glass Packaging - Average Recycled Content (Europe, 2019)

Colour	Average recycled content (%)
Unspecified colour	52%
Green glass	80%
Brown glass	50%
Flint glass	40%

Source: FEVE (European Container Glass Federation)

These average figures mask variation by Member State. It is likely that recycled content in glass packaging is higher in those Member States with a higher glass packaging recycling rate, due to a stronger supply of cullet (see Figure 36).

Figure 36. Glass packaging recycling rate, by Member State, 2016

[317] British Glass (2019) *Recyced Content in Glass Packaging*, accessed 19 October 2020, https://www.britglass.org.uk/sites/default/files/00016-E2-2019_Recycled_content_in_glass_packaging_WEB.pdf



Source: FEVE

In terms of trends in recycled content uptake in glass packaging over time, British Glass (the British trade association for glass) publishes one such dataset which has been tracking the average recycled content in UK glass packaging since 2008, when a consistent method for measuring recycled content was agreed between UK glass container manufacturers. The materials counted towards recycled content under this method are:

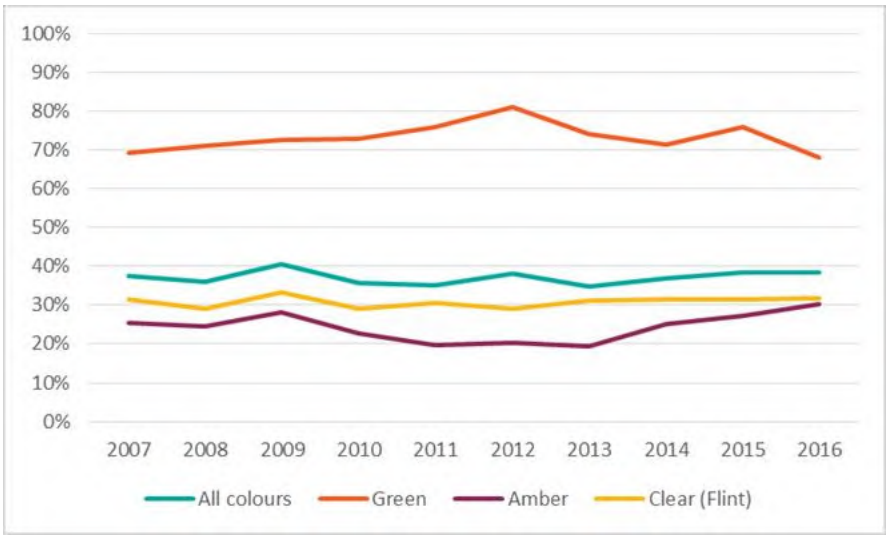
- glass packaging waste e.g. bottles and jars from recycling collections (UK and imports);
- waste plate glass e.g. glazing, automotive; and
- calumite (a waste material from iron production).

Glass from internal process losses (eg test runs, rejects) is not included.

As shown in Figure 37, the recycled content in glass packaging remained fairly constant between 2007 and 2016 (albeit with some fluctuation), at an average of around ~40%.[318] In comparison, over the same time frame, the UK glass packaging recycling rate has increased from 55% to 67% (see Figure 38). This indicates that there may be some technical issues, or market failures, limiting the uptake of recycled content in glass packaging.

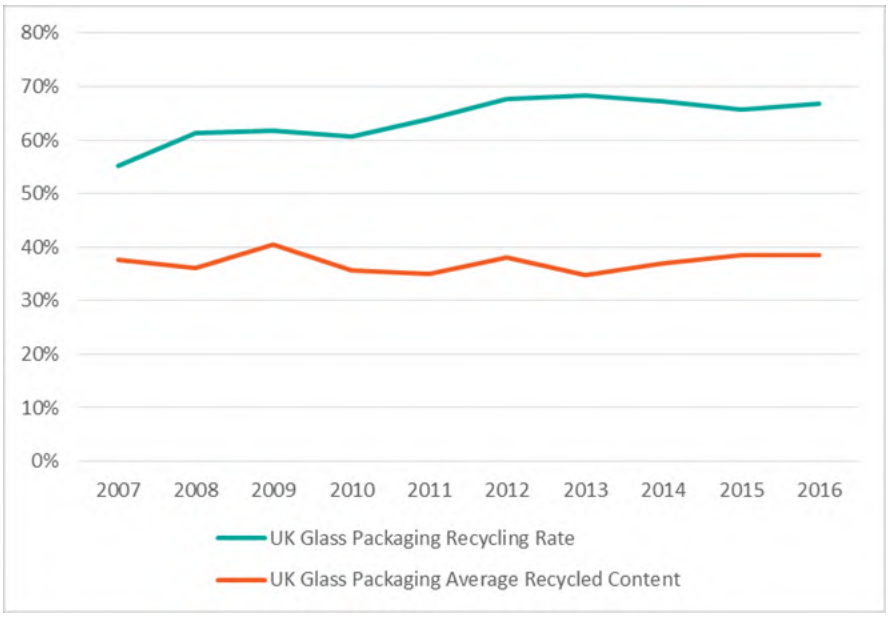
Figure 37. UK Glass Packaging - Average Recycled Content (British Glass)

[318] British Glass (2017) *Recycled content – packaging*, September 2017, https://www.britglass.org.uk/sites/default/files/1709_0001-E1-17_Recycled%20content_0.pdf



Source: British Glass

Figure 38. UK Glass Packaging – Recycling Rate vs. Recycled Content



Source: British Glass; Eurostat

Wood packaging

The main form of wooden packaging is non-consumer, wooden pallets, which are used to transport goods. Typically, they are constructed from virgin timber and do not contain any recycled content (though, as an

exception, some may include compressed blocks of recycled wood in the corners).[319] Though there are targets for the recycling of wooden packaging in the Packaging and Packaging Waste Directive (25% by 2025 and 30% by 2030), wood tends to be downcycled for use as feedstock for the panel board industry, animal bedding, surfacing (e.g. equestrian, play areas, landscaping) and biomass fuel. Further investigation with pallet manufacturers is required to understand the desire and feasibility to make wooden pallets from recycled content (it may not be feasible from a strength / durability perspective). Note that a company called 'Pallite' is manufacturing pallets from recycled content, but they are paper based rather than wood based.[320]

Summary of Trends

The main trends in recycled content uptake across different packaging materials are as follows:

1. The uptake of recycled content in plastic packaging is generally low, though there are exceptions, with some brands marketing 100% rPET bottles. Growing pressure from *inter alia* consumers and policy makers is driving brands to increase recycled content in their packaging (across all materials, though plastics are a particular focus for consumers at present). The SUP Directive also includes targets for increased recycled content in beverage containers by 2025/2030. As a result, in recent years, there has been sustained demand for recycled PET from manufacturers, even in periods when the price of virgin PET has fallen significantly.
2. Average recycled content in paper and card packaging applications is higher than in plastics (especially for corrugated cardboard and carton board), due to a greater supply of recycled material and fewer technical limitations. However, after multiple life cycles, paper fibres tend to become shorter and less suited to incorporation in new products. Additionally, beverage carton packaging, for technical reasons, cannot include recycled content. Food contact safety considerations also apply to paper and card packaging.
3. Aluminium and steel can be endlessly recycled without any loss in quality, or concerns about food safety, so in theory 100% recycled content in steel and aluminium packaging is feasible. The high value of recycled aluminium and steel means strong economic drivers to recycle it already exist, reflected in high recycling rates. However, demand for metal recyclate outstrips supply and limits the uptake of recycled content in packaging applications. Key trade associations argue that any recycled content targets for metal packaging would just divert recycled aluminium/steel from one application to another, rather than stimulate further recycling.
4. Glass is also endlessly recyclable, though complications arising from how it is collected (mixed colours, non-glass contaminants) can limit the quality of cullet, and therefore its inclusion in glass packaging.

6.8.1. Consequences

The uptake of recycled content in products – as well as recycling rates – varies significantly between different packaging materials, as shown in Table 13.

[319] RAJA UK (2019) *A Guide to Pallets | Understanding warehouse logistics*, accessed 20 October 2020, https://www.rajapack.co.uk/blog-uk/pallets-guide/

[320] PackagingNews (2019) *Pallite moves to use 100% recycled materials*, accessed 20 October 2020, https://www.packagingnews.co.uk/news/materials/paper/pallite-moves-use-100-recycled-materials-12-11-2019

Generally, it is observed that greater quantities of packaging material are sent for recycling than make it into new packaging products. For steel and glass, the amount of recycled content that is used in packaging products is equivalent to around three-quarters of the tonnage of material that is sent for recycling. The difference is much greater for PET bottles, however, for which recycled content use is equal to only 20% of the tonnage that is recycled. This suggests that steel and glass used in packaging displays much greater circularity than PET bottles.

Where circularity is low, seemingly high recycling rates can mask the environmental benefits that recycling delivers if the secondary materials produced from recycling processes are either being downcycled, or are not being incorporated as recycled content in new products multiple times. As the quantity of packaging placed on the market continues to increase, this indicates an ongoing reliance on virgin resources.

The lack of uptake of (and therefore demand for) recycled content additionally restricts growth in the recycling sector, prolonging our dependence on other waste management methods such as landfilling and incineration, and the negative environmental externalities these disposal routes entail relative to recycling. Even waste that has been sent for recycling might not be processed into secondary materials (especially when demand is low), being disposed of instead of becoming recycled content in new products. Therefore, where uptake of recycled content in the packaging sector is limited and displays low circularity, wide-ranging effects are felt on the environment, supply chain, and packaging and recycling markets, as discussed in this section.

Table 13. Comparison of Recycling Rate and Recycled Content by Packaging Material (Europe)

Packaging Material	**Application**	**Recycling Rate - 2017**	**Average Recycled Content**
Metals	**All metal packaging**	79.2% (Eurostat)	-
	Steel packaging	80.5% (APEAL)	58% (APEAL)
	Aluminium packaging	Aluminium cans: 74.5% (European Aluminium)	*No data*
Paper/ Cardboard	**All paper and cardboard packaging**	84.6% (Eurostat)	-

	Corrugated Cardboard	-	89% (FEFCO)
	Carton board		50% (CEPI)
Glass	**All glass packaging**	74.7% (Eurostat)	55.5% (average of all colours, FEVE)
Plastic	**All plastic packaging**	41.9% (Eurostat)	-
	PET	56.3% (Petcore)	*No data*
	PET beverage bottle	58.2% (EPBP)	11.7% (EuPC)

Continued Reliance on Virgin Resources for Production

Typically, the extraction of virgin resources such as aluminium, steel and glass, oil for the manufacture of plastics, and in the practice of forestry, are associated with a number of negative environmental externalities, including:

* noise;
* dust;
* air overpressure;
* emissions to air and water;
* congestion;
* changes in biodiversity;
* depletion of finite resources; and
* in the case of forestry, changes in carbon sequestration.

It is important to note that the production of recycled content is not without its own externalities, such as emissions generated through collection and re-processing. That being said, the total sum of externalities incurred through extraction and processing of virgin resources far outweighs that of the production and use of recycled content. In particular, the **extraction of virgin resources is well-understood to have much greater energy requirements than the use of recycled content, and therefore higher associated GHG emissions**.

These emissions contribute to the problem of climate change and low air quality, impacting human, animal and plant health and the environment. Other things being equal, ensuring that production processes make greater use of materials with a lower embodied energy content will support efforts to reduce emissions of GHGs. This is clearly demonstrated through the benefits of increasing the proportion of recycled content across a range of packaging types. Switching to recycled steel, for example, has been shown to reduce the impact on climate change by around 80%, and emissions of particulate matter by circa 70%; whilst CO_2 reductions for aluminium and PET are around 95% and 85%, respectively.[321]

With regards to aluminium beverage cans, evidence suggests that the carbon intensity can be as low as 0.5 tonnes CO_2 equivalent per tonne of recycled aluminium, compared to up to 20 tonnes CO_2 equivalent per tonne of aluminium from coal-based production.[322] This is reflected in the process of recycling aluminium, which can be achieved with only five per cent of the energy required to manufacture primary aluminium.

Closed-loop recycling also helps to lower GHG emissions more than it would to recycle material in an open loop by maintaining material quality to an extent that it can substitute virgin material, be used multiple times, and maintain its value as a resource. For some materials this can be done indefinitely without the material quality degrading. In open-loop recycling, where material is not re-used multiple times, value is lost from the cycle. One example is the use of recycled glass as aggregate for construction material; once used as aggregate, it can no longer be used in new glass packaging, known as 'down-cycling.' This increases the demand for virgin materials and is less efficient than closed-loop recycling, because of the loss of resources from the cycle. In a closed loop, all materials are used as far as possible to maximise efficiency, and therefore minimise GHG emissions. This is demonstrated in the recycling of aluminium cans, for example, where the reduction in energy requirement is achieved partly through the use of the coatings as fuel for the melting of the material.

This demonstrates that recycling material in a closed loop maximises resource efficiency by keeping it in use for longer, and therefore higher levels of recycled content will help to reduce GHG emissions further by reducing the need for further primary resource extraction.

Figure 39 shows the cumulative impact of higher recycling rates on resource efficiency. The logic behind the chart is as follows:

1. At a 10% recycling rate, 100 PET bottles would produce enough rPET to make 10 more PET bottles with the first round of recycling. Once those 10 bottles are recycled, they produce enough rPET to make 1 more PET bottle. In total, the 100 bottles worth of raw material created 11 bottles made of rPET.
2. At a 90% recycling rate, 100 PET bottles would provide enough recycled plastic material for 90 bottles more PET bottles with the first round of recycling. Once those 90 bottles are recycled, they produce

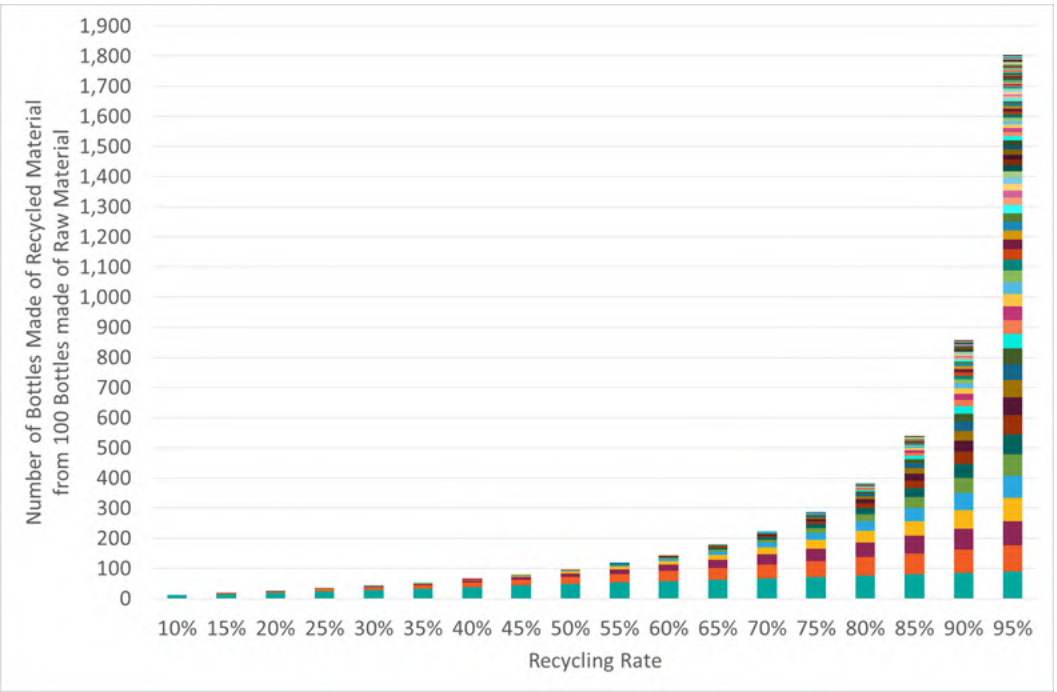
[321] European Commission (2020) *Effectiveness of the essential requirements for packaging and packaging waste and proposals for reinforcement : final report and appendices.*, accessed 16 September 2020, http://op.europa.eu/en/publication-detail/-/publication/05a3dace-8378-11ea-bf12-01aa75ed71a1

[322] European Aluminium (2020) *Circular Aluminium Action Plan*, 2020, https://www.european-aluminium.eu/media/2931/2020-05-13_european-aluminium_circular-aluminium-action-plan_executive-summary.pdf

enough rPET to make 81 more PET bottles, and so on. The dramatic cumulative effects of such a higher recycling rate, over numerous rounds of recycling, on overall material efficiency is shown in this figure.

This demonstrates that recycling material in a closed loop maximises resource efficiency by keeping it in use for longer, and therefore higher levels of recycled content will help to reduce GHG emissions further by reducing the need for further primary resource extraction.

Figure 39. Impact of Circularity Through Recycling (95% Yield)



Note: Each colour block represents the number of recycled bottles created from the previous round of recycling

Source: Eunomia

Low uptake of recycled plastic content, however, is preventing these impacts from being felt. Globally, it is estimated that ~1.5% of global oil production is used in the production of plastic packaging, but only 2% of plastic packaging is recycled in a closed loop, while 40% is landfilled and 32% is leaked to the environment.[323]

Furthermore, use of higher amounts of recycled content has a disproportionately large impact on the emissions for plastics packaging. A study in Ireland, for example, showed that increasing recycled content of

[323] Ellen MacArthur Foundation (2016) *The New Plastics Economy: Rethinking the Future of Plastics*, March 2016, https://www.ellenmacarthurfoundation.org/assets/downloads/EllenMacArthurFoundation_TheNewPlasticsEconomy_15-3-16.pdf

PET trays from 85% to 100% reduced the overall GHG emissions by 24%.[324] Such significant cumulative impacts are only felt where levels of recycled content are higher; when the combined impacts of both resource efficiency to reduce embodied carbon and the energy savings from the extraction of virgin resources are much greater.

The European Commission has identified increasing the use of recycled content as a key element in the delivery of the Circular Economy Action Plan's goal of designing sustainable products, which will play a significant role in reducing the harmful emissions associated with extraction of virgin resources.[325] In order to deliver these benefits, however, **there will need to be much greater cooperation along the supply chain to trace and verify the amount of recycled material in products, as well as sourcing the material in the first place**. The plastics economy in particular is highly fragmented, which has led to the development of many different materials, formats, labelling, collection schemes, and sorting and reprocessing systems being used. Extensive coordination along the recycling supply chain will be required to enable the plastics economy to supply the right material in order to maximise use of recycled content.

Increasing demand for recycled content would be accompanied by a greater burden on municipalities who will need to make investments into improving recycling collections, potentially requiring increases in fees for those in receipt of such collections. However, this would be mitigated by revenues from an increase in end markets available for the materials processed. In addition, bearing in mind the requirement for EPR schemes for packaging to be in place by 2024 (and by 5th January 2023 for Member States where schemes were established before 4th July 2018), and for these schemes to contribute to the net costs of such waste management improvements, municipalities alone are unlikely to bear these costs. Indeed, waste managers and operators are likely to have to bear these to a certain extent, as new advanced technologies for sorting and processing materials are costly, and not necessarily compatible with existing infrastructure in the short term. However, greater demand for recycled materials would help to drive innovation in such sorting and reprocessing technologies in a commercially viable way in order to allow supply to grow, thereby creating opportunity for investment.

6.8.2. Barrier to Increasing Recycling Rates

The low demand for recycled content in the packaging sector hinders the improvement of recycling rates, since there is a **lack of end markets** to which recycled materials can be sold, making investment in recycling beyond a certain point, and/or for particular materials, economically unviable. This is particularly relevant given the challenges posed by increased packaging waste recycling targets and the revised measurement method for proving attainment against those targets. By measuring recycling rates at the point at which materials are input into the final part of the recycling process, rather than any earlier stage, such as at the point of collection, or just after preliminary sorting (after which points there may be further losses prior to recycling), attainment of these targets will only be achieved if more material is actually recycled.

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[324] Dormer, A., Finn, D.P., Ward, P., and Cullen, J. (2013) *Carbon Footprint Analysis in Plastics Manufacturing*, July 2013, https://doi.org/10.1016/j.jclepro.2013.01.014

[325] European Commission (2020) *Circular Economy Action Plan: For a Cleaner and More Competitive Europe*, 2020, https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf

In Europe, packaging waste that is not re-used or recycled will be disposed of – if properly handled – in one of two ways: energy recovery through incineration, or disposal (landfill). Incineration of waste for energy and heat is an efficient process on which many European countries rely, but does lead to associated GHG emissions through the burning of fossil carbon present in waste. Much of this fossil carbon is found in plastic, which has been shown to emit 55% more GHG emissions when incinerated as opposed to recycled,[326] and for which the uptake of recycled content is the lowest of all packaging materials. Waste can also be exported for energy recovery, transport for which carries associated emissions. Landfills must be carefully managed to prevent leachate – which is formed through the breakdown of waste – escaping into the surrounding water and ground. Illegal incineration operations and dumpsites still exist in some Member States where the environmental consequences of these are not properly managed, and whose associated emissions are higher due to the lack of mitigation efforts. For some packaging types, particularly single-use packaging, problems with littering are also common, with packaging constituting around half of all marine litter items found on European beaches, including food containers, beverage cups and containers, and packets and wrappers. Littered plastics are a particular concern in marine environments, where they can degrade and break down to form microplastics, which re-enter the food chain in marine animals, and are known to build up in humans who consume these, potentially leading to health complications. Landfilling, incineration, littering and waste crime, and their associated emissions and negative externalities, could therefore be reduced if the uptake of recycled content were greater.

Additionally, recycling follows circular economy principles by keeping material at a higher value for longer. If waste is not recycled, and is instead littered landfilled or incinerated, this value is essentially lost from the market, resulting in a continued dependence on virgin materials that is incompatible with the Commission's circular economy aspirations. A lack of uptake of recycled content in packaging therefore constrains demand and the availability of end markets for recyclate, in turn preventing the development of the recycling sector, including increased collections, improved sorting technologies, and so on. A 'chicken-and-egg' scenario therefore exists wherein demand for recycled content is insufficient to drive supply of higher quantities and quality of recycled materials, while the quantity and quality of secondary materials available are inadequate to ensure steady, and increasing, demand.

6.8.3. Problem Summary

Without a recognised method or reliable technologies to measure recycled content in a product, nor any agreed definition as to what can be counted, the uptake of recycled content in packaging is framed by a considerable lack of data. Where data are available, rates of uptake of recycled content in packaging are shown to vary significantly across different materials, with broader categories of paper and cardboard, aluminium, steel, and glass generally showing higher levels of uptake than for plastics and wooden packaging. Within these categories, however, rates of uptake vary further still depending on the packaging application; in the paper and cardboard category, for example, the average level of recycled content in corrugated cardboard is 89%, whilst for beverage cartons it is 0%.

[326] Hillman, K., Nordisk Ministerråd, and Nordisk Råd(2015) *Climate Benefits of Material Recycling: Inventory af Average Greenhouse Gas Emissions for Denmark, Norway and Sweden*, Kbh.: Nordisk Ministerråd : Nordisk Råd : [Eksp.] www.norden.org/order

Where there is insufficient supply or demand for recycled materials in a closed loop, the demand for packaging materials must be met through extraction of virgin resources, the environmental impacts for which – including GHG emissions – are much greater than using secondary materials. Furthermore, **failure to incorporate higher levels of recycled content into some packaging materials due to low demand actively prevents recycling rates from increasing**. This waste is instead treated through incineration for energy recovery and landfill, which further contributes to environmental problems of GHG emissions and pollution, whilst the value of the waste is also lost.

Additionally, waste that is not recycled frequently ends up in marine environments, causing pollution which has been shown to cause harm to marine life, and but with as yet unknown effects on species higher up the food chain, including humans.[327] increasing recycling rates to displace waste from incineration and landfill will require investment from municipalities in terms of collection capacity (the burden of which will be shared by producers as per the revised EPR requirements), but it will play an important role alongside improving industry's uptake of recycled content by ensuring a more steady supply of quality material. This will be particularly important for those materials in which it has been suggested there is currently sufficient demand for recycled materials (such as metals and glass). Addressing these issues with waste will therefore play a key role in achieving the Commission's 2050 climate neutrality objectives, as well as those of the Green Deal in minimising resource use. This will, however, also require a shift in industry to embrace the differences between the secondary and virgin material supply chain, and how to effectively incorporate these materials into their products.

6.8.4. Problem drivers

6.8.4.1. Market Drivers

Much like other markets, recycling post-consumer material to be incorporated into new products is underpinned by steady supply and demand. Where demand for secondary materials for use as recycled content is low, it is much more difficult to achieve higher recycling rates, such as those laid out in the Circular Economy Action Plan; the economics of recycling simply do not work as there is a lack of financial incentive for recyclers. Greater demand must come from an end market to which to sell recycled material, increasing the incentive to collect, sort, and reprocess recyclate of a consistent quality. However, stimulating this demand depends upon a range of factors, including competition with virgin material. Compared to the use of virgin materials, recycled content is associated with greater risk, reduced quality, and inconsistent supply, in addition to higher costs, which act as barriers to its uptake in new products. The term 'packaging,' however, is broad and these barriers apply across different materials to varying degrees. Further detail on these barriers is provided in the sections below.

Insufficient Internalisation of Externalities

Prices for both virgin and recycled materials, including – but not limited to – plastics, at present do not factor in the externalities that will lead to the environmental and social consequences discussed in Section 6.8.1. Instead of being priced into the market, the correction of environmental damage is often a burden for

[327] Akhbarizadeh, R., Moore, F., and Keshavarzi, B. (2018) *Investigating a probable relationship between microplastics and potentially toxic elements in fish muscles from northeast of Persian Gulf*, January 2018, https://doi.org/10.1016/j.envpol.2017.09.028

the taxpayer to bear, or simply left to cause harm if unaddressed. By failing to internalise these costs there is a lack of financial incentive to incorporate greater amounts of recycled content into those packaging materials which rely primarily on virgin resources. In principle, full internalisation would reduce demand for materials overall, but to the extent that the externalities of recycled content production are lower than virgin materials, then full internalisation would have the effect of inserting a price wedge between the secondary and primary materials, effectively reducing the price of recycled content relative to primary resources.

Even when uptake of recycled content is high, such as in aluminium packaging products, the extraction of virgin material to meet demand still fails to fully incorporate and address externalities, although accounting for these in the price of virgin materials would not necessarily divert demand towards secondary materials recycled content. Different materials each have different influencing factors affecting uptake of recycled content, which may be affected differently by an increase in costs for virgin materials if externalities were accounted for. The mining of Bauxite, from which aluminium is produced, is heavily associated with polluting emissions to both air and water, the costs of which are not incorporated into production of aluminium. Unlike other raw materials used for packaging, however, bauxite has been recognised on the European Commission's Critical Raw Materials list,[328] reflecting the dwindling virgin stocks that remain. Recognition that reserves of bauxite are limited has forced the recycling market for aluminium to develop to ensure that material stocks are sufficient to meet growing demand, and it is thought that around 75% of the aluminium ever produced is still in use.[329] Recycled content in aluminium packaging applications is therefore unlikely to be bolstered by an increase in costs for virgin materials, and instead this is more likely to have the effect of increasing the cost for aluminium packaging products overall. For other materials, such as glass and cardboard, the externalities are associated with emissions to air and water, as well as energy use, but the methods of extraction and impacts on stocks are very different. The wood that is used to produce cardboard is a readily available renewable material, but is associated with polluting activities. The recycling of cardboard is fairly straightforward, and already demonstrates high levels of uptake of recycled content, but relies upon the inclusion of virgin material to ensure product quality – recycled cardboard degrades after each cycle. For glass, meanwhile, although the uptake of recycled content is already high, it is thought to be higher in some European countries than in others, since improvements have been made in the collection and sorting phases of recycling that could be driven to improve further with a greater financial incentive to use recycled material.

Although it is important to consider the externalities of extraction of virgin materials, for some packaging materials the uptake of recycled content is already relatively high. Accordingly, sufficient internalisation of externalities to insert a price wedge between virgin and recycled materials is more of a driver for the uptake of recycled plastic than for other materials, such as aluminium, for which quality standards and demand for recycled content already exist, but for which supply is insufficient. For these materials, ensuring effective collection, sorting and processing will help to meet a greater demand through maximising the supply and quality of material.

Price Volatility for Virgin Materials

Prices for recycled plastic content factor in a variety of costs that are relatively unchanging, including those associated with collection, sorting, processing, and search and transaction, in addition to the underlying costs

[328] European Commission (2020) *Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability*, 2020, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0474&from=EN

[329] European Aluminium (2016) *"Recycled Content" vs. "End-of-Life Recycling Rate"*, 2016, https://www.european-aluminium.eu/media/1644/recycled-content-vs-end-of-life-recycling-rate-may-2016.pdf

of virgin plastics. The price of virgin plastic materials, on the other hand, largely track those of oil and natural gas, since petrochemicals are important feedstocks for plastic production. Although primary commodities markets display a degree of inelasticity in supply responses (i.e. lags in increases or decreases in production as a response to changing prices), the responsiveness of supply to market prices is virtually non-existent in secondary materials markets, making the problem of inelasticity far worse. This is because the nature of the waste collection service is not such that it can be turned on or off, and it also reflects the fact that where recycling is concerned, there is little or no possibility of authorities requesting that participants stop, and then re-start, recycling when prices are low and high respectively. Large fluctuations in oil prices have therefore historically been responsible for volatility in virgin plastics prices, which have, at times, dipped below the point at which the recycling of plastics of a sufficient quality – and the associated price competitiveness of plastic recycled content – is economically viable. In recent years, falling oil prices have led to the cost of producing virgin plastic resin being much lower relative to that of recycled plastic resins. This has been exacerbated by the impacts of the COVID-19 pandemic, in which demand for oil fell to the extent that it was priced at a negative value in some instances.[330] Costs for producing recycled plastic resin simply do not have the flexibility to compete with virgin resin prices in such instances, and it is expected that it will be at least two years (i.e., 2022) before oil prices recover, and for recycled plastics to be in a more competitive position.[331]

Consumer Demand

Consumer demand for improvements in the environmental impacts of packaging has been growing, and given the direction of policy as set out in the Commission's Plastics Strategy and the more recent Circular Economy Action Plan, brands and producers are starting to respond accordingly. A recent study by WRAP demonstrated that 78% of British consumers "*said that they would feel more positive about a product or manufacturer whose packs contained recycled plastic*,"[332] whilst Veolia found that over half (57%) of the respondents surveyed in the UK believe that plastic bottles are already made from at least 50% recycled content. According to the European Consumer Packaging Perceptions Study, 75% of Europeans admit that the environmental impact of a product's packaging affects their purchasing decision,[333] although it does not specifically address recycled content. Publicising the use of recycled content in packaging used by large FMCG companies such as Coca-Cola[334] and Danone[335], however, suggests that the use of recycled content appeals to the consumer. With increasing awareness of the negative environmental impacts of not recycling, this suggests that consumers might be willing to embrace small increases in packaging costs to account for these impacts, which could partially mitigate the increase in costs associated with switching to recycled plastics in the current market.

Quality Risk Associated with Recycled Content Use

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[330] Stuab, Colin (2020) *Low virgin plastics pricing pinches recycling market further*, accessed 22 October 2020, https://resource-recycling.com/plastics/2020/05/06/low-virgin-plastics-pricing-pinches-recycling-market-further/

[331] *Ibid*

[332] WRAP (2007) *Using Recycled Content in Plastic Packaging: the Benefits*, https://www.wrap.org.uk/sites/files/wrap/Using%20recycled%20content%20in%20plastic%20packaging%20the%20benefits.pdf

[333] PROCARTON (2018) *European Consumer Packaging Perceptions Study*, 2018, https://www.procarton.com/wp-content/uploads/2018/10/European-Consumer-Packaging-Perceptions-study-October-2018.pdf

[334] The Coca Cola Company (2020) *Sustainable Packaging*, accessed 10 November 2020, https://www.coca-colacompany.com/sustainable-business/packaging-sustainability

[335] Danone (2019) *Circular economy model - Danone*, accessed 10 November 2020, https://www.danone.com/impact/planet/packaging-positive-circular-economy.html

Where virgin materials are readily available, not significantly more expensive than secondary materials, relatively cost-effective, and of guaranteed quality, incorporating recycled content into packaging materials can be considered somewhat risky. For some packaging materials, such as plastics and some paper applications, the perception that quality of packaging material produced from recycled content is poor is considered a key factor in the lack of demand in the sector. In meeting the required standards, a certain proportion of losses from the conversion process is expected. However, beyond a certain threshold, loss rates can make the process inefficient and economically unviable. There are therefore potential risks associated with loss rates from using recycled material in packaging for multiple players along the supply chain, including packaging converters and manufacturers/ brands.

For example, contamination is possible if recyclable materials are mixed with non-recyclable materials, potentially preventing an entire batch from being recycled. Undetected contamination could thus compromise the quality of the output. A small amount of PVC in a PET stream, for example, degrades recycled PET resin because PET is melted and processed at a higher temperature than PVC, producing harmful hydrochloric acid gas. This potential for contamination therefore impacts supply of materials of a sufficient quality, and is something which manufacturers using recycled content must be confident will not be affected. Furthermore, recyclate must be washed and cleaned to remove any contaminants such as grease or hazardous chemicals. In order to mitigate such risks, reprocessors often incur additional costs for decontamination, adding to the overall cost of recycled content. These costs are associated with extra mechanical technology (for sorting and cleaning), cleaning agents, energy, water consumption, and the subsequent treatment of contaminated wastewater. New cleaning technologies are emerging, however, that require less energy, water and chemicals to decontaminate homogenous batches, instead employing methods such as supercritical carbon dioxide (sc-CO_2) extraction, which uses carbon dioxide collected from industrial processes and keeps it in a closed-loop cycle to decontaminate plastics.[336] This process is more effective for decontamination of hazardous materials than washing and drying, and produces recycled plastics of a quality that is compliant with REACH regulations for both consumer products and children's articles. That being said, despite better quality output and lower processing costs, these emerging technologies come with high investment costs, which mean they have yet to take hold in the recycling market, and acting as a barrier to quality recycled content reaching the market.

Conversely, the use of virgin materials is more likely to guarantee quality of packaging and ensure that the contents are adequately protected. Virgin material is less likely to be contaminated than recycled content, and has gone through less processing, which degrades the material. Although recycled content can be used in the production of good-quality products, virgin material has a better guarantee and a broader range of uses than recycled content at present. In the case of cardboard packaging, although recycling rates and incorporation of recycled content is high, virgin material is often added to fortify fibres. Like plastic, recycled cardboard is a material that is prone to contamination, often with oil or grease from food which renders it unrecyclable. Additionally, material degrades after being reprocessed four to five times.

Information Failure

The potential for use of recycled content in different applications, and the associated perception of risk described above, is, in some cases, compounded by the lack of clear and accurate information regarding quality. Would-be users of recycled content may be risk-averse and might not be in possession of all the facts regarding the quality of, and hence the potential to make use of, recycled content. As a result, they may

[336] Alassali, A. et al. (2020) *Assessment of Supercritical CO2 Extraction as a Method for Plastic Waste Decontamination*, June 2020, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7362185/

also be unaware of the extent to which they could integrate recycled content into their production processes, or need to invest in costly sampling/ testing/ pre-processing strategies to mitigate against this risk. For some of the more complex and less mature materials recycling markets, notably plastics, there remains a role for credible provision of information to lubricate the demand for more recycled content. Wider use of standards would instil greater confidence in manufacturers and in some markets, there are already relatively well-accepted systems of grading for recycled content (e.g. paper). Such standards, whether industry-led or mandated, fall under the field of regulation, and will play an important role in incentivising the use of recycled content over virgin materials.

High Transaction and Search Costs

In some material markets, the suppliers of virgin materials are well known. Indeed, there may be global exchanges which allow for widespread trading of primary materials. Although there are some exchanges in which recycled content is traded, they are less well-known, and the companies involved may also be relatively poorly known.

The supply chain for recycled content is not as well established as for virgin materials, and costs are therefore incurred in buying or selling material. There must be significant cooperation and transparency between players to eliminate transaction costs, such as broker fees, which can affect buyers and sellers of recycled material. These transactions must be further underpinned by quality checks to ensure supply meets demand, further increasing overall costs. 'Search costs' are often grouped together with transaction costs, as would-be participants might not be known to each other, and therefore incurs the cost of trying to find either a buyer or seller of recycled material. These costs are likely to reduce if the market for recycled material is able to operate on an economy of scale, as for virgin materials.

Unreliable Supply of some Packaging Materials

The supply of recycled content of sufficient quality across all materials and packaging types cannot yet be guaranteed, reflecting – in part – the limitations of processes further up in the supply chain, in which materials are collected, sorted, and re-processed. Recycling rates have increased since 2006 at similar rates across all packaging types, but glass, paper and cardboard, and metallic packaging recycling rates are far greater than those for plastic and wooden packaging (see Table 13). Using 100% recycled content in metallic packaging is theoretically relatively straightforward compared to other packaging types, due to material purity and lack of degradation. These materials are more likely to be affected by issues of supply of recycled content, as opposed to quality. Paper and cardboard recycling, on the other hand, is susceptible to issues with quality, which can be for such reasons as oil contamination on food packaging, preventing some material from being recycled despite higher collection rates. Consistently high recycling rates ensure that there is a reliable supply of material, even with some level of contamination, reducing the risk that supply contracts might not be able to be fulfilled by providers of recycled content.

Recycling rates for plastic and wooden packaging, meanwhile, are lower than those of other packaging materials, limiting the availability of recycled packaging material for uptake, and accordingly the lower rates of recycled content in plastic and wooden packaging. Regarding wooden packaging in particular, the data shows fluctuations in recycling rates, although revisions to the targets and associated measurement method for recycling rates in the PPWD should ensure that the reuse and repair of wooden pallets and packaging, as well as the disposal of wood packaging will be included in the calculation of recycling rates more clearly in the future.

Lack of Investment in Research and Development

Firms are reluctant to invest in research and development in areas such as reprocessing technologies and market research, as there is a lack of confidence within the market that the demand for recycled content will be raised sufficiently to make such investments worthwhile. This is particularly true for plastic packaging, for which the quality that the market requires cannot be attained without these investments. Many leading companies involved in sorting technologies are based in Europe, and therefore the development of these technologies should be seen as an opportunity to stimulate innovation, research and investment in the EU. Without a guarantee of recouping profits, however, lack of innovation is hindering the plastics recycling market.

Despite reluctance from the market to invest in infrastructure for mechanical recycling, the European Commission is funding large-scale research projects in non-mechanical recycling technologies (which are mainly applicable to plastics), such as iCAREPLAST and PUReSmart. These projects investigating the potential for processes such as pyrolysis, where plastic is separated into its basic polymer, additives, and other substances, potentially enabling the removal of undesirable substances such as Substances of Very High Concern (SHVCs), as well as enabling greater circularity. Whilst these technologies are still emerging and are not yet widespread, their potential to work alongside mechanical recycling to improve availability and quality of recycled material is expected to encourage greater uptake of recycled content.

6.8.4.2. Regulatory Drivers

Recycling policy in the EU has historically been focused largely on supply, setting EU-wide targets for Member States that have helped to increase the amount of packaging waste collected for recycling. However, **an efficient recycling market that is able to maximise use of this recycled material to an extent that will sufficiently displace virgin resource extraction has yet to fully emerge**. Until recently, targets for the uptake of recycled content in packaging to stimulate demand have been lacking, alongside the framework of a measurement method and standards to make such targets feasible. For plastics in particular, market failures discussed above have meant that the use of virgin materials is not disincentivised to such an extent to favour recycled materials, although this is in contrast to some other packaging materials, such as corrugated paper, glass and steel, which already incorporate high levels of recycled content. For those packaging materials which have, until now, been less successful in incorporating recycled content, there is opportunity to develop regulation that can help to stimulate demand in the market across the EU.

Historic lack of recycled content measures in the EU's waste acquis

Until recently there has been a notable gap in European regulation addressing the incorporation of recycled content into new products. In particular, the Essential Requirements, although seeking to minimise the volume of weight of packaging that is used, do not refer to the use of recycled material, and any consideration of recycled content is consequently left out of the accompanying Standards. In neglecting recycled content, setting a very low bar to be classed as recyclable and allowing all plastics to be incinerated, the Essential Requirements and accompanying Standards neither stimulate the demand or supply of recycled material, and, at worst, undermine the whole purpose of the Commission's Circular Economy vision for the packaging sector. They are, therefore, inadequate in the broader policy landscape on recycled content.

Further regulatory gaps have been identified as not sufficiently disincentivising extraction of virgin materials in favour of secondary materials for packaging articles in which incorporation of recycled content

is particularly lacking. Considering that the motivation for uptake of recycled content is partly framed against the externalities associated with the extraction of virgin resources, there is an opportunity for regulation disincentivising the extraction of these materials in the form of taxes, tradeable credits or fee-rebate schemes. Whilst the externalities, as described in Section 6.8.1, could be addressed through regulation to ensure the cost for abatement is included across all material extraction, for those materials for which recycled content uptake is already high, it is likely to increase the overall cost of these types of packaging where the recycling market for these materials is already operating efficiently, due to lower potential for increasing the proportion of recycled content used.

Recognising these gaps, more recently, Article 8 of the revised WFD states that "*Member States may take appropriate measures to encourage the design of products*"... "*that contain recycled materials*", mirrored by Article 4 in the PPWD, stating that "*Member States shall, where appropriate, encourage the use of materials obtained from recycled packaging waste for the manufacturing of packaging and other products by: (a) improving market conditions for such materials; (b) reviewing existing regulations preventing the use of those materials*". The SUP Directive subsequently introduced targets for minimum 25% recycled content for single-use PET beverage containers by 2025, and 30% recycled content in all plastic beverage bottles by 2030. In the future, further targets for recycled content can be expected, as set out in the new CEAP, which states that the "*Commission will propose mandatory requirements for recycled content and waste reduction measures for key products such as packaging, construction materials and vehicles, also taking into account the activities of the Circular Plastics Alliance*".

Whilst considered appropriate for certain plastics, where inclusion of recycled content is particularly low, it is noted that there is concern that minimum requirements for other materials or packaging applications would not be effective. The aluminium industry, for example, for which there is insufficient supply of recycled material to meet demand, notes that setting minimum standards for specific products could "simply take recycled aluminium from other products without a minimum threshold."[337] For different plastic products, minimum targets need to consider the circularity of different types of plastic, being careful to avoid the potentially adverse effect of producing low-quality packaging materials which are more difficult to recycle (i.e., down-cycling). Regulation must therefore be appropriately tailored to different packaging materials, as well as considering how the market will respond; including meeting the demand for all recycled materials through improvements in collection, sorting and reprocessing to ensure the quality and quantity in supply.

Legal Restrictions on Recycled Content Use in Packaging (particularly for plastics)

Another consideration is the legal restrictions that can affect the use of recycled content, particularly in packaging used for food, cosmetics and toys. Materials used for food packaging, for example, are subject to strict regulation that prevents the contamination of food items with harmful substances. Food safety regulations limit the possibilities to include secondary material and there is a limited supply of food-grade material due to the nature of the existing sorting systems. It has been suggested that more clarity in the European Union rules under food contact legislation on functional barriers would help. Whilst using recycled content is common in food packaging, it is more difficult to reach the standards required of plastic packaging than it is with other materials such as glass and paper. According to Article 4c of Commission Regulation (EC) No 282/2008:

[337] Michalopoulou, S. (2019) *Aluminium Windows Contribute to the Circular Economy*, 2019, https://www.european-aluminium.eu/media/2687/aluminium-windows-contribute-to-the-circular-economy_march_2019.pdf

- *either the plastic input must originate from a product loop which is in a closed and controlled chain ensuring that only materials and articles which have been intended for food contact are used and any contamination can be ruled out; or*

- *it must be demonstrated in a challenge test, or by other appropriate scientific evidence that the process is able to reduce any contamination of the plastic input to a concentration that does not pose a risk to human health.*

Manufacturers therefore require certainty that recycled content in plastic food and drink packaging is free of contamination, but there are risks associated with using recycled content. This could be due to contamination in the recyclate, and therefore could discourage manufacturers from using recycled content in their products, with the exception of PET packaging. It may also be that industry standards need to be reviewed to allow more scope for recycled content. The new Circular Economy Action Plan recognises this need, suggesting that, on the one hand that *"EU companies should benefit from a robust and integrated single market for secondary raw materials and by-products. This requires deeper cooperation across value chains, as in the case of the Circular Plastics Alliance"*, and, on the other, that the *"Commission will consider legal requirements to boost the market of secondary raw materials with mandatory recycled content (for instance for packaging, vehicles, construction materials and batteries). Commission will also establish rules for the safe recycling into food contact materials of plastic materials other than PET"*. An evaluation of, and subsequent revisions to the food contact regulations are, at the time of writing, ongoing.

It is noted that whilst EU food contact legislation exists for plastics, there is no such harmonised legislation for packaging for other packaging materials used in food contact applications, such as paper, cardboard and glass, with regulations instead enforced at Member State level.[338] Despite no legislation, Framework Regulation (EC) No 1935/2004 sets out the general requirements for food contact materials as follows:

Materials and articles, including active and intelligent materials and articles, shall be manufactured in compliance with good manufacturing practice so that, under normal or foreseeable conditions of use, they do not transfer their constituents to food in quantities which could:

(a) endanger human health; or

(b) bring about an unacceptable change in the composition of the food; or

(c) bring about a deterioration in the organoleptic characteristics thereof.

Therefore, although there is no harmonised legislation for non-plastic food-contact packaging materials, similar principles apply that mitigate the risk of potentially harmful substances, although to a less prescriptive extent. Recognising the potential issues that might be raised from some other food-contact packaging materials, some Member States are known to have put in place their own legislation. Belgium and the Netherlands, for example, have set a total migration limit for regulated substances commonly found in recycled paper and board fibres, whereas restrictions for the total dry residue in hot and/or cold-water extracts for paper and fibres have been set by others, including Czech Republic, Germany, France and Slovakia. The only legislation requiring producers to declare compliance with migration levels from

[338] FoodDrinkEurope (2016) *FoodDrinkEurope Guidelines on the safe use of paper and board made from recycled fibres for food contact use*, 2016, https://www.fooddrinkeurope.eu/uploads/publications_documents/FoodDrinkEurope_Guidelines_safe_use_of_paper_and_board_made_from_recycled_fibres.pdf

paper/board fibres is in Italy.[339] For glass packaging, whilst generally considered safe to recycle, there is also a risk that contamination through the recycling process can lead to potentially harmful substances in recycled material. Regulations that apply to glass packaging are generally in line with the regulations that apply to ceramics. Member States regulate substances used for treatment of the external surfaces of glass, particularly lead and cadmium, as well as other metals,[340] that are often present in glass light bulbs, and which can contaminate recycling.

Whilst regulations for other packaging materials are not as stringent as those for plastics recycling (potentially allowing industry to make greater use of recycled materials), where there is a lack of harmonised legislation, such divergence between Member States could affect confidence among manufacturers as to whether recycled materials can be effectively used in packaging without risking contamination of food or drink contents. Furthermore, where packaging is used across multiple Member States, it would have to comply with the strictest regulations, potentially discouraging industry from using recycled paper/board fibres or glass if it does not comply.

Lack of Standards for Measurement/ Quality of Recycled Content

The packaging market is not well-supplied with accurate and clear information regarding the quality of recycled content, and the potential for its use. For some of the more complex and less mature markets, notably plastics, there remains a role for credible provision of information to lubricate the demand for more recycled content. The European committee for Standardization (CEN) states that: "*at present there are no reliable technologies for an analytical determination of the recycled content in a material or product*." To tackle this, a CEN Standard which sets out a mandatory process to be followed to assess the potential to include recycled content could provide manufacturers with greater confidence to include these materials in their products. However, clear standards of a regulatory nature are not always easy to develop. For example, an attempt was made to define an 'end-of-waste' standard for plastics at the European level, but this proved to be extremely challenging.

Mandated standards for traceability of recycled content would help to guarantee that materials are safe for use in food contact packaging, by certifying that there are no harmful substances present in the recycled content used. There are points in the supply chain in which the recycled content of material is known to a relatively high degree of accuracy, but at present this is not tracked. Traceability of the input material will play a key role as it will enable an accurate tracking of the source and characteristic of incoming material, as well as minimising fraud along the value chain.

For many materials, once they have been prepared to be manufactured into a product (e.g. plastic flakes, metal sheets), distinguishing the proportion of the material derived from recycled materials, or primary ones, becomes difficult, if not impossible. At present, however, there is no agreed point at which to measure recycled content in new products, whether this might be at the point when recyclate has first been transformed to be used in the manufacture of a new product, or whether at the point it *becomes* a new product.

[339] Joint Research Centre. (2016) *Non-Harmonised Food Contact Materials in the EU: Regulatory and Market Situation, Baseline Study: Final Report.*, Report for LU, 2016, https://data.europa.eu/doi/10.2788/234276
[340] ibid.

6.8.5. Problem evolution

To some extent, **the EU has already sought to stimulate the market for recycled content through policy**. For example, Article 8 of the WFD states that "Member States may take appropriate measures to encourage the design of products"... "that contain recycled materials". This, **however, does not require Member States to take any action**, and therefore it is reasonable to assume that its future impact on the uptake of recycled content will continue to be minimal.

More directly, the Single Use Plastic Directive (SUP Directive) includes a target of 25% recycled content for PET beverage containers by 2025, and 30% for all beverage bottles by 2030. The vast majority of beverage containers are made from PET, meaning the 30% target can be met through increasing recycled content in PET bottles alone. This target is therefore unlikely to stimulate the development of recycling markets outside of rPET (e.g. rHDPE), for which the market is already relatively well-developed compared to some other plastics. Another factor to be aware of is that recycled content targets set for specific packaging types, such as PET bottles, may have the effect of simply diverting recycled material from one application to another, rather than stimulating an overall increase in the uptake of recycled content across all PET packaging. This is an argument put forward by the EAFA in the context of recycled content targets for aluminium packaging. The EAFA suggests that the aluminium recycled content market is supply constrained, but that there are already sufficient economic drivers in place to ensure aluminium is recycled. It argues that *"calling for high aluminium recycled content in specific applications"* will not stimulate further aluminium recycling and instead would just divert recycled aluminium from one application to another.[341]

The SUP Directive also includes a target to collect 77% of single use plastic bottles by 2025, and 90% by 2029. In response, several Member States are at varying stages of planning and implementing a DRS for beverage containers (Malta, Poland, Portugal, Romania, Slovakia, and the UK[342]). Though the main aim of a DRS is to boost collection rates for single use plastic bottles, such systems also provide a clean and consistent stream of food-grade rPET. There is some evidence to suggest that the current supply of rPET is insufficient to support high levels of recycled content[343], and therefore any additional supply of rPET is likely to be beneficial in terms of boosting recycled content uptake in PET packaging. However, there are also number of demand side drivers which limit uptake of rPET (see Section 6.8.4). Therefore, it is reasonable to conclude that improving the supply of rPET alone will not be sufficient to significantly increase recycled content uptake across plastic packaging.

Finally, the EU has confirmed that non-recycled plastic packaging waste will form the basis of a new Member State budgetary contribution from 1 January 2021. This is set at a rate of EUR0.80 per kg of non-recycled plastic packaging, introduced alongside a mechanism to prevent regressionary impacts. It is unclear whether, or how Member States will use this to incentivise the plastic packaging industry to ensure plastic packaging is recyclable and incorporates recycled content (e.g. by passing on the burden of the contribution

[341] European Aluminium Foil Association (2019) Aluminium Foil and Recycled Content - Explanatory Note
[342] The UK withdrew from the European Union on 31st January 2020
[343] Victory, M. *Europe R-PET content targets unrealistic*, accessed 20 October 2020, https://www.icis.com/explore/resources/news/2019/01/31/10313630/europe-r-pet-content-targets-unrealistic

via a tax on packaging producers using virgin materials). In the best-case scenario, the mechanism does have the potential to drive a price wedge between virgin plastic for packaging and recycled plastic, thereby making the latter more competitive, and potentially encouraging its uptake. Equally, however, given the current price difference between virgin PET and rPET, the cost of using virgin plastic ***and*** paying the tax may still be less than using rPET. For example, in March 2020, the spread between food grade rPET and virgin PET was EUR 650/tonne (>EUR 450/tonne tax).[344] Therefore, the EU level tax on non-recycled plastics may not stimulate the uptake of recycled content because a) individual Member States may choose not to pass the burden onto industry, and b) even if Member States do introduce a tax for industry it may not be a strong enough economic driver to disincentivise the use of virgin plastic. Additionally, in the absence of supply-side stimulus to the market, a tax on virgin plastic could simply serve to increase demand and competition for limited materials, thereby driving up the price for materials without any real market impact in terms of material use.

Additionally to these more prescriptive measures, in its Plastics Strategy the European Commission called on industry to submit voluntary pledges to ensure that by 2025 10 million tonnes of recycled plastics are used in new products (compared to <4 million tonnes in 2016).[345] In order to facilitate this, the Commission launched the Circular Plastics Alliance in December 2018. Other voluntary initiatives include the European Plastics Pact, a public-private coalition of companies, organisations and governments focused on solving issues around single use plastics products and packaging. A key objective of the pact is to increase the use of recycled plastics in new products and packaging by 2025, with plastics user companies achieving an average of at least 30% recycled plastics (by weight) in their plastic products and packaging. As of September 2021, there were 149 signatories from 21 countries in Europe.[346]

Further analysis would be required to estimate the proportion of packaging that is placed on the European Market by a company that has made a voluntary pledge, but most major FMCG companies have made some sort of commitment, for example:

1. Coca-Cola: 50% recycled content in all packaging by 2030 (western European business has pledged to meet this target by 2025).[347]
2. Colgate-Palmolive: 50% recycled content across all packaging in 2020 and 25% recycled content in plastic packaging by 2025.[348]
3. Danone: average of 25% recycled material for all its plastic packaging by 2025. Average of 50% recycled material for water and beverage bottles.[349]
4. Pepsico: 25% of recycled content in global plastic packaging by 2025 and 30% rPET in bottles[350]

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[344] Tudball, M. *Italy's postponed virgin plastic tax to be implemented in January 2021*, accessed 20 October 2020, https://www.icis.com/explore/resources/news/2020/05/15/10508256/italy-s-postponed-virgin-plastic-tax-to-be-implemented-in-january-2021

[345] European Commission (2018) *A European Strategy for Plastics in a Circular Economy*, January 2018, http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1516265440535&uri=COM:2018:28:FIN

[346] *European Plastics Pact*, accessed 8 October 2021, https://europeanplasticspact.org/

[347] Ellen MacArthur Foundation (2019) *New Plastics Economy Global Commitment: June 2019 Report*, 2019, https://www.ellenmacarthurfoundation.org/assets/downloads/GC-Report-June19.pdf

[348] ibid.

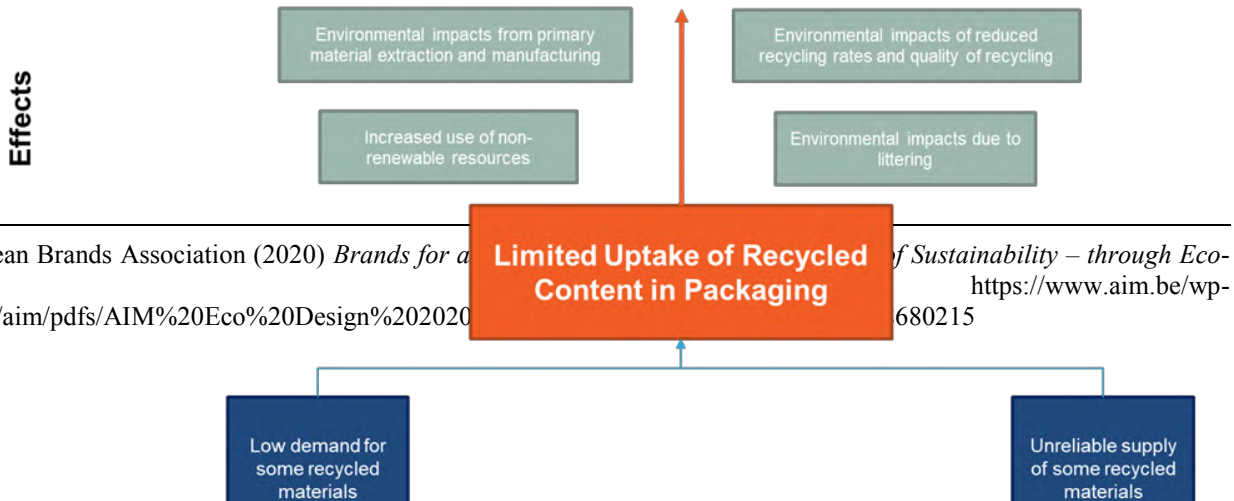
[349] ibid.

It remains to be seen whether global brands will adhere to the goals they have set themselves (whether they do or not is likely to be linked to the economics of doing so).

Finally, in the future, new technologies such as chemical recycling may enable plastic packaging that is currently difficult to recycle mechanically (e.g. multi-layer, contaminated) to be recycled, increasing the supply of secondary material (albeit in the form of monomers) for uptake in packaging, overcoming the quality/ health and safety issues currently associated with mechanically recycled secondary plastics. Concerning packaging materials other than plastics, the development of blockchain technology to enable the tracking and tracing of recycled content in products may provide a solution to the issues associated with verifying recycled content claims made by producers. Digital watermarking, chemical marking and other tracking and tracing technologies may allow not only better identification and sorting of packaging materials to improve the quality of secondary materials available, but may also support improved consumer awareness of the environmental claims made by packaging producers. However, the commercial viability and success of these technologies are still uncertain and unreliable.

In summary, though the European Commission has introduced legislation specifically related to recycled content in packaging (i.e. the SUP beverage container targets), it is unlikely to stimulate an increase in recycled content uptake across packaging beyond PET bottles. It is also important to note that all legislation related to recycled content focuses on plastics. This is unsurprising given the low levels of current uptake in plastic packaging (see Section 6.8.4.1) and the attention that the environmental impacts of plastic packaging has received in recent years. However, it does mean that there is a clear absence of legislative drivers to increase the uptake of recycled content in non-plastic packaging materials, as well as in non-PET plastic packaging applications. In addition, the lack of sufficient economic incentives and persistence of market failures to increase uptake of recycled materials relative to virgin materials in packaging suggests that there is a role for further intervention to correct the market failures.

6.8.6. Problem Tree



[350] AIM European Brands Association (2020) *Brands for a* *f Sustainability – through Eco-Design* https://www.aim.be/wp-content/themes/aim/pdfs/AIM%20Eco%20Design%202020 680215

The CEAP states that:[351]

> *To increase uptake of recycled plastics and contribute to the more sustainable use of plastics, the Commission will propose mandatory requirements for recycled content and waste reduction measures for key products such as packaging, construction materials and vehicles, also taking into account the activities of the Circular Plastics Alliance.*

The CEAP also notes that the Commission will, for the first time, develop rules on measuring recycled content in products.

The environmental impacts associated with the extraction of virgin materials is much greater than those associated with using secondary materials. Therefore, ensuring that production processes make greater use of recycled materials (with a lower embodied energy content than virgin material) will support efforts to reduce emissions of GHGs. Switching to recycled steel, for example, has been shown to reduce the impact on climate change by around 80%, whilst CO_2 reductions for aluminium and PET from using recycled rather than virgin content are around 95% and 85%, respectively[352].

Rates of uptake of recycled content in packaging vary significantly across different materials. Broader categories of paper and cardboard, aluminium, steel, and glass generally show higher levels of uptake than for plastics. Within these categories, however, rates of uptake vary further still depending on the packaging application; in the paper and cardboard category, for example, the average level of recycled content in corrugated cardboard is 89%, whilst for beverage cartons it is 0%. Table 14 provides a comparison of recycling rates and recycled content by packaging materials. However, it is important to note that there is **no standardised approach to measuring recycled content in packaging**, nor any agreed definition as to what can be counted. The uptake of recycled content in packaging is therefore framed by a considerable lack of data.

Table 14. Comparison of Recycling Rate and Recycled Content by Packaging Material (Europe)

Packaging Material	Application	Recycling Rate - 2017	Average Recycled Content
Metals	**All metal packaging**	79.2% (Eurostat)	-

[351] European Commission (2020) A new Circular Economy Action Plan for a Cleaner and more Competitive Europe, COM(2020) 98, 11th March 2020, available at https://eur-lex.europa.eu/resource.html?uri=cellar:9903b325-6388-11ea-b735-01aa75ed71a1.0017.02/DOC_1&format=PDF

[352] European Commission (2020) *Effectiveness of the essential requirements for packaging and packaging waste and proposals for reinforcement : final report and appendices.*, accessed 16 September 2020, http://op.europa.eu/en/publication-detail/-/publication/05a3dace-8378-11ea-bf12-01aa75ed71a1

Packaging Material	Application	Recycling Rate - 2017	Average Recycled Content
	Steel packaging	80.5% (APEAL)	58% (APEAL)
	Aluminium packaging	Aluminium cans: 74.5% (European Aluminium)	*No data*
Paper/	**All paper and cardboard packaging**	84.6% (Eurostat)	-
Cardboard	Corrugated Cardboard	-	89% (FEFCO)
	Carton board		50% (CEPI)
Glass	**All glass packaging**	74.7% (Eurostat)	55.5% (average of all colours, FEVE)
	All plastic packaging	41.9% (Eurostat)	-
Plastic	PET	56.3% (Petcore)	*No data*
	PET beverage bottle	58.2% (EPBP)	11.7% (EuPC)

At the moment materials are not being recycled to a quality that allows them to be recycled back into packaging, exacerbated by a lack of quality standards (particularly for recycled plastics). For example, PET bottles make up the majority of the input into Europe's PET reprocessing facilities, but less than a fifth of

PET is used to manufacture new bottles; most PET is used in other applications such as trays and sheets, fibre and strapping[353].

Accordingly, for producers there is a **quality risk** associated with the use of recycled content. Where virgin materials are readily available, not significantly more expensive than secondary materials, relatively cost-effective, and of guaranteed quality, incorporating recycled content into packaging materials can be considered somewhat risky. For some packaging materials, such as plastics and some paper applications, the perception that quality of packaging material produced from recycled content is poor is considered a key factor in the lack of demand in the sector.

In addition to this quality risk, the relative environmental impacts associated with the production of virgin materials and secondary materials are not reflected in the market prices of those materials, thus **external costs are not incorporated into the price paid by producers**.

The potential for use of recycled content in different applications, and the associated perception of risk described above, is, in some cases, compounded by the lack of clear and accurate information regarding quality. Would-be users of recycled content may be risk-averse and might not be in possession of all the facts regarding the quality of, and hence the potential to make use of, recycled content. As a result, due to this **information failure** they may also be unaware of the extent to which they could integrate recycled content into their production processes, or need to invest in costly sampling/ testing/ pre-processing strategies to mitigate against this risk.

In some material markets, the suppliers of virgin materials are well known. Indeed, there may be global exchanges which allow for widespread trading of primary materials. Although there are some exchanges in which recycled content is traded, they are less well-known, and the companies involved may also be relatively poorly known. This means that there are **high transaction and search costs** for producers seeking to incorporate recycled content.

6.9. What are the problem drivers?

At the root of the issues described above are two key problem drivers, market failures and regulatory failures.

The first problem driver is **market failure**, i.e. where markets fail to deliver an efficient outcome from a societal perspective. In respect of packaging, market failure takes a number of forms:

1. **Externalities** – where market prices do not internalise the full costs to society associated with an activity – for example the relative environmental impacts of virgin and recycled content are not internalised in the costs faced by producers of packaging, meaning that overall levels of consumption

[353] EFBW, Petcore Europe and Plastics Recyclers Europe (2020) *PET Market in Europe - State of Play: Production, Collection and Recycling Data*, 2020

of packaging are higher than they otherwise would be, with lower levels of use of recycled content than would be optimal from a societal perspective;

2. **Split markets** – whereby a misalignment of incentives exists, meaning that socially desirable actions are not undertaken because market actors have different objectives that are not aligned. To date this has been an issue in that producers have not been faced with the full costs of end-of-life management of their packaging. Under Article 8a of the revised Waste Framework Directive the general minimum requirements for extended producer responsibility schemes should go some way towards addressing this, albeit the way in which Member States seek to implement these requirements will not necessarily provide consistent incentives to producers;

3. **Imperfect information** – information is needed for markets to operate efficiently, and where market information is imperfect, or not equally available to all market participants, sub-optimal decisions can lead to sub-optimal societal outcomes. One area where this applies is the lack of clear and accurate information for producers on the quality of recycled content available to them. More broadly, regulators do not yet have adequate information about the nature of packaging placed on the market that would enable them to make better informed regulatory decisions in respect of what might be considered to be 'excessive' packaging, or where further restrictions on hazardous substances might be required.

The second problem driver is **regulatory failure**, i.e. where intervention by public authorities fails to achieve an efficient allocation of resources. This can be due to poor design, poor implementation and /or enforcement, and/or simply becoming out of date. In the case of the Essential Requirements it is clear that they:

Fail to reflect the waste hierarchy, as there is not sufficient recognition that reuse takes precedence over recovery, or that recycling is preferable to energy recovery; and

Are unenforceable in practice, as their formulation is too imprecise for Member States to enforce them – a situation compounded by the lack of requirements on producers to report on conformity.

As a consequence, there is very little enforcement activity in the Member States and surveys suggest that the Essential Requirements have had little influence on packaging design. The Essential Requirements Scoping Study noted that:[354]

> *"There is little guidance for producers, fillers and regulators as to what constitutes the 'minimum adequate amount' and the evaluation of the Essential Requirements concluded that the inherent subjectivity inhibits compliance and enforcement".*

[354] Eunomia, "Effectiveness of the Essential Requirements for Packaging and Packaging Waste and proposals for reinforcement", February 2020, p.82.

The 2014 Fitness Check[355] also noted the difficulty in enforcement:

> *"[The Essential Requirements] are formulated in a very general manner and judged as difficult to implement. Implementation measures are scarce and guidance given to industry is mostly lacking."*

6.10. Summary of consequences

The problems described above lead to three main groups of consequences, as set out in the problem tree. These inter-connected consequences **impede the move towards a circular economy**, generating **negative social and environmental impacts**, and **threaten the integrity of the EU internal market**.

Circular Economy. The heightened demand for packaging, combined with low recyclability and low levels of recycled content would mean increased use of a range of non-renewable resources. This would require the continued extraction and use of high levels of virgin resources, with the extraction processes being associated with a number of significant negative environmental impacts including localised impacts on biodiversity, air and water quality, and in respect of greenhouse gas emissions.

Social and environmental impacts. Increased generation of packaging waste within the EU, particularly where it is not readily recyclable, poses challenges to Member States in terms of waste management, and will lead to higher levels of landfilling and (increasingly) incineration than would otherwise be the case. This threatens union objectives in respect of achieving climate neutrality by 2050, and along with objectives to reduce pollution to air and water as well as commitment to tackle the pressures that contribute to the decline of biodiversity. Hazardous substances within packaging may compound the air pollution issue during end of life management, but may also have negative impacts during the use phase, albeit the understanding of this is as yet incomplete.

The increased incidence of litter from packaging, often from on-the-go consumption, is expensive to clean up, and has been shown to have severe consequences in terms of the way citizens feel about their local environment. In addition, plastic packaging can have specific impacts on ecosystems, including on marine life.[356]

Packaging waste is a notable soil and land pollutant[357]. Soils are a globally important reservoir for biodiversity, hosting at least one quarter of all living organisms on the planet.[358] Soil provides a variety of functions and services supporting life on the planet. However, the ability of soils to provide these services is highly dependent on their biodiversity. Soils biota has its own unique capacity to recover form change and is considered a key attribute of biodiversity. Soils with a higher biodiversity are thought to have an innate resistance and resilience to change. A loss in this biodiversity can lead to soil with resistance and a reduced capacity to recover.

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[355] SWD(2014) 209 final, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014SC0209&from=EN

[356] ICF and Eunomia Research & Consulting (2018) *Plastics: Reuse, recycling and marine litter – Impact assessment of measures to reduce litter from single use plastics*, Report for DG Environment, 2018, http://ec.europa.eu/environment/waste/pdf/Study_sups.pdf

[357] Ncube LK, Ude AU, Ogunmuyiwa EN, Zulkifli R, Beas IN. *Environmental Impact of Food Packaging Materials: A Review of Contemporary Development from Conventional Plastics to Polylactic Acid Based Materials*. Materials. 2020; 13(21)

[358] Tibbett M, Fraser TD, Duddigan S. 2020. *Identifying potential threats to soil biodiversity*.

Packaging sent to landfills, especially when made from plastics, does not degrade quickly or, in some cases, at all, and chemicals from the packaging materials, including inks and dyes from labelling, **can leach into groundwater and soil**[359]. Chemicals can affect soil organisms directly, with toxic effects on their reproductive ability and survival, or indirectly, by contaminating their food supply or habitat. Their effects may be short lived or long term and impact some, or all soil organisms.[360] Pollution is likely to affect and potentially threaten soil biodiversity and functioning of the entire soil community. Some of these changes may turn out to be irreversible or associated with efforts and costs to maintain soil biodiversity and ecosystem functioning[361].

EU internal market. Lack of coordination in the regulatory efforts presents an importance risk of regulatory divergence, which could result in a **sub-optimal functioning of the EU internal market** as individual Member States seek to take action unilaterally. This has been mentioned in previous sections but some notable examples include:

The vague nature of the Essential Requirements could potentially mean they pose a barrier to the functioning of the internal market, as interpretations could differ between Member States.

With regards to food-contact material, Belgium and the Netherlands have set a total migration limit for regulated substances commonly found in recycled paper and board fibres, whereas restrictions for the total dry residue in hot and/or cold-water extracts for paper and fibres have been set by others, including Czech Republic, Germany, France and Slovakia. The only legislation requiring producers to declare compliance with migration levels from paper/board fibres is in Italy[362].

With regards to the consideration of 'waste', Germany is the only country which does not treat industrial packaging as waste when it is sent to reconditioning;

Different labelling requirements, with a most notorious example of the Green Dot being penalised in France and at the same time being mandated in other countries (e.g. Spain)[363].

This presents **challenges to the free circulations of packaged goods** – what is valid in one Member States may not be valid in another, and it results in additional costs for producers to have to adapt to divergent legislations. Stakeholders from the industry have stressed the downside of the current situations and additional risks in the absence of intervention (see Appendix G of the Supporting study – Stakeholder Synopsis Report).

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[359] US Environmental Protection Agency. "Getting Up to Speed: Ground Water Contamination." EPA, August 2015. Retrieved March 7, 2019

[360] ENV-09-038_soil-biodiversity-brochure-EN.indd (europa.eu)

[361] Stefan Geisen, Diana H. Wall, Wim H. van der Putten, Challenges and Opportunities for Soil Biodiversity in the Anthropocene, Current Biology, Volume 29, Issue 19, 2019

[362] Joint Research Centre. (2016) *Non-Harmonised Food Contact Materials in the EU: Regulatory and Market Situation, Baseline Study: Final Report.*, Report for LU, 2016, https://data.europa.eu/doi/10.2788/234276

[363] https://www.europen-packaging.eu/news/no-rest-for-the-eu-single-market-frances-green-dot-case/

Furthermore, while it doesn't threaten the integrity of the internal market, differences in the criteria used for fee modulation in EPR schemes can reduce the effectiveness and efficiency of efforts to improve the design of packaging.

6.11. How will the problem evolve?

Packaging waste generation in the EU is at its highest level ever. Projected figures (see section 5 Baseline) suggest that this problem will increase further as both population and GDP continue to grow. This will likely translate to greater consumption of goods and therefore additional generation of packaging waste across the EU. Although legislation and initiatives aiming to combat this increase have been introduced at both EU and Member State level, there are areas of the packaging lifecycle that remain insufficiently addressed. **Without revision of the Packaging and Packaging Waste Directive, the scale and complexity of the problem will continue to grow.**

The problems addressed within the review of the Packaging and Packaging Waste Directive can be largely split into three:

1. High and growing levels of packaging waste;
2. Low levels of packaging recyclability; and
3. Low levels of uptake of recycled content

Although inherently interlinked, the evolution of these problems should be considered distinct and have therefore been addressed here as such.

High and growing levels of packaging waste includes both overpackaging and instances where alternatives to single use packaging could be implemented but currently are not. It is widely recognised that there are instances of packaging which are heavier and larger than necessary. Evidence suggests that the use of excessive packaging is not simply a function of safety. In some applications (for example, wine bottles), thicker and heavier packaging is perceived to be indicative of a higher quality product. In others (for example, children's toys), packaging size is driven by the desire to occupy maximum shelf space to increase the likelihood of a sale. While these perceptions remain, in the absence of regulatory intervention, problems associated with intentional overpackaging are unlikely to change. While requirements for increased cost coverage under EPR for packaging (required under Article 8a of the Waste Framework Directive) will mean greater attention is paid by producers to reducing the amount of packaging used, this effect is likely to be strongest where, all else being equal, the cost of the packaging is high relative to the value of the product. By contrast, where the value of the *product* is high relative to the cost of the packaging, and especially where the appearance of the packaging is important to the marketing the product, the incentive provided by EPR alone to reduce packaging will be weaker.

Some recent signals suggest the decline in reusable primary packaging may be slowing in some areas and for some consumer applications, so there is significant opportunity in this sector to build upon a rise in consumer awareness. However, without widespread education and supporting policy, these small shifts are unlikely to have anything but minimal effect.

Overall, the anticipated continued GDP growth in the EU will - to the extent that this is translated in a higher goods consumption - add further to the generation of packaging waste.

Low levels of packaging recyclability. Over the past decade, the amount of difficult to recycle packaging has increased at a greater rate than the total packaging waste. New packaging formats and complex combinations of materials are introduced at such a rate that local recycling infrastructure is unable to adapt to meet demands. This trend is likely to continue unless action is taken. Increased cost coverage under EPR for packaging, as well as modulation of fees (as required under Article 8a of the Waste Framework Directive) may well mean greater attention is paid by producers to the recyclability of packaging used. This will, however, depend upon the extent to which Member States focus on incentivising recyclability through fee modulation, and whether they do so in a way that applies harmonised criteria. However, even in the case where there is full harmonisation of criteria to incentivise recyclability, the effect will likely be strongest where the cost of the packaging is high relative to the value of the product, and weakest where the value of the *product* is high relative to the cost of the packaging, and especially where the appearance of the packaging is important to the marketing the product.

Additionally, as compostable plastics grow in popularity and reach end of life, we can expect an increase in contamination of both organic waste streams and recyclable plastic streams leading, in turn, to a reduction in the quality and quantity of recycled materials. The latter, in particular, would support increased accuracy in the identification and subsequent separation of compostables in the plastic packaging stream, or vice versa, allowing for their removal in a more efficient manner to prevent contamination.

In addition, without correct labelling of, and education around, these materials, this increased use will cause more disruption to supply chains, further limiting packaging circularity.

Various regulatory and industry-led initiatives have been launched to address issues relating to labelling more broadly, including the Commission's Green Claims initiative. However, it is noted that while the green claims initiative may prevent "greenwashing" (inaccurate claims regarding a packaging item's environmental credentials), it will not necessarily tackle the proliferation of inconsistent/ unclear labelling and the underlying lack of consistent collections for recycling. In addition, the scope of the revised EPR requirements, including the modulation of fees on the basis of whether packaging is recyclable or not has potential to address this issue but to what extend is currently unclear. Industry action via the Circular Plastics Alliance (CPA) committed to a number of actions including the development, update and revisions of design for recycling guidelines for all plastic products, the contribution to the work of CEN and industry on recyclability and other related standards, and the uptake of recycled material. These initiatives are likely to have some impact in terms of removing some forms of packaging that inhibits recycling from the market and reducing the cost burden associated with sorting, cleaning and decontamination.

Some improvements in labelling have already been seen. The use of QR codes to allow consumers to access additional information, and the development of smart technologies like digital watermarking may suggest the potential for further improvements in the streamlining of packaging labelling more widely.

However, the objectives of the proposed revisions to the PPWD and Essential Requirements to make all packaging placed on the market recyclable or reusable by 2030 would, in principle, eliminate the confusion regarding packaging recyclability.

Until the adoption of the SUPD, there have been no targets designed to stimulate the **uptake of recycled materials in packaging** and as such, demand for recyclate has been low, particularly for plastics.

In its Plastics Strategy the European Commission called on industry to submit voluntary pledges to ensure that by 2025 10 million tonnes of recycled plastics are used in new products (compared to <4 million tonnes in 2016). In order to facilitate this, the Commission launched the Circular Plastics Alliance in December 2018. Other voluntary initiatives include the European Plastics Pact, a public-private coalition of companies, organisations and governments focused on solving issues around single use plastics products and packaging. A key objective of the pact is to increase the use of recycled plastics in new products and packaging by 2025, with plastics user companies achieving an average of at least 30% recycled plastics (by weight) in their product and packaging range. As of September 2021, there were 149 signatories from 21 countries in Europe. It remains to be seen whether global brands will adhere to the goals they have set themselves (whether they do or not is likely to be linked to the economics of doing so).

Finally, in the future, new technologies such as chemical recycling may enable plastic packaging that is currently difficult to recycle mechanically (e.g. multi-layer, contaminated) to be recycled, increasing the supply of secondary material (albeit in the form of monomers) for uptake in packaging, overcoming the quality/ health and safety issues currently associated with mechanically recycled secondary plastics. The development of blockchain technology to enable the tracking and tracing of recycled content in products may provide a solution to the issues associated with verifying recycled content claims made by producers. Digital watermarking, chemical marking and other tracking and tracing technologies may allow not only better identification and sorting of packaging materials to improve the quality of secondary materials available, but may also support improved consumer awareness of the environmental claims made by packaging producers. However, the commercial viability and success of these technologies are still uncertain and unreliable.

6.12. Who is affected and how?

This section describes who affects, or is affected by, the problems outlined above. A selection of the key stakeholders has been outlined below alongside a top-level overview of how they are affected by the described problems.

1 **Society and the general public.** Packaging and packaging waste represent a huge potential burden to society if issues associated with their manufacture, use, and disposal are not sufficiently addressed. Potential adverse impacts include, but are not limited to, environmental pollution, depletion of finite resources, unnecessary emissions, economic loss, and damage to public health.

2 **EU consumers**. EU consumers lack access to clear, harmonised, and reliable information concerning packaging. This lack of information prevents them from making well-informed decisions regarding the most appropriate packaging options for a particular product they are looking to purchase. It also reduces the likelihood of consumers effectively and consistently engaging in the correct end-of-life strategy for the packaging waste they generate.

3 **Brands.** Brands are consistently subjected to scrutiny over the packaging they use. The quality of a product's packaging is often taken to be indicative of the quality of the product within. As a result, many brands are constantly innovating and redesigning their packaging to maintain competitiveness. However, they are doing this against a backdrop of a regulatory landscape that is not fully harmonised across EU Member States, with uncertainties, for example, in the way in which EPR schemes might choose to revise their fee structures and reporting requirements, along with the way in which modulation might be

implemented. Brands would therefore benefit from far greater harmonisation of requirements across the EU as a whole.

4 **Packaging manufacturers.** Packaging manufacturers are required to meet the demands of the brands they service. Therefore, many of the ways in which brands are affected by the problems associated with current packaging are also relevant to the packaging manufacturers themselves. As a result, they must be able to adapt their manufacturing capability to maintain their position in the supply chain.

5 **Waste management companies and recyclers.** Innovation and developments in technology have thus far resulted in significant changes to the designs and materials used for modern packaging. The waste management industry would benefit from increased clarity and harmonisation in terms of the future regulatory requirements, with recyclers in particular better able to co-ordinate investment with a clear view as to future developments in recyclability across the packaging mark.

ANNEX 7: INNOVATION - LIFE AND HORIZON PROJECT BEST PRACTICES

7.1. Executive Summary

The European Union has developed far-reaching legislation and policies to achieve high standards of quality of life and became a frontrunner worldwide in tackling environmental and climate change issues. In order to support the design, update and implementation of such legislation and policies, the European Union set up dedicated funds as the LIFE programme and the Horizon/Horizon Europe programme.

The results from projects funded by LIFE and Horizon/Horizon Europe are fundamental tools for the European policy making. Projects identify gaps and barriers on the current policy framework and developed solutions to address them. **The wealth of knowledge gathered through the projects proved to be valuable evidence for better designing policies and update legislation**. Furthermore, some projects provide an important support to the implementation of new policies and legislation by developing capacities and raising awareness of the targeted audience.

The support of projects to shape and implement evidence-based policy making is a policy-feedback mechanism: on the one hand policies influence the selection of projects by identifying the areas of need for funding, on the other projects provide information on the barriers on the ground and how to tackle them.

This document provides with an **overview of best practices developed by projects** supported by **LIFE and Horizon 2020 / Horizon Europe Programmes** in the field of packaging and packaging waste. The selected projects can support the measures of the new Regulation, in particular to the following objectives:

1. Strengthening the functioning of the internal market (including production, reuse and recycling), by ensuring a level playing field through a common set of rules;

2. Promoting a low-carbon circular economy;

3. Reducing environmental and social impact throughout all stages of the packaging life cycle.

Section 2 "Introduction" describes the key features of the LIFE and Horizon 2020/Horizon Europe programmes. This section presents figures of the funding and number of projects in the areas of intervention identified in this Impact Assessment.

Section 3 "Contribution to the revision of the PPWD[364] and implementation of new measures" explains the added value of LIFE and Horizon projects to the revision and implementation of EU legislation, linked to the selection procedure they undergo prior to being funded, which ensures their alignment with EU policy priorities.

Section 4 "Projects results highlights per intervention area" provides the list of selected projects and presents innovations and best practices by area of intervention as identified in this Impact Assessment. It is important to note that that the list provided is not an exclusive list but rather a selection of key projects. Other EU-funded projects contribute as well to the implementation of the objectives in the field of packaging and packaging waste.

The following table lists the selected projects and shows the intervention areas to which they contribute:

Project Acronym	**Waste prevention & reuse**	**Recyclability & compostability**	**Recycled content**	**Enabling measures (hazardous waste, green public procurement, labelling, extended producers responsibility)**
LIFE IP C-MARTLIFE	x	x	x	x
LIFE BioTHOP		x		

[364] Packaging and Packaging Waste Directive

LIFE BOSS		x		
LIFE EPS SURE		x		
Life GreenFEST				x
LIFE BAQUA		x	x	
LIFE MULTIBIOSOL		x		
LIFE RECYPACK		x		
LIFE AGANFOILS		x		
LIFE BIOCOPACPLUS		x	x	x
LIFE CEPLAFIB			x	
LIFE BREAD4PLA		x	x	
LIFE EXTRUCLEAN		x		x
LIFE DEBAG	x			

LIFE TTGG				x
H2020 YPACK	x			
H2020 GloPack		x		
H2020 CIRCPACK		x	x	
H2020 FORCE		x	x	

7.2. Introduction

7.2.1. Policy contribution of EU-funded projects

Projects funded by the European Union play an important role in the development, implementation and update of European policies. Such projects underwent a selection procedure that ensures alignment with EU policy objectives. Therefore, their feedback to policy making is valuable both in terms of addressing legal bottlenecks that they may find on the ground and those projects test solutions that can help in the achievement of EU policy goals.

7.2.2. LIFE: programme functioning and relevant Calls

The LIFE programme, *L'Instrument Financier pour l'Environnement*, is the EU's funding instrument solely dedicated to support projects in the field of environment and climate action. The objective of LIFE is to contribute to the implementation, updating and development of EU environmental and climate policy and legislation by co-financing projects with European added value.

Since its start in 1992 LIFE has funded over 5,200 projects for the protection of nature, environment and climate, thus supporting about 28,000 beneficiaries throughout the EU. The total value of these projects is about 11.5 billion EUR.

LIFE is organised based on an annual call for proposals, usually published in the second quarter of the year. The single main call is composed by several sub calls per priority area in line with the LIFE Multiannual Work Programme. More information is available on the LIFE website.

The two main project types relevant for the revision of the PPWD and funded by LIFE between 2014-20 are:

- **Traditional projects** (renamed Standard Action Projects (SAP) in 2021-27): pilot, demonstration, best practices projects promoting techniques, products, processes, services that offer environmental or climate advantages compared to current practices. They also include "Information, awareness and dissemination projects" aimed at supporting communication, dissemination of information and awareness raising in the fields of Environment and Climate. On average, their duration is about 4.5 years and the EU contribution is in the range 0.5 - 5 million EUR
- **Integrated Projects** (renamed Strategic Nature Projects and Strategic Integrated Projects in 2021-27): projects implementing on a large territorial scale, in particular, regional, multi-regional, national or trans-national scale, environmental or climate plans or strategies required by specific Union environmental or climate legislation. The projects are led by competent national authorities responsible for the implementation of the targeted plan or strategy. These projects have an average duration of about 10 years and average EU contribution of 12 million EUR.

Under the 2014 – 2020 LIFE programming period, LIFE invested more than 366 million EUR into 215 projects supporting circular economy, catalysing a total project investment of about 945 million EUR. In section 3 of this Annex a selection of LIFE circular economy projects with contributions relevant to the revision of the PPWD is provided.

7.2.3. HORIZON 2020 and HORIZON EUROPE: programme functioning and relevant Calls

Horizon 2020 is the financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative aimed at securing Europe's global competitiveness. By coupling research and innovation, Horizon 2020 is helping to achieve this with its emphasis on excellent science, industrial leadership and tackling societal challenges. The goal is to ensure Europe produces world-class science, removes barriers to innovation and makes it easier for the public and private sectors to work together in delivering innovation.

The Horizon 2020 programme has funded extensive R&I activities in the field of circular economy. With the latest projects under Horizon Europe coming to an end in 2022, the first projects under Horizon Europe, the follow-up multiannual R&I framework programme, are starting. Both programmes are organised thematically.

The circularity aspects, specifically related to plastics, are mainly addressed in Horizon Europe clusters "Digital, Industry and Space" and "Food, Bioeconomy, Natural Resources, Agriculture and Environment". Horizon Europe also proposes so-called partnerships and missions. The Circular Bio-based Europe and Carbon Neutral and Circular Industry partnerships and , and Missions, such as the ones on (1) A Climate Resilient Europe: Prepare Europe for climate disruptions and accelerate the transformation to a climate resilient and just Europe by 2030, (2) Mission Starfish 2030: Restore our Oceans and Waters, (3) 100 Climate-Neutral Cities by 2030 – by and for the citizens, and (4) Caring for Soil is Caring for Life – 75% healthy soils in the EU.

Current EU activities to promote R&I funding and investments for the circular economy – selected key figures:

Funding for Circular Economy has been a priority under Horizon 2020. Horizon 2020 already invested EUR 1.4 billion in Circular Economy R&I projects in the period 2016-2018. An additional EUR 960 million was allocated to Circular Economy R&I Actions in the work programme 2018-2020.

In addition to the funding of R&I projects, actions are taken to stimulate the generation and financing of Circular Economy projects and raise further awareness through the Circular Economy Finance Support Platform. With a commitment of EUR 2.7 billion under Horizon 2020, InnovFin (EU Finance for Innovators) aims to leverage EUR 24.5 billion and mobilise at least EUR 47 billion of investments in support of innovative and high-risk projects.

The focus of thematic actions will be on large-scale demonstrations, addressing a number of systemic barriers and showcasing how the circular economy approach can be successfully implemented through exploitation of the specific potential of regions and collaboration of regional actors.

Horizon 2020 and its successor Horizon Europe continue to support research and innovation activities in the area of packaging and packaging waste in the circular economy through dedicated calls for proposals. These materialised in a range of currently on-going or recently started projects which target a range of issues – from new and smart packaging designs and materials, new and improved technologies for processing complex and multilayer products, addressing single use plastic use and reduce plastic pollution.

In the following sections, only a selection of projects, supported by Horizon 2020 Societal Challenge 5 and 2, which have been recently closed, are presented in detail (besides a selection of LIFE projects).

7.2.4. LIFE and HORIZON projects contribution to the revision of the PPWD and implementation of new measures

A substantial amount of LIFE and Horizon projects have been addressing key challenges related to the packaging and packing waste intervention areas. These projects have identified gaps on the ground and addressed them by proposing new solutions, technologies, approaches, raising awareness and building capacities.

As mentioned in section 1.1 of this Annex, LIFE projects undergo a selection procedure that ensures their alignment with EU policy objectives, in this case those related to packaging and packaging waste. Horizon projects are also expected to contribute to and be aligned with EU environmental policy frameworks and respective legislation. Thus, the results and highlights of the selected projects listed below constitute highly valuable information for the development of the impact assessment of the packaging and packaging waste directive.

LIFE and Horizon projects presented are key references for the implementation of the packaging and packaging waste provisions. They are contributing to:

a) Strengthening the functioning of the internal market (including production, reuse and recycling), by ensuring a level playing field through a common set of rules;

b) Promoting a low-carbon circular economy;

c) Reducing environmental and social impact throughout all stages of the packaging life cycle.

7.3. Project results highlights per intervention area

7.3.1. PREVENTION AND REUSE

7.3.1.1. Scope of this intervention area

The scope of this intervention area is to ensure the prevention of packaging waste generation and the maximum reuse of packaging waste. This area of intervention addresses specifically the issues of over-packaging.

This is meant to be achieved in particular through (1) clearer, more enforceable EU level requirements on packaging, which are (2) revised to drive design for reuse and recyclability of packaging and prevent the continued growth in the generation of packaging waste.

7.3.1.2. Overview of best practices from projects

The following projects identified and tested key best practices in the field of prevention of packaging waste and reuse. For more detailed info and additional relevant best practices and policy feedback of the projects listed here, see the project fiches in the next section.

- **LIFE19 IPE/BE/000008 - LIFE IP C-MARTLIFE** (end year 2027) – project with multiple actions to implement Flemish waste legislation, with a focus on plastics (Flemish Plastics Action Plan). This project is accelerating substantially the implementation of legislation, improving dialogue between public administration, waste management and packaging umbrella organisations, and triggering access to further funds. A wide number of actions on prevention and reuse of plastics & packaging, **improving the dialogue between Public Waste Agency of Flanders and waste management organisations**.

- **LIFE14 GIE/GR/001127 - LIFE DEBAG –**project focussed on raising awareness on prevention and reduction of plastic bag pollution in the marine environment in Greece, both at local and national level. **The outstanding communication campaign and related measures in Syros island resulted in a reduction of plastic bags of 85%** on the surveyed beaches and by 60% on the seafloor. At national level contributed among others to change legislation on single-use plastic bags and to promote a national voluntary agreement with supermarket chains to reduce plastic bag consumption.

- **H2020 YPACK (773872) – High performance polyhydroxyalkanoates based packaging to minimise food waste - t**he project focused on reducing the use of petroleum-based plastic materials in food packaging and developed innovative packaging solutions, which were fully scaled as functional biodegradable packaging. They were assessed in terms of LCA, biodegradability in the environment and in composting, migration, and as **packaging elements for the shelf-life extension of several selected food products**, yielding satisfactory results.

7.3.1.3. Fiches of projects mentioned

LIFE19 IPE/BE/000008 - LIFE IP C-MARTLIFE (end year 2027)

i. Problem addressed and objectives

Plastics and packaging waste prevention and management need innovation and knowledge investment to make additional improvements in Flanders. The Flemish government has developed a Plastics Action Plan, which aims to reach the targets of the European Strategy for Plastics in a Circular Economy.

This LIFE integrated project implements Flemish Waste Management policy, with a specific focus on accelerating and reinforcing the Plastics Action Plan. **Several actions of the project address the reduction of plastic packaging**. The project is also targeting other waste streams such as textiles, marine litter, construction and demolition waste, diapers, food waste or transboundary shipments. Expected results include, among others:

- 90% collection of drink packaging by 2022.
- All packaging is reusable, recyclable, compostable or biodegradable by 2025, with 25% and 50% recycled content in PET-bottles by 2022, respectively 2025.
- Increased recycling rate with closed loops by 80% for plastics in food packaging, textile, construction.
- Regulation on use of single-use catering material at events and for governments.
- A Green deal on waste prevention in the distribution sector.

ii. Description of the solution

Project actions can be grouped under 4 topics: (i) reduction and efficient use of plastics; (ii) prevention of plastic litter; (iii) creating a sustainable recycling market for plastics; and (iv) stimulating plastic recyclate as a fully-fledged raw material. The graph below shows an overview of the main waste-stream-specific actions, grouped by the Flemish action plan they contribute most to:



iii. Main policy feedback

In spite of its early implementation stage, several tangible benefits already include:

- The project has been so far an ideal platform to improve the dialogue between Public Waste Agency of Flanders and waste management and packaging umbrella organisations.
- Collaboration with the Dutch authorities on sustainability of public procurement, and translation of the Dutch MVI-criteriatool to the Flemisch context.
- The LIFE funding received by the coordinator Public Waste Agency of Flanders enabled an increase in 7 staff, thus substantially increasing the speed in the implementation of the multiple policies targeted.
- LIFE funding and 7 additional staff helped OVAM to get, from the Recovery and Resilience Facility (RRF), additional EUR30 million funds for projects on innovative recycling technologies to close material cycles: https://www.ovam.be/subsidies-recyclagehub

iv. Further info & contact data

https://webgate.ec.europa.eu/life/publicWebsite/index.cfm?fuseaction=search.dspPage&n_proj_id=7883

LIFE14 GIE/GR/001127 - LIFE DEBAG

i. Problem addressed and objectives

Litter is a major problem for the marine environment, with plastic bags being one of the most common and persistent items. Since over 80% of marine litter comes from land-based sources, preventing litter at source is very important. However, an integrated approach to tackling plastic waste is often lacking due, among others, to little knowledge of the impacts of plastics on the environment.

The main objective of the LIFE DEBAG project was to reduce the plastic bags pollution in the marine environment in Greece by encouraging users to change behaviours. The core of the actions focused on raising awareness on the problem of littering of plastic bags.

ii. Description of the solution

The project developed and implemented an integrated information and awareness-raising campaign for the reduction of plastic bag pollution in the marine environment, on a national level in Greece and on a local level on the Greek island of Syros.

On Syros, the project informed more than 41 000 visitors and 16 500 inhabitants of the problems caused by plastic bags in the marine environment, as well as of measures to address the issue, for example, through factsheets at hotels and leaflets for the general public. The project team produced 12 000 reusable cotton bags, which were given for free to the local population. Local voluntary agreements to reduce the consumption of plastic bags were signed with 215 local shops in Syros. Educational events were held, such as beach clean-ups, and information materials produced for every school on the island.

At the national level, the projects **intensive information campaign**, **involving TV and radio** spots, printed publications and electronic newsletters, and social media, reached approximately 600 000 people. A **national voluntary agreement** was reached with five **supermarket chains** (representing more than 50% of Greece's market share), with a variety of measures introduced to reduce plastic bag consumption. The project also organised seven **stakeholder consultation forums** that brought together for the first time all pertinent stakeholders in Greece. Through these forums, it contributed with a significant **set of recommendations** for the integration of the European Directive on reducing the consumption of lightweight plastic carrier bags (2015/720) into Greek legislation. These were **incorporated in a Joint Ministerial Decision** in 2017 that imposed a **fee on single-use plastic bags** from January 2018. **After the fee, a 60%-80% plastic bag use reduction was noted in Greece after one year**, according to the Hellenic Recycling Agency. **Networking** activities with 95 groups in Greece and six other EU countries took place.

The project **expanded the OSPAR Marine Litter Beach Questionnaire** to include a detailed plastic bag classification scheme. It also initiated the development and testing of an **innovative marine litter monitoring protocol** for the international scientific community, using technologies such as shallow benthic monitoring and aerial surveys using drones.

iii. Main policy feedback

- A well designed and targeted communication campaign led to changing behaviours of thousands of people in Greece. The project involved well-known actors and displayed used main channels of TVs and radio to reach a wide audience. Thanks to the project work, **the accumulation of plastic bags decreased by 85% on the surveyed beaches and by 60% on the seafloor.** This strongly **indicates that an intensive awareness-raising campaign can have a tangible impact** on the environment.
- The project conducted a rigorous assessment of the marine litter load on Syros beaches and seafloor using drones, towed underwater camera and underwater remote operated vehicles; results showed that, at the end of the project. A robust analysis of the issues faced in the Syros beaches was very important to **support the communication campaign with evidence-based data**.
- **Significant long-term socio-economic benefits** were identified, including: reduction of costs to local authorities for cleaning up plastic bag waste; benefits for shop owners due to reduced costs for plastic bags; increased attractiveness and touristic potential for Syros and municipalities that replicate the project; and benefits for commercial fishing due to reduced pollution of the marine environment.
- The project developed a **Replication Handbook** which summarises the steps interested parties can take for reducing consumption of plastic bags and other single-use plastic items.

iv. Further info & contact data

https://webgate.ec.europa.eu/life/publicWebsite/index.cfm?fuseaction=search.dspPage&n_proj_id=5349

H2020 YPACK (773872) – High performance polyhydroxyalkanoates based packaging to minimise food waste

i. Problem addressed and objectives

The project aims to reduce the use of petroleum-based plastic materials in food packaging by developing alternative solutions such as **biodegradable performing packaging derived from food by-products** such as cheese whey and almond shells. It also addresses the challenge of demonstrating both the technical and economic feasibility of fully bio-based compostable packaging that can achieve the required packaging properties, protect the environment and make economic sense.

ii. Description of the solution

The project developed and scaled up two innovations: 1) **Multi-layer bio-based and compostable films** from poly-hydroxyalkanoates with improved oxygen barrier and anti-microbial/antioxidant properties for food packaging applications; and 2) **Compostable thermoformed tray** made of almond shell residues and poly-hydroxyalkanoate derived from cheese whey as a fully bio-based alternative to current fossil fuel-based packaging materials. The solutions were fully scaled as functional biodegradable packaging. They were assessed in terms of LCA, biodegradability in the environment and in composting, migration, and as

packaging elements for the shelf-life extension of several selected food products, yielding satisfactory results.

iii. Main policy feedback

Key messages of the project include:

- education and communication are important to change consumer behaviour, which remains a significant barrier to bringing innovative solutions on the market;
- there is still consumer's confusion around the definitions "biodegradable" and "compostable" and the difficulty of correctly discarding different food packaging;
- a more systemic approach should be adopted and in particular impacts in the biosphere should be better taken into account for the development of future circular bio-based products.

iv. Further info & contact data

CORDIS web site – https://cordis.europa.eu/project/id/773872

Project website - https://www.ypack.eu/

7.3.2. RECYCLABILITY & COMPOSTABILITY

7.3.2.1. Scope of this intervention area

The scope of this intervention area is to increase the use of recyclable and compostable packaging. The objective is to achieve a smooth functioning of the internal market in recycling packaging with increased consistency of requirements and incentives across Member States. Key measures include the provision of clear definitions of recyclability and compostability as well as compulsory compostability for certain products.

7.3.2.2. Overview of best practices from projects

The following projects identified and tested key best practices in the field of recyclability and compostability. For more detailed info and relevant policy feedback of the projects listed here, see the project fiches in the next section.

LIFE16 ENV/ES/000258 - LIFE EPS SURE: the project developed an **innovative way of recycling food contact packaging of fish boxes made of expanded polysterene** to produce high quality recycled polysterene for food contact packaging such as yogurts and milk bottles.

LIFE15 ENV/NL/000429 - LIFE AGANFOILS – the project identified and tested an innovative process at full-industrial scale at which post-consumer low-density polyethylene **foils from dirty Materials Recycling Facilities** are **upcycled to 'as-good-as-new plastic'**. The **new recycling plant** of company Attero is expected to **recycle** around **24 000 tonnes per year** of post-consumer plastic film waste, leading to about **15 000 tonnes per year of high-quality plastic regranulate**.

LIFE13 ENV/IT/000590 - LIFE BIOCOPACPlus – the project team designed and built a prototype manufacturing plant to produce a **bio-lacquer for food packaging (metallic cans) from tomato waste skins** to be used as coating for food contact applications in metal cans.

LIFE10 ENV/ES/000479 - LIFE BREAD4PLA - the project set up a pilot plant at pre-industrial scale for the synthesis of poly-lactic acid (PLA) from bakery waste products, using a low-energy process with water-based enzymes, and proved that **bakery waste is a suitable raw material for 100% compostable plastic packaging**.

LIFE13 ENV/ES/000067 - LIFE EXTRUCLEAN – the project demonstrated a new technique for **eliminating hazardous substances from waste** polyethylene packaging for solvents or phytosanitary products, using less labour, energy and water. The recycled material can be employed in the production of packaging for hazardous substances.

LIFE16 ENV/ES/000305 - LIFE RECYPACK – successful use of existing logistics that distribute electronic devices, to collect and transport back, for later recycling, packaging waste (reverse logistics).

LIFE15 ENV/ES/000157 – LIFE BAQUA – The project incorporated **banana crop waste fibre as reinforcement for biobased** and biodegradable film, to be used in the manufacture of bags for feed packaging and banana sleeves. They also worked assessing the inclusion of natural fibres in plastic bags to see the effects.

LIFE14 ENV/ES/000486 - LIFE MULTIBIOSOL – The project developed a solution for the use of biodegradable mulching in agriculture showing a better environmental and technical performance compared to polyethylene film.

LIFE18 ENV/SI/000056 - LIFE BioTHOP– The project intends to replace polypropylene twine, used as support to grow hop crops, by twines of biodegradable and compostable bioplastic (polylactic acid - PLA), so that when the harvest is finished, the twine + hop crop waste can be used for 3 purposes: hop fibres as filler additives, hop fibre-reinforced PLA biocomposites for injection moulding, hop fibre crumbs for pulp moulding applications. These materials will have fertilising properties when degrading, being thus good for e.g. planting pots.

LIFE20 ENV/UK/000630 - LIFE BOSS– Demonstration of an innovative automated process capable of separating black PP/PE plastic to the same purity as other colours, allowing for full recyclability of mixed plastic waste.

H2020 GloPack (773375) - Granting society with LOw environmental impact innovative PACKaging - The GLOPACK project demonstrated the feasibility of using microbial bio polyesters (P(HB-co-HV)) to produce food containers and pack fresh food products with optimal shelf-life.

H2020 CIRCPACK (730423) - Towards circular economy in the plastic packaging value chain - The project validated new packaging solutions made of Biodegradable and Compostable (B&C) plastics from renewable resources and designed and validated eco-designed alternatives for multilayer and multicomponent packaging with better end-of-life impact.

7.3.1.1. Fiches of projects mentioned

LIFE16 ENV/ES/000258 - LIFE EPS SURE

i. Problem addressed and objectives

Expanded polystyrene (EPS) is typically used in containers to store, transport and present fresh food. Only 25% is recycled in southern Europe, around 30% is incinerated and the rest is landfilled. A main reason is the difficulty in collecting low quantities and removing food residues and odours from used EPS.

The project aimed to provide an innovative method and technological solutions for recycling waste EPS fish boxes, getting as output high quality polystyrene (PS) with properties similar to the virgin PS used for packaging food.

ii. Description of the solution

The LIFE EPS SURE project developed a way of recycling fish boxes made from EPS, transforming them into PS food contact packaging. The project's treatment process in TOTAL PETROCHEMICAL pilot plant reactor is similar to the current treatment of polyethylene terephthalate (PET), but it is a closed loop, thereby guaranteeing that more than 99% of the material to be recycled has food contact origin.

iii. Main policy feedback

- Expanded polystyrene can be recycled into a high quality polystyrene to be used for packaging food. **A clear and stable policy framework is desirable to advance recycling of materials.** Lack of integrated and harmonized EU legislation approach can lead to unexpected consequences like hampering the technological recyclability developments of materials.
- Economic feasibility should be facilitated also with careful consideration of financial incentives. **Extended Producer Responsibility (EPR) might be required to make technological innovation economically feasible**. This also includes consideration about landfilling taxation, which in some regions of Europe is still too favourable.

iv. Further info & contact data

https://webgate.ec.europa.eu/life/publicWebsite/index.cfm?fuseaction=search.dspPage&n_proj_id=6184

LIFE15 ENV/NL/000429 - LIFE AGANFOILS

i. Problem addressed and objectives

Post-consumer low-density polyethylene (LDPE) plastic foils recovered from municipal solid waste are considered difficult to recycle. This plastic waste usually has a high level of contamination with dirt, organic material and adhesives, among others. As a result, in most countries, LDPE plastic waste is currently either incinerated for energy recovery or landfilled.

The project established a smart collection scheme that diverts LDPE away from landfills and incineration to recycling, and at demonstrating a full-industrial scale recycling installation at which **post-consumer LDPE foils from dirty Materials Recycling Facilities** (MRF) are **upcycled to 'as-good-as-new plastic'**.

ii. Description of the solution

The innovative process results in a higher quality odourless re-granulate. For the first time an integrated, full-industrial scale, waste-to-resource recycling facility was demonstrated on one location for plastic waste foil. By eliminating transportation needs, the facility enabled low-cost upcycling at a significantly lower environmental impact. It is largely a closed looped process in which used process water is treated and reused, maximising resource efficiency.

Furthermore, by introducing an innovative hot washing stage to the plastic foil recycling process a **higher quality end-product and higher yield can be achieved compared to current plastic foil recycling facilities**.

The **new recycling plant** of company Attero is expected to **recycle** around **24 000 tonnes per year** of post-consumer plastic film waste, leading to about **15 000 tonnes per year of high-quality plastic regranulate**. Since the waste LDPE would no longer need to be transported from the Netherlands to Germany, this would reduce CO2 emissions by up to 1 100 tonnes per year.

iii. Main policy feedback

- Low-density polyethylene (LDPE) plastic foils can be recycled into a high quality material through the process developed by LIEF AGAINFOILS. This new waste process is low-cost and allowed a close loop process. Plastic waste is now recovered from municipal solid and diverted from landfills.
- The solution developed by AGAINFOILS can be transfered to other Member States. The coordinator of the project has already received interest from other parties within Europe.

iv. Further info & contact data

https://webgate.ec.europa.eu/life/publicWebsite/index.cfm?fuseaction=search.dspPage&n_proj_id=5781

LIFE13 ENV/IT/000590 - LIFE BIOCOPACPlus

i. Problem addressed and objectives

Lacquers for food packaging are mainly derived from petroleum, with epoxy resin being the most widely used component. Using a petrol-based lacquer increases the carbon footprint of a packaging company by 0.4% for each kilogram of metallic cans produced; 90% of this impact is linked to the production of the epoxy resin. At the same time, each year, Europe generates more than 300 000 tonnes of solid tomato residues like skins and seeds.

The project demonstrated the use of a bio-lacquer made using cutin, a water-repellent biopolymer found in waste tomato skins. This lacquer can be cost-effectively produced on an industrial scale, and demonstrate compliance with EU food contact regulations at the end of the cans' shelf life.

ii. Description of the solution

The project team designed and built a prototype manufacturing plant to produce a bio-lacquer from tomato waste. This allowed them to make 250 kg of a waxy, water-repellent substance called cutin from around five tonnes of tomato skins. This cutin formed the main ingredient of the lacquer and was used to line and protect cans containing food.

A test run of 3 000 cans was coated with the bio-lacquer and it met all the required functional and hygienic properties. This means it can replace existing commercial lacquers made from oil. Also, the solution solves the problem of traditional organic coatings which could contaminate canned food and harm human health.

Resources and energy consumption were saved by reducing processing temperatures and times. Also, all the solid and liquid waste generated was used to produce biogas. When compared with a standard lacquer of fossil fuel origin, CO2 equivalent emissions were 730 mg lower per can.

iii. Main policy feedback

- The bio-solution gives value to the tomato industry by-products through its waste reuse approach. As the container is more easily recyclable, the metal packaging sector also becomes more competitive.
- The approach is highly replicable.

iv. Further info & contact data

https://webgate.ec.europa.eu/life/publicWebsite/index.cfm?fuseaction=search.dspPage&n_proj_id=5088

LIFE10 ENV/ES/000479 - LIFE BREAD4PLA

i. Problem addressed and objectives

The European bakery sector produces 3.5 million tonnes of degradated starch waste with minimal nutritional value every year. At least 5% of this waste is disposed of in landfill because there is currently no alternative use.

The main objective of the project was to demonstrate the technical and economic viability of using waste products from the bakery sector in the fabrication of a 100% biodegradable plastic film.

ii. Description of the solution

The project operated a pilot plant at pre-industrial scale for the synthesis of poly-lactic acid (PLA) from bakery waste products, using a low-energy process with water-based enzymes.

The project **proved that bakery waste is a suitable raw material for 100% compostable plastic packaging**. This was done through an analysis of all stages, from the selection and characterisation of bakery waste, enzymatic fermentation, PLA polymerisation and plastics processing pathways, including the use of additives such as thermal stabilisers to avoid PLA molecular degradation, and the production of sheets of packaging material.

The main achievement was the demonstration of the packaging production process, followed by its validation using different types of bakery and pastry waste as raw material. The main innovation was the demonstration of the use of bakery waste as a novel raw material to produce PLA packaging, and showing that the product had the same performance as PLA packaging produced from cereals.

iii. Main policy feedback

- It was concluded that the following three conditions are necessary for turning the pilot process into a viable industry: the bakery waste must be available in sufficient quantities; the supply must be constant; and it should be sourced from as few locations as possible to simplify logistics, minimise transport costs and ensure consistency of quality.
- Replicability can be considered viable as this type of waste is available in all European countries, and the project results suggests that a scale-up to industrial level would succeed with the corresponding optimisation in terms of cost reductions. Specifically, Germany and the UK generate

the largest amounts of this type of waste in Europe, which makes them candidate countries for initiating the project results at industrial scale.

- Companies generating different types of food waste (e.g. fruit and vegetables) were also interested in collaborating to use their waste to produce biodegradable packaging material. Adaptations on the final thickness of the packaging would be necessary to transfer the technology to other sectors, to preserve products during their required shelf-life.

iv. Further info & contact data

https://webgate.ec.europa.eu/life/publicWebsite/index.cfm?fuseaction=search.dspPage&n_proj_id=3996

LIFE13 ENV/ES/000067 - LIFE EXTRUCLEAN

i. Problem addressed and objectives

The conventional method for reducing or eliminating threats from hazardous waste containers involves the triple rinsing and draining of empty containers. In the case of plastic packaging, it involves pre-rinsing, crushing, washing (with different washing agents, detergents or surfactants) and subsequent rinsing and drying. After drying, the material can then be passed through an extrusion line, to produce a recycled material in pellet form.

This process requires large amounts of water, cleaning agents and energy. It also produces large volumes of wastewater. Recycled plastic obtained from conventional recycling processes is used in applications with low added value (e.g. pallets), as it generally has inferior mechanical and organoleptic properties.

The project demonstrated the **viability of a new technique for eliminating hazardous substances from waste polyethylene (PE) packaging for solvents or phytosanitary products**, using less labour, energy and water. The recycled material would then be employed in the production of packaging for hazardous substances, closing the lifecycle.

ii. Description of the solution

The project developed an innovative technique to remove hazardous substances from plastic waste, based on the use of supercritical carbon dioxide (sc-CO2), which is added to the melted plastic during the extrusion process.

The technology eliminates 2 of the 3 rinsing stages of conventional ‘triple washing and rinsing’, and **removes about 70% more hazardous contaminants**, being thus much more cost-efficient, with a short payback period.

PET recycled with this technology shows improved properties compared to traditional recycled material, such as less odour and better mechanical properties. This enables it to be used in higher added value applications, such as packaging dangerous goods.

iii. Main policy feedback

- The technique developed by the project allows the reduction of more than 70% of hazardous substances from plastic waste packaging. The quality and features of the plastic waste source strongly influences the final packaging quality. The project could obtain packages with improved mechanical and chemical resistance when the waste came from industrial packages of a certain minimum capacity.

iv. Further info & contact data

https://webgate.ec.europa.eu/life/publicWebsite/index.cfm?fuseaction=search.dspPage&n_proj_id=4927

LIFE16 ENV/ES/000305 - LIFE RECYPACK

i. Problem addressed and objectives

The main problem addressed by the project is related to the fact that packaging waste from shops often is landfilled and not recycled. The resource obtained from the shops is a high-quality material, so its mixture with other streams causes "contamination" with organic or another type of material, which reduces its quality in terms of valorisation in its overall concept (collection, separation, recycling, and reuse as a secondary raw materials). LIFE RECYPACK aimed to improve collection and recycling of Commercial Plastic Packaging Waste (CPPW) in cities, focussing on polyethylene (PE) and expanded polystyrene (EPS). The project set up an innovative public-private waste management system and tested four different models for improving the collection of plastic packaging waste:

- Collection of CPPW in commercial centres
- Door-to-door CPPW collection from small shops in town center
- Use of reverse logistics to collect CPPW in large chain distribution companies
- Adaptation of existing waste collection "green dot" sites to collect CPPW, providing incentives to those who deposit CPPW.

ii. Description of the solution

The project created a new value chain for plastic packaging waste and identified that the main success came from the use of reverse logistics. The company COMELSA implemented this action with support from the MILLAR Group, which sells electronic devices and for which the COMELSA manages the distribution logistics. COMELSA collects now CPPW from 70 shops of MILLAR. COMELSA distributes the devices to

the MILLAR group shops and uses the same logistics to collect and transport the electric and electronic equipment waste to their treatment plants. They keep selling the collected CPPW to the recycling company TRAXPO.

iii. Main policy feedback

- The solution developed by the project can foster the implementation of green public procurement, however the project highlighted that setting up an EPR scheme with only two materials such as commercial PE and polystyrene (PS) seems unrealistic due to the low amounts collected.
- Selective collection involves a large amount of awareness raising and communication campaigns to have any chance of success.

iv. Further info & contact data

https://webgate.ec.europa.eu/life/publicWebsite/index.cfm?fuseaction=search.dspPage&n_proj_id=6187

LIFE15 ENV/ES/000157 – LIFE BAQUA

i. Problem addressed and objectives

Banana production (of large importance in the Canary Islands) generates organic waste called "pseudostem" that is usually left on the plantation once the fruit has been harvested. Since this has no nutritional value for the soil its accumulation poses a problem for future harvests and may have negative impacts on the environment.

The project planned to extract the **banana waste natural fibres** and use them as natural additives to reinforce 100% bio-based and 92-98% biodegradable plastics. In particular, the project produced **prototypes for biodegradable fish feed bags**, biodegradable covers to protect banana trees against UV radiation and plastic components for different devices and household appliances.

ii. Description of the solution

LIFE BAQUA developed and optimised a fibre extraction pilot plant that produces clean, high-quality fibre at a high production rate. The obtained fibre was included in a bio-based matrix for the production of the above-mentioned biodegradable bags. This fibre was also used to reinforce a conventional plastic matrix for a range of plastic products.

The project also prepared an industrialisation plan to upscale the extractive process on the Canary Islands, where banana production is one of the most important economic sectors. A clear strategy for its implementation was presented to the regional authorities, which have shown great interest in upscaling the project.

iii. Main policy feedback

- The project presented allegations to the Circular Economy Strategy that the Spanish Ministry of Agriculture and Fisheries, Food and Environment is currently preparing. The proposal from LIFE BAQUA to this strategy is to promote the use of natural fibres coming from waste from crops grown for food, rather than specifically cultivating to produce natural fibres.
- The mechanism proposed by the project is to subsidise the production of this kind of fibre coming from agro-waste, as well as the manufacturing of composite plastic material with natural fibre. Considering that such subsidies are not possible at the EU level by the Common Agricultural Policy, the proposal is to have subsidies at regional level.

iv. Further info & contact data

- https://webgate.ec.europa.eu/life/publicWebsite/index.cfm?fuseaction=search.dspPage&n_proj_id=5746

LIFE14 ENV/ES/000486 - LIFE MULTIBIOSOL

i. Problem addressed and objectives

Current existing semi-intensive and intensive farming practices require the use of large quantities of mulching film and fruit protection bags (and clips to close them), typically made from low and high density polyethylene. These non-degradable polymers after single-use become plastic waste, difficult and expensive to recycle, being thus usually abandoned, incinerated or taken to a landfill.

The project aimed at developing and demonstrating an innovative, economically viable and fully biodegradable plastic that eliminates waste completely.

ii. Description of the solution

The project **developed biodegradable plastics films** with biodegradable polymers and additives made from renewable raw materials that are **not petroleum-based** and **do not compete in food markets**. Biomass for these biodegradable plastics comes from trees and crops that extract CO2 from the atmosphere as they grow. Moreover, when they degrade, they add value to the soil through oligo elements (trace minerals as natural fertilisers) and micro-perforation functionalities that contribute to agriculture à la carte and help improve the health of the soil and the quality of the final product.

iii. Main policy feedback

- Plastic waste **legislation should be stricter with the management of agricultural plastics**. Collection schemes and penalization to lack of plastic waste management should be taken into account (only a 28% of farmers manage correctly the agricultural plastic wastes according to farmers consultation during project);

- Results of the project could contribute to the biodegradability review foreseen by Art. 50 of Regulation (EU) 2019/1009. The **regulation fails to recognise the potential role of biodegradable mulch films in modern agriculture** and their improvement of the content on organic matter. It has to be highlighted the usefulness of the standard EN 17033:2018 "Biodegradable mulch films for use in agriculture and horticulture - requirements and tests methods" in view of acknowledging this role and link it with the existing regulation;

- Some EU Members States (such as Portugal, Spain and France) financially support the utilization of biodegradable plastic mulch through Common Agriculture Policy and the Producer Organizations schemes, and farmers are partially reimbursed with the cost difference between biodegradable and conventional PE mulch. Integration of sustainability criteria through CAP and/or Regional Development Programme to promote the use of biodegradable materials as well as more awareness among the farmers should be fostered.

- Results from the project show that **current subsidies of 30% are not enough to cover the differences with the conventional materials**, **so they should be higher**. Also tax incentives could be used although this might be decided only at national level.

iv. Further info & contact data

https://webgate.ec.europa.eu/life/publicWebsite/index.cfm?fuseaction=search.dspPage&n_proj_id=5284

LIFE18 ENV/SI/000056 - LIFE BioTHOP

i. Problem addressed and objectives

Hops growing still uses a system based on wire or polypropylene twine attached to trellises. Roughly 45km of polypropylene twine per hectare is used each season, making proper composting, recycling or landfilling of post-harvest biomass (15 tonnes/ha/year) impossible.

The project will combine bioplastic twining materials with new ways to use hop crop waste in packaging and horticulture products.

ii. Description of the solution

The project intends to replace polypropylene twine, by twines of biodegradable and compostable bioplastic (polylactic acid - PLA), so that when the harvest is finished, the twine + hop crop waste can be used for 3 purposes: hop fibres as filler additives, hop fibre-reinforced PLA biocomposites for injection moulding, and hop fibre crumbs for pulp moulding applications. These materials will have fertilising properties when degrading, being thus good for e.g. planting pots.

iii. Main policy feedback

So far, two legislative recommendations were prepared by the project, to allow hop farmers composting post-harvest biomass on-site (rather than at the industrial composting facilities), and for the biodegradable twines to be subsidised.

iv. Further info & contact data

https://webgate.ec.europa.eu/life/publicWebsite/index.cfm?fuseaction=search.dspPage&n_proj_id=7216

LIFE20 ENV/UK/000630 - LIFE BOSS

i. Problem addressed and objectives

Existing solutions to process bulky mixed rigid plastic either cannot technically separate this plastic or cannot do so in a scalable, economically viable way. There is currently no commercially proven solution in the market for separating dark plastics, which can account for up to 33% of the plastic fraction.

The project aims at demonstrating an innovative automated process capable of separating black PP/PE plastic to the same purity as other colours, allowing for full recyclability of mixed plastic waste.

ii. Description of the solution

The patented system provides a scalable, automated, water-based solution. It uses oscillation to generate specific flow patterns in the water, which affect different polymer types in different ways. This effectively stratifies different polymers based on density, allowing the particles to be split with a density delta of 0.005 g/m3. The project will develop a large-scale demonstration 25kt/y recycling plant for post-consumer plastic, including heavy and black plastics, as a scalable, automated recycling line with zero manual sorting. In addition it aims at replicating the technology at a second recycling plant, targeting mixed post-consumer flexible plastics e.g. mixed mono-layer polyolefin flexibles (PP&PE), laminated flexibles (PE backed with aluminium) and multi-layer flexibles (PE layered with nylon & PET)) with a capacity of 13kt/y.

iii. Main policy feedback

No feedback so far in terms of policy feedback.

iv. Further info & contact data

https://webgate.ec.europa.eu/life/publicWebsite/project/details/5614

H2020 GloPack - Granting society with LOw environmental impact innovative PACKaging

i. Problem addressed and objectives

The project aims to lift the barriers to market uptake of sustainable food packaging innovations, in particular biodegradable materials issued from agro-food residues' conversion and intelligent packaging for shelf-life tracking.

ii. Description of the solution

The GLOPACK project demonstrated the feasibility of using microbial bio polyesters (P(HB-co-HV)) to produce food containers and pack fresh food products with optimal shelf-life. The project's demonstrated the feasibility of scaling up production of microbial biopolymers from agri-food feedstock, turning organic wastes into a highly valuable resource. Microbial biopolymers are ultimately biodegradable in natural conditions (e.g., soils) ensuring the complete circularity of the food packaging. The GLOPACK sensor-enabled RFID system permits to track food freshness without opening the packaging all long the food life cycle, contributing to food waste and loss mitigation and to reduce the corresponding useless negative impact that producing and distributing uneaten or inedible food has on our environment and economy.

iii. Main policy feedback

- **Generalize and standardize quantification and labelling of packaging sustainability,** including benefit in term of food waste reduction and material's circularity. Clear distinction between processes that clearly lead to circularity (e.g., ultimate biodegradation in natural environment) and other solutions that are not endlessly repeatable (e.g., mechanical recycling) deserves to be promoted. Lack of integrated and harmonized EU methodology to assess what circular packaging is leads to claim as "sustainable" some packaging that are not in practice.
- **Financial incentives to the territorial communities** to help them to upscale the setting up of home composting or alternatively bio-waste collection and related after-use systems and infrastructures. European and local regulatory incentives must be set up to favor **the use of biodegradable packaging solutions** that would be collected and treated together with bio-waste streams. Tax landfilling in regions where it is still practiced.
- **Set up international collaboration** to manage globally packaging sustainability worldwide because isolated and scattered local actions lack efficiency to solve global issues such as marine plastic litter.

iv. Further info & contact data

Cordis web site - https://cordis.europa.eu/project/id/773375

Project web site - https://glopack2020.eu/

H2020 CIRCPACK (730423) - Towards circular economy in the plastic packaging value chain

i. Problem addressed and objectives

The main challenges addressed by the project are related to the improvement of recycling economics and quality, the recyclability improvement of multilayer and multicomponent packaging and the reduction of fossil-based resource dependency.

i. Description of the solution

The project validated new packaging solutions made of Biodegradable and Compostable (B&C) plastics from renewable resources (including test of waste cellulose fraction obtained from AHP recycling) for several flexible and rigid packaging applications, notably carrier bags, shampoo bottles, trays and films for fresh food, coffee capsules and flexible boxes. Prototypes demonstrated high performances and were validated by brand owners and consumers with good acceptance. The potential recyclability of the new biomaterials was also demonstrated. A 30% of recycled content was defined for keeping quality, functionality and preserving the shelf life of biomaterial.

In addition, the project developed new eco-designed alternatives for multilayer and multicomponent packaging with better end-of-life impact were designed and validated by brand owners.

All the innovations have been assessed to quantify the improvements in terms sustainability and circularity. Significant reductions, up to 30% and 53%, were achieved on Global Warming Potential and Fossil Resources Scarcity respectively.

ii. Main policy feedback

- to develop new and promote the use of standards as a tool to enhance social acceptance and overcome trade barriers;

- to introduce Green Public Procurement requirements to reward packaging materials that are easy to separate and recycle (e.g.: mono-material, limited number of detachable components, suitable for recycling or up-cycling) and packaging solutions with high rates of recycled content; and

- to reward industrial stakeholders demonstrating promising circular business models for packaging waste through suitable EPR schemes, fiscal incentives or tax exemptions.

With the experience gained during the project, an online tool was launched (https://circpack.fcirce.es) to help packaging manufacturers and designers in the transition to more sustainable packaging and to raise awareness on how to improve the circularity and recyclability of packaging.

i. Further info & contact data

Cordis website - https://cordis.europa.eu/project/id/730423

Project website - https://circpack.eu/home/

7.3.3. RECYCLED CONTENT

7.3.3.1. Scope of this intervention area

This area of intervention address the definition of recycled content and the selected measures aim at an increased uptake of recycled content in plastic packaging.

7.3.3.2. Overview of best practices from projects

The following projects identified and tested key best practices in the field of recycled content. For more detailed info and relevant policy feedback of the projects listed here, see the project fiches in the next section.

LIFE17 ENV/SI/000119 - LIFE CEPLAFIB – the project team developed new compounds such as packaging trays and pipe plugs from used plastics like recycled polypropylene, high-density polyethylene as well as old newsprint paper. When combined, these materials can be used among others **as industrial packaging or protective covers** for pipes. Tests show that these eco-materials are around **half the price of plastic-wood composites currently available** on the market.

H2020 FORCE (689157) – Cities Cooperating for Circular Economy. In Copenhagen, the project demonstrated a successful partnership between the municipality and private companies on how post-consumer flexible plastics can be used as a high-value raw material in production of plastic products in the circular economy.

7.3.3.3. Fiches of projects mentioned

LIFE17 ENV/SI/000119 - LIFE CEPLAFIB

i. Problem addressed and objectives

The project aims at developing recycled plastics that satisfies market needs, particularly for added value applications, and there must be sufficient flows of high-quality recyclates.

The project aims to produce a **new material called CEPLAFIB for the packaging**, automotive and construction industries, **suitable for** extended manufacturing techniques such as **thermoforming and injection moulding**. This will be **made from deinked pulp** (from recycled newspapers), **recycled polypropylene and high-density polyethylene**.

ii. Description of the solution

The CEPLAFIB team developed new compounds such as packaging trays and pipe plugs from used plastics like recycled polypropylene, high-density polyethylene as well as old newsprint paper. When combined, these materials can be used **as industrial packaging or protective covers** for pipes, fastening parts for caravans, decorative panels for facades, soundproofing for walls, and even building blocks for kids. Those products made from recycled materials are just **as reliable and attractive** to consumers **as** those coming from **virgin raw materials**.

Tests show that these eco-materials are around **half the price of plastic-wood composites currently available** on the market.

iii. Main policy feedback

- The approach developed by the project should boost the participating regions' recycling rates of used plastics by 40% and cut GHG emissions by the same figure when compared to current recycling activities.
- This innovation should be easily transferable to other regions and sectors.

iv. Further info & contact data

https://webgate.ec.europa.eu/life/publicWebsite/index.cfm?fuseaction=search.dspPage&n_proj_id=6749

H2020 FORCE (689157) - Cities Cooperating for Circular Economy

i. Problem addressed and objectives

The FORCE project demonstrated 16 value-chain based partnerships for circular economy in 4 European cities – Copenhagen, Hamburg, Lisbon and Genoa. The Copenhagen partnership, among other things, focused on demonstrating how post-consumer flexible plastics can be used as a high-value raw material in production of plastic products in the circular economy. Post-consumer plastics are often difficult to handle as they represent a more complex waste stream consisting of several different products, which contain different colours, adhesives, labels etc. and some of which are laminated. In Copenhagen, flexible plastics make up for around 10-15 % of the total quantity of collected household plastic waste. The collected flexible plastics consist of around 90 % flexible PE (e.g. LDPE, LLDPE), 5 % flexible PP, and 5 % laminated films.

At the same time, there is a business opportunities and cost saving potential in using post-consumer plastics as a raw material.

ii. Description of the solution

The project developed and demonstrated ten prototypes of products, which are produced from post-consumer flexible plastics. One application – ground mat - contains 100% recycled post-consumer PE material, it is characterised by low expected production difficulty level while having high business potential. Another application – chair - contains 100% recycled material and it is characterised by medium expected production difficulty level while having high business potential. Several applications (cable cover, beer shelf, rainwater container, outdoor furniture) contain more than 50% recycled post-consumer PE material.

Prior to the project, none of the already existing applications contained post-consumer flexible plastics and none of the private companies, partners in the project, had been working with this waste stream before.

iii. Main policy feedback

- The work in Copenhagen demonstrated successful value chain partnerships where the city authority played an important role collaborating with the private sector and steering innovations with clear economic benefits for the business.

- The project showed that the used method of sorting the household collected post-consumer plastic produced a polymer purity of flexible PE for the production of the targeted new applications. It is interesting to note that citizens in Copenhagen collect all plastics generated at their households (incl. packaging, non-packaging, rigid and flexibles) into the same bin and the sorting is done at a sorting facility using a windshifter for sorting out a mixed film fraction and a Near Infra-Red scanner (NIR) for sorting the film in PE or PP polymers or rigid PP.

- The processing methods of polymer sorted film with downsizing, density separation, friction washing and melt filtration in pellet production produced a sufficiently clean material for production of the 10 applications.

- It was also observed that printed ink on mixed film produced gasses, which were difficult to remove in the extrusion of pellets. Therefore, a high content of film with printed ink needs more efficient removal of gases during extrusion or even several steps of extrusion. Problems with trapped gases were observed in some applications like tubes and for rotational moulding applications.

iv. Further info & contact data

Cordis website: https://cordis.europa.eu/project/id/689157

Project web site: http://www.ce-force.eu/

7.3.4. ENABLING MEASURES (Hazardous waste, Green Public Procurement, Labelling, Extended Producer Responsibility)

7.3.4.1. Scope of this intervention area

This area of intervention identifies all enabling measures that can support the achievement of the objectives identified by the Regulation. In particular it focuses on packaging and hazardous waste, green public procurement, labelling and Extended Producer Responsibility.

7.3.4.2. Overview of best practices from projects

The following projects identified and tested key best practices in the field related to enabling measures. For more **detailed info and relevant policy feedback** of the projects listed here, see the **project fiches in the next section**.

LIFE16 ENV/IT/000225 - LIFE TTGG– to reduce cheese supply chain Product Environmental Footprint (PEF), pilot activities have defined product benchmarks, datasets for Life Cycle Inventory (LCI) and PEF reduction measures in the pilot companies audited. The tools for simplified impact assessment and the related Environmental Decision Support System (EDSS) are being developed and the sector seems very interested in them. In addition a PEF communication strategy was defined, helping customers to identify the environmental aspects of the products in an easy and clear way, on different types of packaging solutions.

LIFE14 GIE/IT/000812 - LIFE GPPbest – This project delivered multiple outputs and actions, with high impact in Italy and Romania, promoting green public procurement (GPP), including guidelines, regional action plans, GPP green code, or tender pilots.

LIFE16 GIE/IT/000748 - Life GreenFEST – This project developed and tested successfully a set of GPP criteria on cultural events (exhibitions, festivals, musical events). Developed guidelines: http://www.greenfest.eu/documentazione/ .

7.3.4.3. Fiches of projects mentioned

LIFE16 ENV/IT/000225 - LIFE TTGG

ii. Problem addressed and objectives

Dairy products play a major role in greenhouse gas emissions. Solutions are needed to improve the supply chain efficiency of French and Italian cheeses and to analyse and reduce their Product Environmental Footprint (PEF).

The project aims to improve the supply chain efficiency of European hard and sei-hard PDO (protected designation of origin) cheeses by designing and developing an Environmental Decision Support System (EDSS) in order to assess and reduce its PEF.

Two of its specific objectives, relevant to packaging and waste packaging, are: (i) to optimise both environmental and economic performances in farms, dairies and packaging producers, and (ii) to increase stakeholder and consumer know-how about PEF, providing sound, reliable and simple information, which could also be used for green public procurement.

iii. Description of the solution

The pilot activities in the Grana Padano consortium have defined product benchmarks, datasets for Life Cycle Inventory (LCI) and PEF reduction measures in the pilot companies audited. The tools for simplified impact assessment and the related Environmental Decision Support System (EDSS) are being developed and the sector seems very interested in them.

In addition a PEF communication strategy was defined, helping customers to identify the environmental aspects of the products in an easy and clear way, on different types of packaging solutions. Report available in https://www.ttggb3.polimi.it/.

iv. Main policy feedback

- Contacts with important representatives of the EU cheese associations were established, possibly favouring discussions on updates/improvements of the PEF category rules in the Italian dairy sector.

v. Further info & contact data

https://webgate.ec.europa.eu/life/publicWebsite/index.cfm?fuseaction=search.dspPage&n_proj_id=6320

LIFE14 GIE/IT/000812 - LIFE GPPbest

i. Problem addressed and objectives

Green public procurement (GPP) is still not a common and established practice, for few reasons including the fact that it is not recognised as a strategic policy tool and as a result there are no procedures or information systems in place for aiding the inclusion of environmental objectives in procurement practices. Secondly, public administration often does not have the necessary planning tools and skills to actually exploit all opportunities linked to the implementation of GPP.

The main objective of the project was to contribute to the promotion of new patterns of sustainable consumption and to the development and dissemination of best practices and policy approaches, in order to highlight the benefits of GPP and to favour its wider application.

ii. Description of the solution

The project developed and got approval of 22 GPP official acts by the project participants – the Italian regions of Basilicata, Sardinia and Lazio, along with the Romanian environment ministry. Documents approved included the National GPP Romanian Plan, the adoption/upgrade of Regional GPP Plans in Italy and the approval of a local GPP Action Plan for Bucharest. Moreover, other public authorities have adopted similar plans, as a result of their involvement in this project. Packaging and waste packaging are key areas addressed by the GPP guidelines developed by the p

The main project outputs included:

- GPPbest catalogue: 51 best practices and methods were collected. 14 different aspects of the GPP are discussed (e.g. policies, official acts designs, regulations, help-desks, training, green criteria and evaluation methods, monitoring systems, etc.);
- GPP regional Action Plans (Basilicata, Sardinia, Lazio and Romania);
- 36 green tenders developed and published by the project beneficiaries;
- 47 green tenders developed by external authorities with the help of the project;
- a green procurement code adopted in the three central purchase agencies of the regions involved in the project;
- a GPP monitoring system which helped the creation of the monitoring system adopted in 2019 at national level in Italy;
- a GPP guideline supporting public authorities in developing their own GPP plan;
- GPP Action Plan for the city of Bucharest; and
- support for the improvement of the Romanian GPP Law.

iii. Main policy feedback

- Regione Sardegna developed a GPP monitoring system, currently used by several regional authorities, that could also contribute to the definition of monitoring procedures to be introduced at national level.
- A general is that collecting data from public authorities is a difficult task, possibly due to the absence of dedicated departments and personnel experienced with GPP. This finding confirmed the need to standardise monitoring activities and to apply them more frequently to foster the creation of GPP departments in local authorities (the beneficiaries tried to pursue this objective by targeting legislation changes).

iv. Further info & contact data

https://webgate.ec.europa.eu/life/publicWebsite/index.cfm?fuseaction=search.dspPage&n_proj_id=5352

LIFE16 GIE/IT/000748 - Life GreenFEST

i. Problem addressed and objectives

In Italy, since 2016 there is a legal obligation to include Minimum Environmental Criteria (MEC) in the public procurement of works, goods and services. GPP is now mandatory in all procurements and tenders for the purchase of goods, services and works that require intensive energy use and in 50% of contracts and tenders for all other categories of economic activity.

The project aims to disseminate good practices for the adoption of MEC in the field of cultural activities funded, promoted or managed by public authorities. In relation to packaging and packaging waste, the project provided clear guidelines to public authorities: packaging has to be made of at least 80% in weight of recycled material if it's made of paper or cardboard, and at least 60% in weight if it's made of plastic.

ii. Description of the solution

Main outputs of the project include:

- Creation of green tender and regulation templates;
- Guidelines for the implementation of GPP in the cultural sector;
- Publication of 16 green tenders and regulations by the two main regions targeted by the project (Lombardy and Marche
- Developed guidelines: http://www.greenfest.eu/documentazione/

iii. Main policy feedback

- The definition of the MEC for cultural events has been included among the compulsory reforms planned by the PNRR (National Plan for Recovery and Resilience - Recovery Plan). The inclusion of these MEC among the reforms of the Recovery Plan is a binding act.
- The GREENFEST MEC have been formally endorsed also by the Olympic Winter Games of Cortina 2026 and by Fondazione Cariplo.
- The Lombardy Region included the GREENFEST MEC within the Action Plan for Green Tenders (May 2020)

iv. Further info & contact data

https://webgate.ec.europa.eu/life/publicWebsite/index.cfm?fuseaction=search.dspPage&n_proj_id=6283

ANNEX 8: BASELINE AND DEVELOPMENT OF OPTIONS

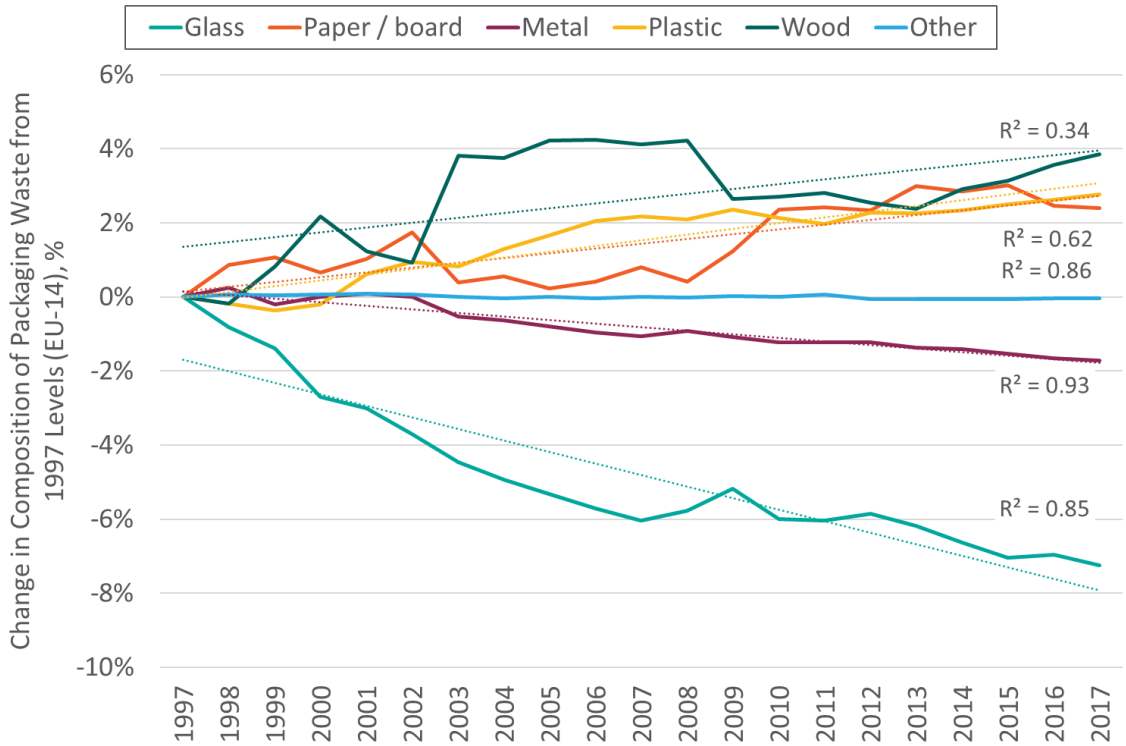
8.1. Baseline

Under the Baseline (also called the Business As Usual), all relevant EU level and national policies and measures are assumed to continue in force within the time horizon of 2030. The situation and problems would evolve as described below and in Annex 6 on problem definition.

8.1.1. Packaging waste

According to Eurostat data, the composition of packaging waste has evolved over time (see Figure 40). The proportion of packaging waste made up of paper and board, plastic and wood has increased, whilst glass and (to a lesser extent) metal are now less prevalent in the waste stream.

Figure 40. Percentage Change in Packaging Waste Generation Composition over Time from 1997 Levels (EU-14) [R2 is the coefficient of determination]



A breakdown of the latest Eurostat data shows the result of these trends. Packaging waste generated in the EU27 is now almost half paper/board by weight. The remaining waste is made up of similar proportions of plastic, glass and wood (in order of highest to lowest quantity), and a minor (approx. 5%) component of metals. The packaging waste composition by weight in the EU27 in 2018 by percentage of materials is:

- 40.9% paper/board;
- 19.0% plastic;
- 18.6% glass;
- 16.2% wood;
- 3.8% steel;
- 1.2% aluminium; and
- 0.3% other.

8.2. Future Projections

The model projects that change in packaging composition, observed in the Eurostat data up to 2018, will continue out to 2035. These trends are based on a combination of Eurostat data (for analysis of trends at the material level) and more detailed market datasets. The data is presented below in terms of the projected total number of uses by material.

Table 15. Packaging Use by Material (2006, 2018, 2030, 2040), Billion Uses

	2006	***2018***	***2030***	***2040***
Glass	*104*	*107*	*95*	*96*
Steel	*44*	*50*	*49*	*51*
Aluminium	*33*	*43*	*50*	*55*
Paper / board	*2006*	*2018*	*2030*	*2040*
Plastic	*660*	*979*	*1,407*	*1,758*
Wood	*1.4*	*1.5*	*1.8*	*2.1*
Other	*4.0*	*4.4*	*4.1*	*4.2*

These data show that use of plastic packaging, already making up almost half (47%) of all packaging used in 2006, has increased significantly historically, and is projected to increase further still, accounting for almost two thirds (65%) of packaging used by 2040. This is equivalent to **almost a doubling in consumption/use of plastic packaging between 2018 and 2040**.

Usage of glass packaging is assumed to decline, despite the general increase in waste generation/consumption assumed due to growing GDP and population. Although consumption increased marginally between 2006 and 2018 (from approximately 104 to 107 billion uses), it will still decrease in the future due to Member States with greater projected increases in population/GDP also having greater historical decrease in glass consumption.

Consumption all other packaging types are assumed to increase, primarily due to general increases in consumption driven by GDP and population growth. However, the proportion of packaging consumption made up of all non-plastic materials is declining. This is most significant for glass packaging, usage of which is projected to almost halve from 2018 to 2040, from 5.9% to 3.5% of all packaging consumption. Usage of metal packaging is also declining, particularly for steel packaging - only 1.9% of packaging is projected to be composed of steel by 2040, down from 2.7% in 2018. The proportion of all packaging consumption that is paper / board packaging consumption is also projected to decrease (even though the absolute amount is forecast to increase.

The overall story is clear, **plastic packaging consumption is on the rise**, and consumption of packaging made from other materials is declining relative to plastic consumption.

The net impact of these assumptions on modelled waste generation is shown in Figure 41. Total packaging waste generated is assumed to **increase from 77.8 million tonnes in 2018, to 92.4 million tonnes in 2030, and 106.6 million tonnes in 2040**.

As **the projected packaging waste generated is correlated with GDP**, the model shows a dip in waste generation coinciding with decreased GDP for Member States resulting from the economic impacts of COVID-19. This is despite estimates that the global packaging market is expected to grow from USD 909.2 billion in 2019 to 1,012.6 billion by 2021[365], driven by a demand for pharmaceutical and e-commerce packaging[366]. While there was a growth in the global size of the packaging market, actual estimates of packaging POM show the opposite trend, one of COVID-19 induced declines in packaging.[367] For the UK, a country similarly affected by COVID-19 as Europe, and likely to be much more representative of trends in packaging waste to Europe than trends in the global packaging market, packaging POM declined from 2019 to 2020.[368] This was driven by a fall in paper, card, plastic and glass POM. Ultimately, COVID-19 increases in E-commerce and pharmaceutical packaging were not enough to offset significant decreases in non-consumer packaging, non-grocery retail packaging, hospitality packaging and C&I packaging.[369] Overall packaging POM demonstrated a 'small dip' from 2019 to 2020, in line with the model's predictions of packaging waste.

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[365] Accumulation of plastic waste during COVID-19, Science 11 Sep 2020: Vol. 369, Issue 6509, pp. 1314-1315 DOI: 10.1126/science.abd9925, available at: https://science.sciencemag.org/content/369/6509/1314

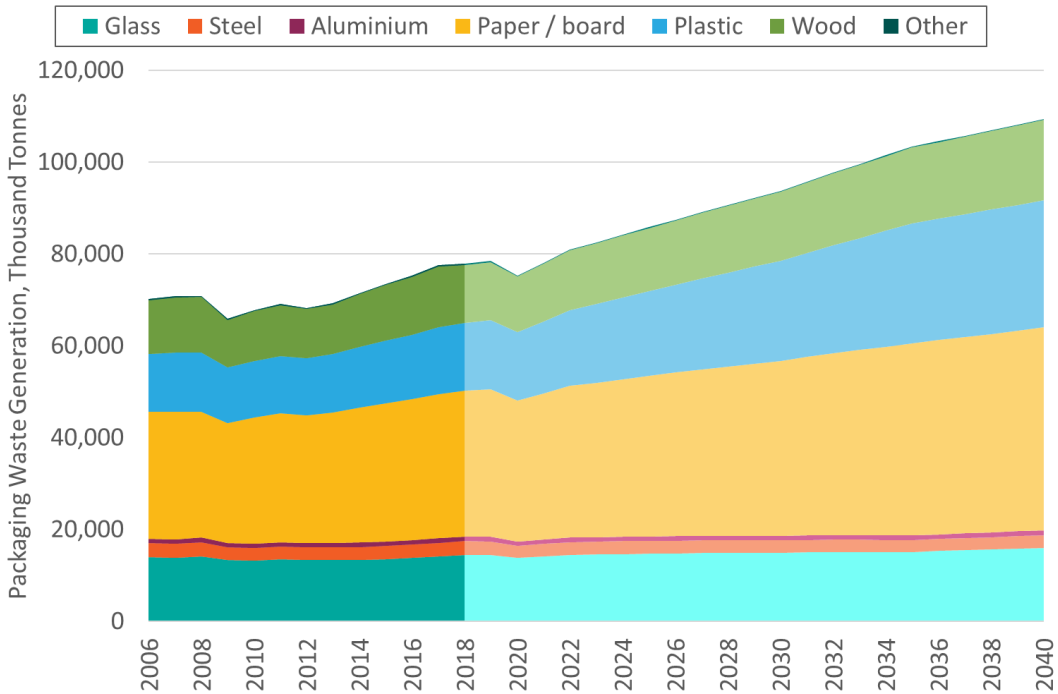
[366] "COVID-19 impact on packaging market by material type, application and region—global forecast to 2021," Business Insider (2020)

[367] PackFlow Covid-19 Phase II, The impact on the compliance landscape for UK packaging recycling 2020-2022, available at: https://wrap.org.uk/resources/report/packflow-covid-19-reports

[368] ibid.

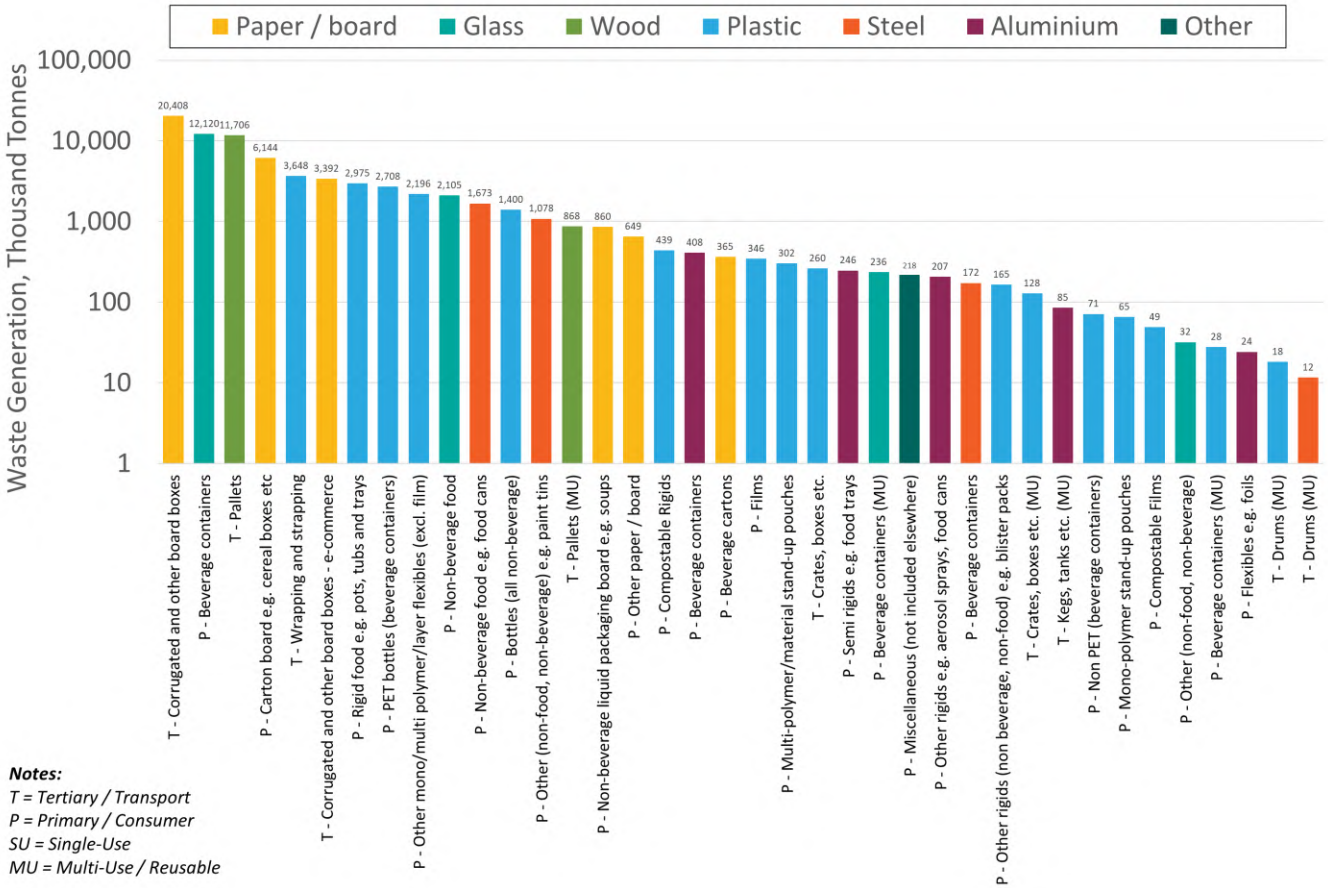
[369] ibid.

Figure 41. Generation of Packaging Waste, Thousand Tonnes



The overall tonnage of waste by packaging type in the latest year of historic data (2018) is shown in Figure 42.

Figure 42. Waste Generation by Packaging Type (2018)



- Corrugated board boxes account for the greatest tonnage of packaging – 20.4 million tonnes – with significant volumes of other paper / board packaging, particularly carton board (6.1 million tonnes).
- Glass beverage containers and wooden pallets each account for approximately 12 million tonnes of packaging waste whilst major plastic packaging types – other flexibles (primary and tertiary), PET beverage containers, pots tubs and trays – each account for between 2 and 4 million tonnes of packaging.
- Moving to packaging types with lower tonnages (between 0.3 and 1.7 million tonnes per packaging type), we see mainly major steel packaging types (e.g. 1.6 million tonnes of food cans) and other plastic and paper / board packaging types. Rigid compostable packaging falls in this weight range at 0.44 million tonnes in weight. This is similar in quantity to aluminium beverage containers which are the major type of aluminium packaging (0.41 million tonnes).
- Packaging types with lower weights are mainly minor plastic packaging types such as mono-layer pouches (65 thousand tonnes) and compostable films (49 thousand tonnes). Reusable packaging types also commonly have lower weights (all are lower than 130 thousand tonnes in weight, with the exception of glass beverage containers and wooden pallets). This is somewhat expected as reusable packaging can be used multiple times and so a lower tonnage (relative to single use packaging) is placed on the market / becomes waste. Considering the breakdown of packaging waste shown in Table 16, the following can be observed for 2018:
    - Glass accounts for the highest tonnage of single use beverage containers (15.6% of all packaging waste vs. 3.6% for plastic), although baseline data also shows that twice as many single use plastic beverage bottles are consumed compared to glass beverage containers (100 million vs. 50 million). Multi-use glass beverage bottles account for a much lower proportion of packaging waste, although usage is similar to single-use containers;

- Steel packaging waste is mainly comprised of non-beverage food containers (e.g. food cans);
- Aluminium packaging waste is roughly half beverage containers with the remaining waste mainly other and semi rigids;
- Tertiary plastic films are the most prevalent type of packaging waste, making up 4.7% of all packaging waste (25% of all plastic packaging by weight);
- Primary rigid plastics are roughly 2.5x more prevalent in the waste composition than primary flexibles (9.4% vs. 3.7%). PET beverage bottles and pots, tubs and trays are the major components of primary rigid plastics, accounting for 3.5% and 3.8% of packaging waste respectively.
- Compostable plastics make up only 0.7% of packaging waste (3.3% of all plastic packaging waste).
- Altogether, tertiary packaging makes up just over half of all packaging waste (52%). Of this the major component is corrugated cardboard, which accounts for over half of all tertiary packaging, and almost a third (30.6%) of all packaging waste.
- Wooden packaging is the other significant tertiary packaging component, making up 16% of all packaging waste.
- Approximately 14% of corrugated cardboard (4.4% of all packaging waste) is used for e-commerce.
- Carton board is also a major component of packaging waste (8%).

Table 16. Packaging Waste Composition (2018) by weight, % [T = Tertiary/Transport, P = Primary/Consumer, SU = Single-Use, MU = Multiple Use]

Material	Packaging Type	Waste Composition by Weight	
		By Material	By Type
Glass	P - Beverage containers	18.6%	15.6%
	P - Non-beverage food		2.7%
	P - Other (non-food, non-beverage)		0.04%
	P - Beverage containers (MU)		0.30%
Steel	P - Beverage containers	3.8%	0.22%
	P - Non-beverage food e.g. food cans		2.2%
	P - Other (non-food, non-beverage) e.g. paint tins		1.4%
	P - Food refill scheme boxes e.g. Loop (MU)		-

Material	Packaging Type	Waste Composition by Weight	
		By Material	By Type
	T - Drums (MU)		0.01%
Aluminium	P - Beverage containers	1.2%	0.52%
	P - Other rigids e.g. aerosol sprays, food cans		0.27%
	P - Semi rigids e.g. food trays		0.32%
	P - Flexibles e.g. foils		0.03%
	T - Kegs, tanks etc. (MU)		0.11%
Plastic	P - PET bottles (beverage containers)	19.0%	3.5%
	P - Non PET (beverage containers)		0.09%
	P - Bottles (all non-beverage)		1.8%
	P - Rigid food e.g. pots, tubs and trays		3.8%
	P - Other rigids (non beverage, non-food) e.g. blister packs		0.21%
	P - Mono-polymer stand-up pouches		0.08%
	P - Multi-polymer/material stand-up pouches		0.39%
	P - Other mono/multi polymer/layer flexibles (excl. film)		2.8%
	P - Films		0.44%
	P - Beverage containers (MU)		0.04%

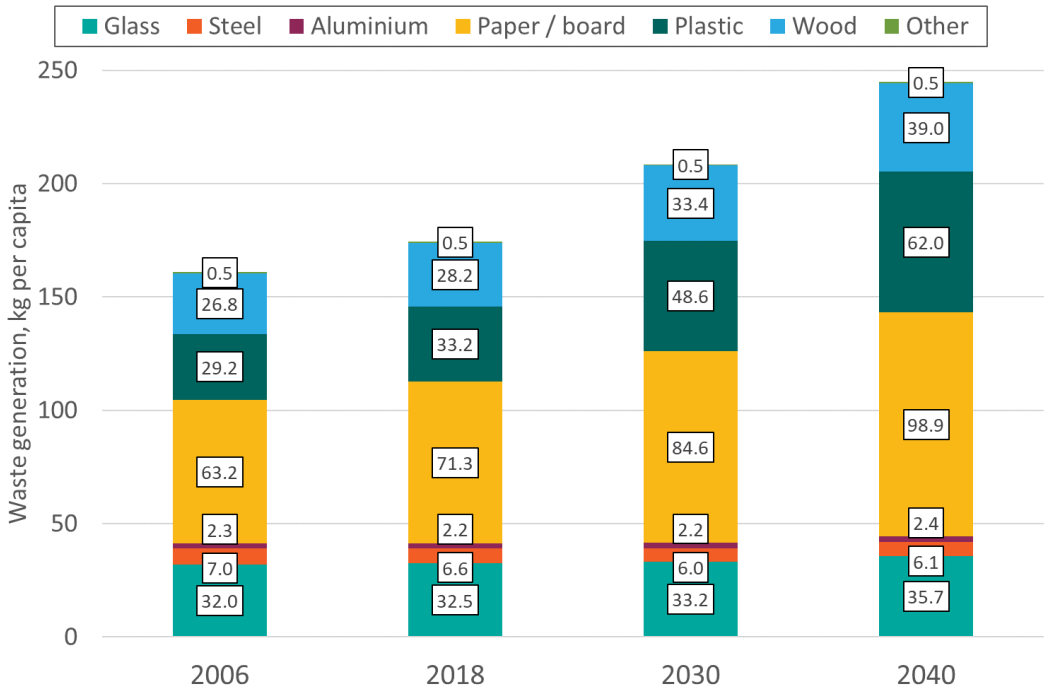
Material	Packaging Type	Waste Composition by Weight	
		By Material	By Type
	P - Bottles (all non-beverage) (MU)		-
	P - Food refill scheme boxes e.g. Loop (MU)		-
	P - Compostable Rigids		0.56%
	P - Compostable Films		0.06%
	T - Film and bubble pouches - e-commerce		-
	T - Wrapping and strapping		4.7%
	T - Crates, boxes etc.		0.33%
	T - Boxes and pouches - e-commerce (MU)		-
	T - Wrapping and strapping (MU)		-
	T - Crates, boxes etc. (MU)		0.16%
	T - Drums (MU)		0.02%
Paper / board	P - Carton board e.g. cereal boxes etc	40.9%	7.9%
	P - Beverage cartons		0.47%
	P - Non-beverage liquid packaging board e.g. soups		1.1%
	P - Other paper / board		0.83%
	T - Corrugated and other board boxes		26.2%

Material	Packaging Type	Waste Composition by Weight	
		By Material	By Type
	T - Corrugated and other board boxes - e-commerce		4.4%
Wood	T - Pallets	16.2%	15.0%
	T - Pallets (MU)		1.1%
Other	P - Miscellaneous (not included elsewhere)	0.28%	0.28%

This output of waste generated by packaging type is the result of the merger, collation and cross-comparison of multiple datasets/sources with varying degrees of accuracy and significant data gaps, and tuned to high-level packaging waste statistics as reported to Eurostat. These tonnages (and any data presented at the packaging type level) are a 'model' of the real-world, which provides the best-possible representation of packaging flows within the constraints of the data and resources available to this study.

Alongside the increase in overall packaging waste shown above, the model shows an increase in packaging waste generated per capita. Historically, packaging waste generated per person has increased from 161 kg (in 2006), to 174 kg (in 2018). This is projected **to increase to 209 kg per capita by 2030, and 245 kg per capita by 2040**, with plastic packaging waste accounting for just under half of this increase (41% of the increase between 2018 and 2040). See Figure 43 below.

Figure 43. Waste Generation, Kg per Capita

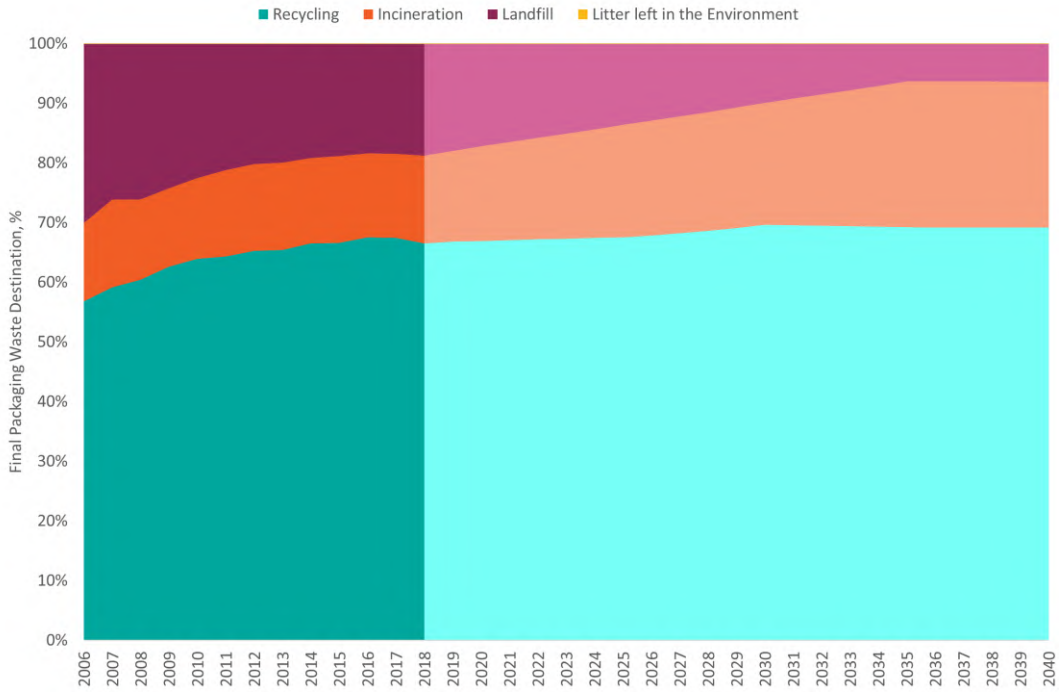


The baseline model indicates **an absolute increase in the use of most plastic packaging, and a decrease in the use of most other packaging types in the period up to 2040**. There are some exceptions to this trend, notably corrugated and other board boxes used for e-commerce which show significant growth of over 7% per annum over this period. Increases in the use of plastic packaging are concentrated in rigid, non-beverage packaging (pots, tubs, trays and other types), pouches and films. Reusable primary packaging (plastic and glass beverage bottles) is shown to continue the historic downward trend in the use of this these packaging types.

8.2.1. Recycling Rates, Residual Treatment and Litter

Waste destinations for all packaging waste are shown in the Figure below. **The overall recycling rate is projected to increase from 66.5% in 2018, to 69.6% in 2030**, as Member States meet or miss the recycling targets set out in the PPWD. **The proportion of waste sent to landfill is projected to decrease from 18.7% in 2018 to 9.9% in 2030, and 6.3% in 2035**. This is a result of progress towards the Landfill Directive (as amended) target of no more than 10% of the total amount of municipal waste sent to landfill by 2035. A minor reduction in litter left in the environment from 2018 to 2030 (0.13% to 0.08%) is also modelled (which is too small a quantity to be visible on the chart). The remaining waste fraction is sent to incineration, which is projected to increase from 14.7% of total packaging waste in 2018, to 20.4% in 2030, and 24.4% in 2035. This increase is a consequence of the modelled interaction of packaging waste recycling targets and landfill targets for municipal waste. The proportion of waste sent to landfill reduces at a greater rate that than the increase in recycling rate, and so there is increasingly more 'spare' residual waste (i.e. not landfilled) which can only go to incineration.

Figure 44. Packaging Waste Final Destinations, Percentages



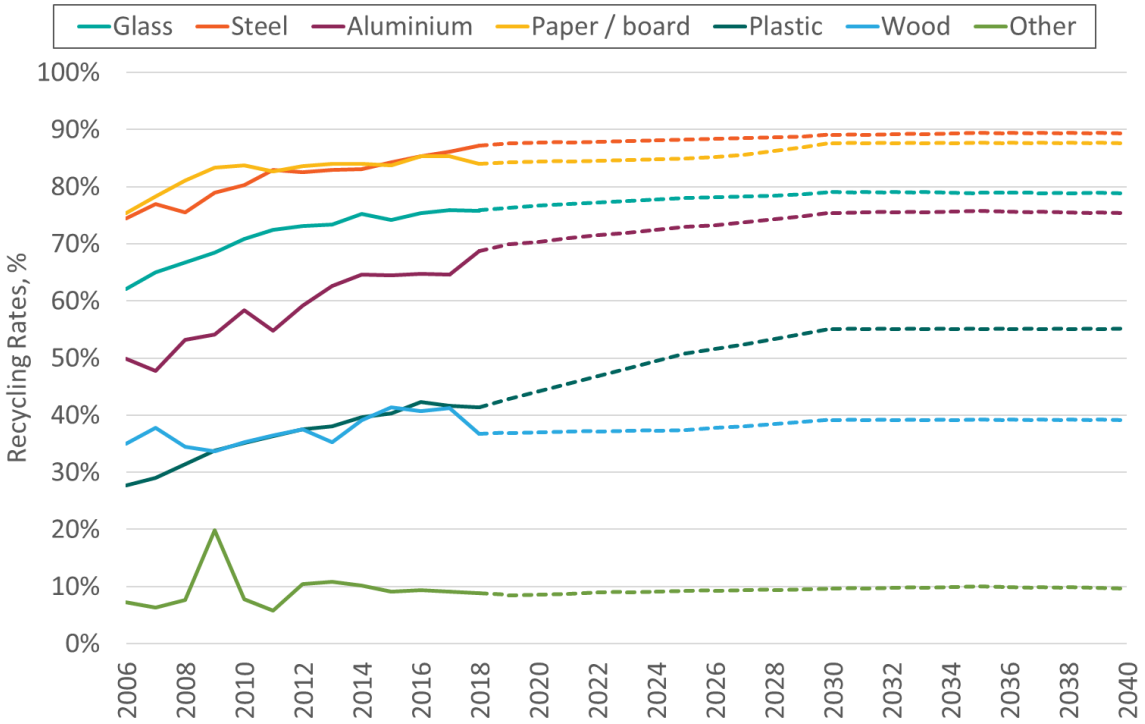
Source: Eunomia Synthesis report

From 2020 onwards, rates reported to Eurostat may reduce relative to recycling rates reported in previous years, due to the potential impacts of the new calculation rules mandated for packaging waste reporting for the 2020 reporting year and thereafter.[370]

As Figure 46 demonstrates, by far **the greatest projected increase in recycling rates between 2018 and 2030 is for plastics**. The highest plastic packaging recycling rate reported for the last complete year of data (2017) is 74.2% (reduced to 69.3% in 2018) whilst the average across the EU27 (as shown) is 41.7%. Thus, on average a 13% increase in recycling rates is required to meet the 55% target set for 2030 in the Packaging and Packaging Waste Directive (with an interim target of 50% by 2025), notwithstanding any additional increase required due to the impact of the new calculation rules on reported tonnages. Modelled increases over the projection period for other packaging materials are lower in magnitude. Moderate increases in recycling rate (2-3%) are required from 2017 to 2030 for glass, steel and paper / board, with a greater increase required for aluminium (estimated at 11% - actual recycling rates are not well understood as Member States are not yet required to disaggregate steel and aluminium tonnages in reporting). These are the average 'distance to targets' across the EU27, and it is important to note that recycling rates modelled at the Member State level vary considerably.

Figure 45. Recycling Rates by Material, %

[370] European Commission (2019) *Commission Decision 2005/270/EC as amended by Implementing Decision (EU) 2019/665*, https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583325017136&uri=CELEX:02005D0270-20190426

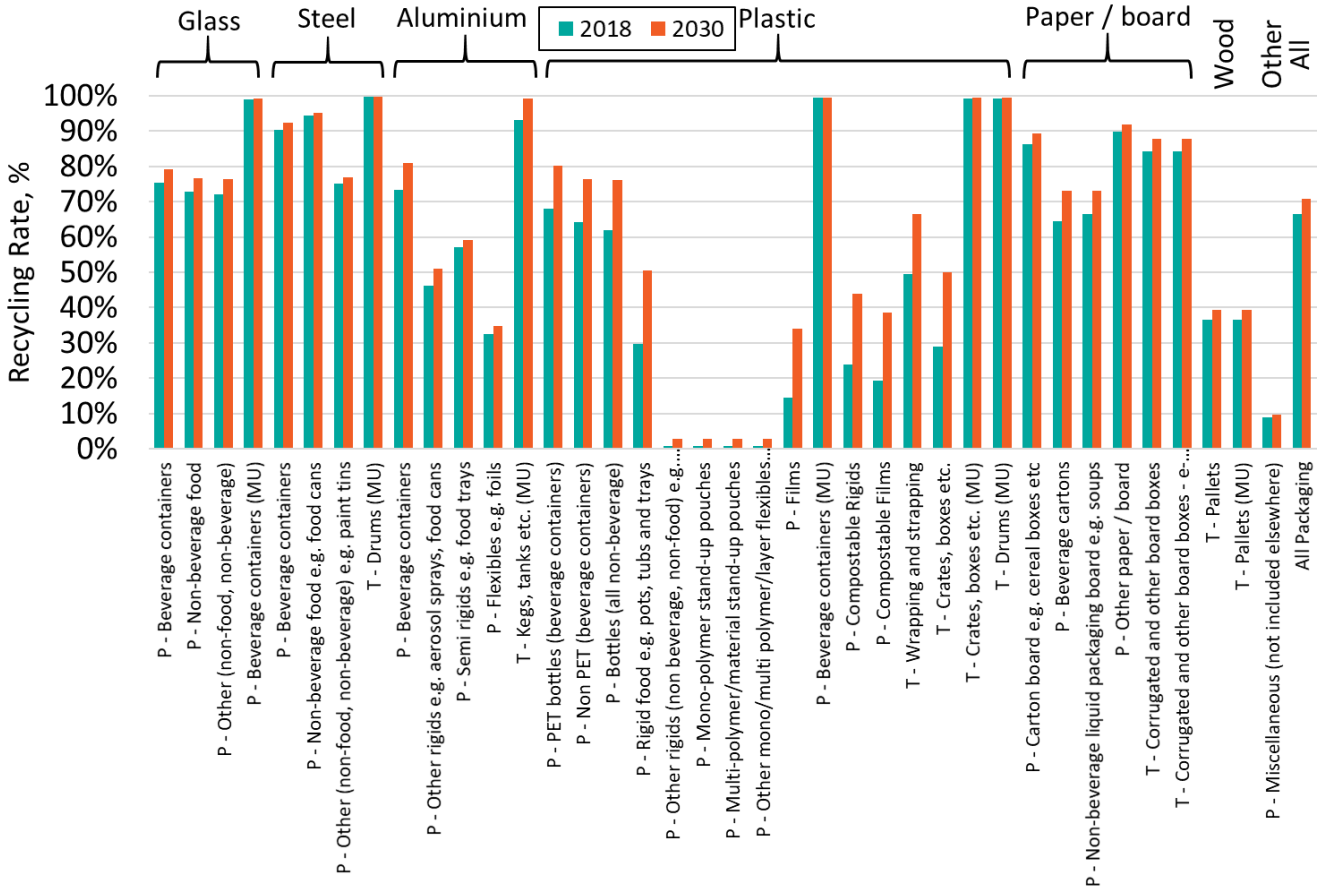


Recycling rates for each packaging type modelled for 2018 and 2030 are shown in Figure 46, which demonstrates the scale of change required at the packaging type level to meet the PPWD targets, particularly for plastic packaging types with moderate to low recycling rates in 2018. Whether this increased recycling is technically and/or economically practical will be a key consideration in any policies which aim to shift consumption from one packaging type to another. In other words, there are two main approaches to increasing recycling rate at the material level: (1) increase recycling rates of the packaging types made up of that material, and; (2) shift consumption away from packaging types with lower recycling rates, therefore improving the overall average recycling rate at the material level.

Packaging types with high recycling rates show a lower increase in recycling rate relative to packaging types with more moderate recycling rates. The rational is that, in general, high recycling rates demonstrate that waste management systems are already optimised and therefore further gains in recycling are more difficult to achieve and therefore lower in magnitude. This can be seen, for example, for paper/board, where packaging types with moderate (e.g. approximately 60%) recycling rates in 2018 are modelled to increase more than packaging types with recycling rates closer to 80/90%.

Conversely, packaging types with very low (<10%) recycling rates in 2018, will show a lower increase in recycling rate relative to those with more moderate rates (i.e. for any given change in the overall – material level – recycling rate). Packaging types at these recycling rates are commonly not recyclable, or only using very specialised technologies. It is often the case that even with advances in investment in recycling technologies that recycling of such packaging remains very niche, given economic and technological constraints. This can be seen, for example, in the difference in greater change in recycling rate for pots, tubs, and trays relative to plastic pouches.

Figure 46. Recycling Rates by Packaging Type, %



Close to 100% recycling is observed only for MU packaging, which is virtually all recycled at end of life (after multiple cycles of reuse), according to discussions with stakeholders.

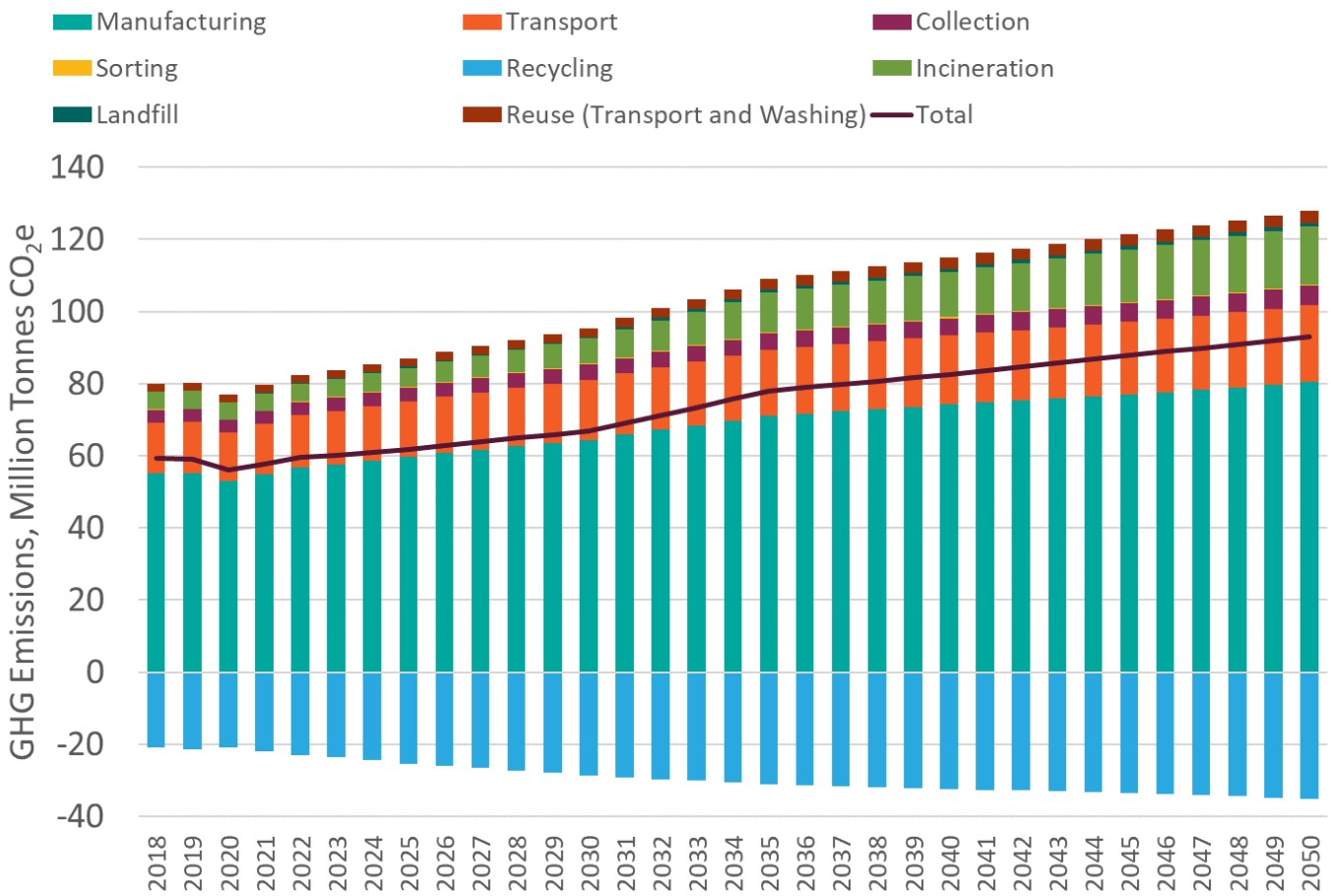
8.2.2. Environmental impacts

8.2.2.1. Greenhouse Gas Emissions

Greenhouse gas (GHG) emissions, in terms of tonnes of CO2 equivalent, are modelled by packaging type based on unit factors for manufacturing, waste management (recycling, incineration and landfill), and emissions from the washing and transport of reusable packaging.

The overall modelled change in GHG emissions over time are shown in Figure 47. Manufacturing emissions account for the largest proportion of GHG emissions, and so emissions are modelled to increase over time due to predicted future growth in packaging placed on the market. An increase in material placed on the market also requires more transport of material, more waste collection and more sorting, all of which leads to an increase in emissions from these sources.

Figure 47. Greenhouse Gas Emissions, million tonnes CO2e



Overall emissions **increase from 59 million tonnes CO_2e per annum in 2018 to 66 million tonnes CO_2e in 2030**. Emissions are projected to increase further to 93 million tonnes CO_2e per annum by 2040. This means that whilst emissions from packaging use only account for 2% of total CO_2 emissions in 2018 (total CO_2 emissions of approximately 2.5 billion tonnes)[371], they could claim a more significant percentage in 2050.

The GHG impact of recycling is negative because it avoids emissions associated with extraction/processing to produce primary material. The emissions from recycling are calculated as the difference between the emissions from reprocessing waste into secondary material and the emissions from primary extraction/processing. The former value is almost universally lower than the latter, meaning the GHG impact comes out as negative. Recycling does increase over time, both due to more material being placed on the market, and a greater proportion of collected waste being sent for recycling (driven primarily by the requirement to meet PPWD recycling rate targets). However, these 'negative' emissions from increased recycling are not sufficient to offset the larger increase in GHG emissions from manufacturing and other sources described above.

[371] Eurostat (2020) *Air emissions accounts by NACE Rev. 2 activity [env_ac_ainah_r2]*, Accessed 30th June 2021, https://ec.europa.eu/eurostat/databrowser/view/env_ac_ainah_r2/default/table?lang=en

Figure 48 and Figure 49 show GHG emissions, in units of kg CO2 equivalent per tonne placed on the market (equivalent to waste generated) by material for 2018 and 2030.

Figure 48. Greenhouse Gas Emissions, Kg CO_2e per tonne PoM / waste generated (2018)

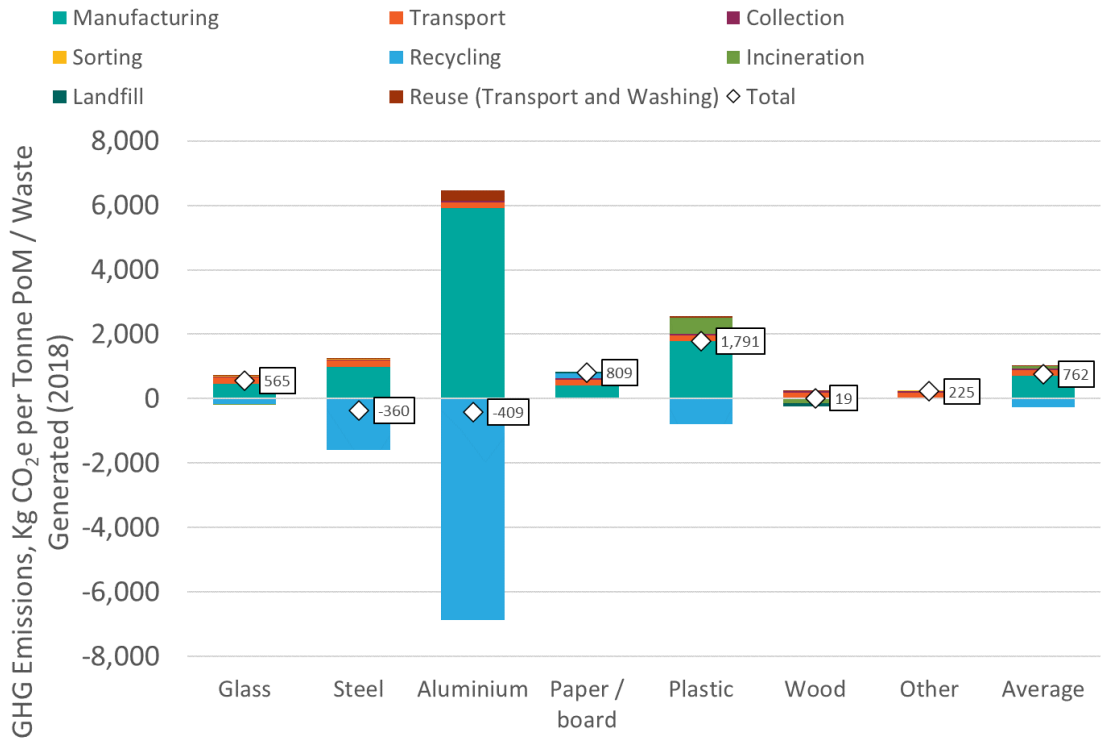
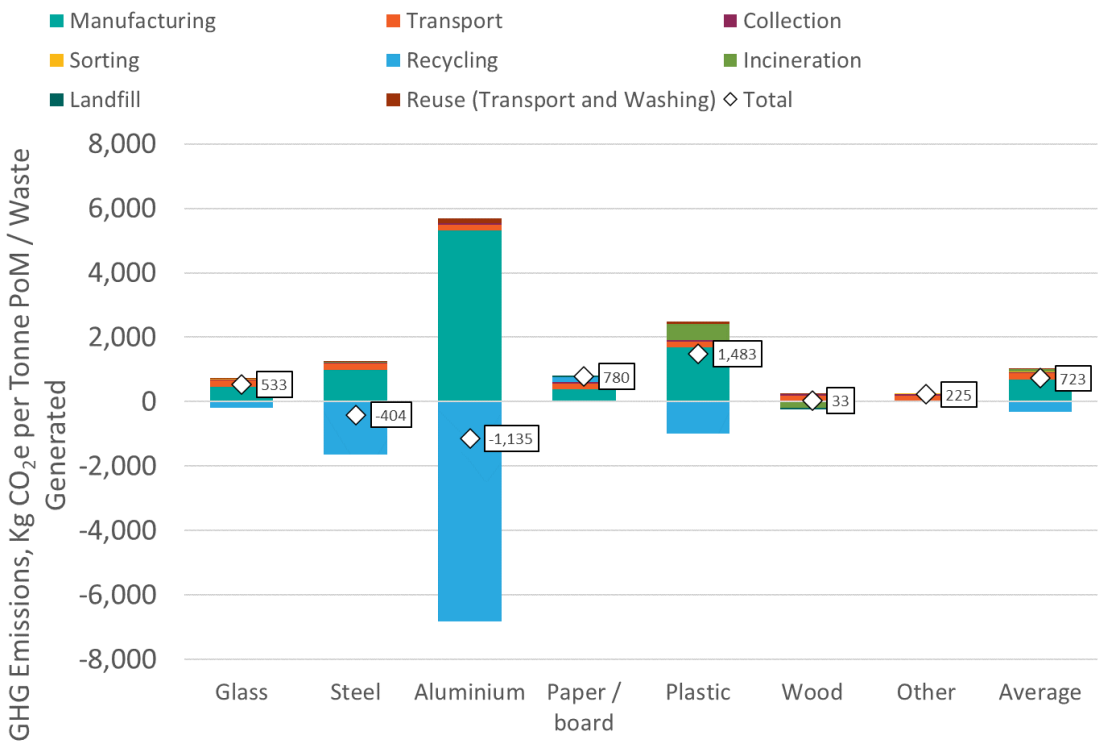


Figure 49. Greenhouse Gas Emissions, Kg CO_2e per tonne PoM / waste generated (2030)



This shows that **plastic packaging is the most carbon intensive**, at a total of 1.8 tonnes of CO_2 emitted for the lifecycle of one tonne of plastic packaging placed on the market in 2018. This reduces to 1.5 tonnes by 2030, due to greater avoided emissions from recycling and a small reduction in manufacturing emissions per tonne due to the increase of recycled content in plastic beverage bottles to 30%, as stipulated in the SUP Directive. However, even with this increase in recycling rate (which is a greater relative upward shift in recycling rate than for other packaging types), plastic packaging is still more carbon intensive than other packaging types. There are various reasons for this:

- GHG emissions from manufacturing are significant and higher than all materials apart from aluminium, which is a very energy intensive material to extract.

- Plastic is composed of fossil carbon, and so leads to significant GHG emissions when incinerated.

- Avoided emissions from recycling are not sufficient to offset these positive emissions, even at higher recycling rates (55% average recycling rate in 2030).

The next most carbon-intensive types of packaging are paper / board and glass, which have emissions of 809 and 565 kg CO_2e per tonne packaging respectively. Wood packaging has very low net emissions – 19 kg CO_2e per tonne packaging. This is due to avoided emissions from recycling and incineration. Net emissions from incineration of wood are negative (avoided) because energy is generated, thus offsetting generation from other sources on the grid and CO_2 emissions from incineration of wood are biogenic carbon and therefore not counted (only fossil CO_2 is in scope). Finally, net emissions from steel and aluminium are negative i.e. there is a net carbon benefit from usage of these materials. This is because of the significant level of recycling of these materials (87% recycling of steel, and 69% of aluminium in the EU27 in 2018), and the relatively high carbon benefits that this leads to as increased recycling avoids the need for relatively energy intensive material extraction processes and manufacturing of metal packaging.

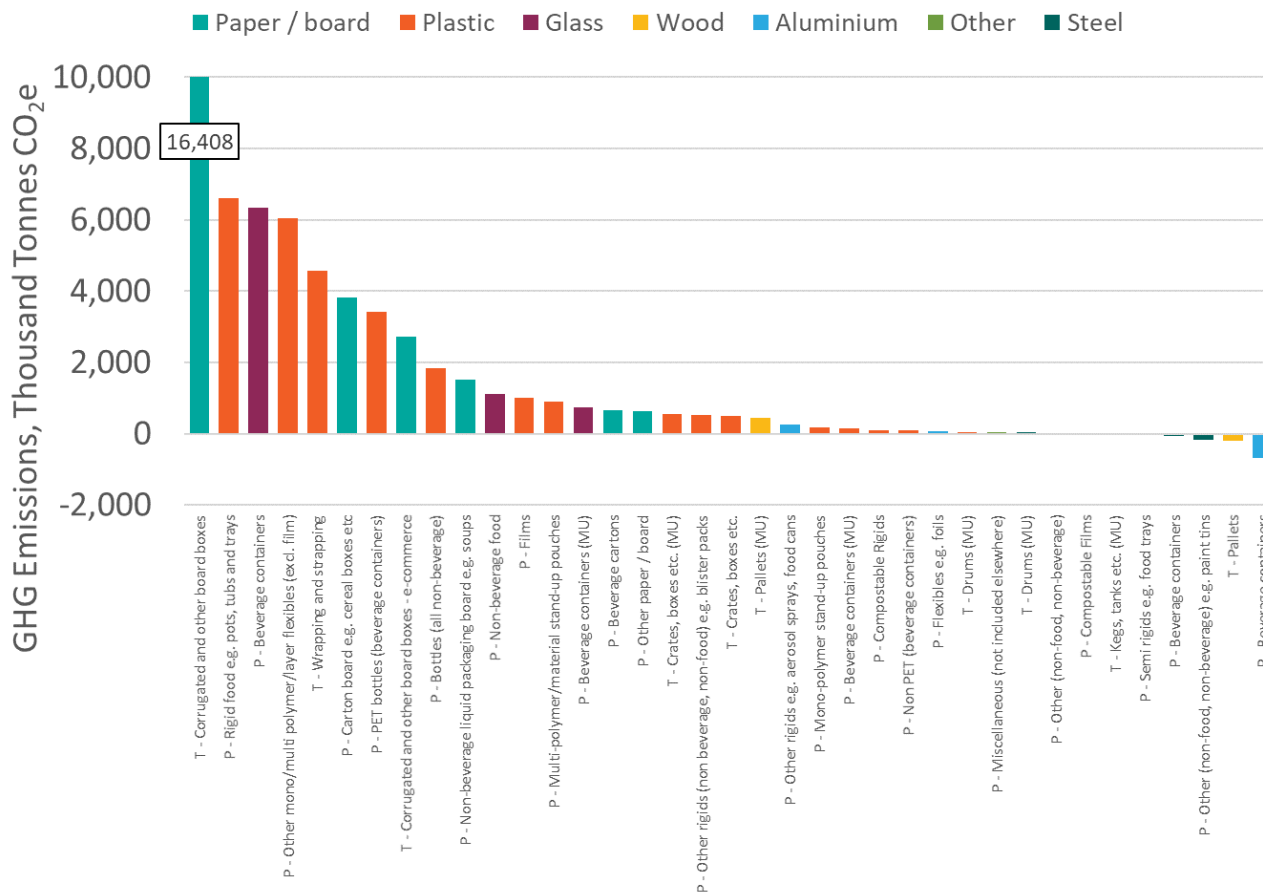
GHG emissions by packaging type are presented in Figure 50 for 2018. The highest emissions are associated with corrugated cardboard (note actual value of 16,408 thousand tonnes CO_2e is off the scale of chart). This is unsurprising considering that the tonnage of corrugated cardboard is almost double any other packaging type. The major types (pots, tubs and trays, films, PET bottles etc.) of plastic packaging also account for relatively high GHG emissions – whilst tonnages are significant (approx. 2-4 million tonnes placed on market), the ranked position of these types relative to other packaging types is mainly due to the higher relative emissions from plastic on a per tonne basis. Other packaging types with large PoM volumes, such as glass beverage bottles and carton board, also show high GHG emissions.

The model also enables the comparison of the GHG emissions per use.

- For single-use (SU) items, every use means that one unit of packaging is manufactured, used and subsequently disposed.
- For multi-use (MU) (reusable) packaging, one unit of packaging can be used multiple times, and thus impacts from manufacture and waste management per unit are apportioned to each use according to the estimated number of uses before waste. Additional emissions for multi-use packaging from transport during reuse cycles and washing are also accounted for.

In nearly all cases, the use of multi-use packaging leads to lower GHG emissions over the lifecycle of the product. For multi-use, whilst manufacturing impacts are greater at first (due to more weight/volume of material used per unit compared to single use), once apportioned on a per use basis they are much lower than for single use packaging. Washing and transport emissions are not insignificant, however, these emissions are significantly outweighed in most cases by the greater per use emissions from manufacturing and waste management for single use items.

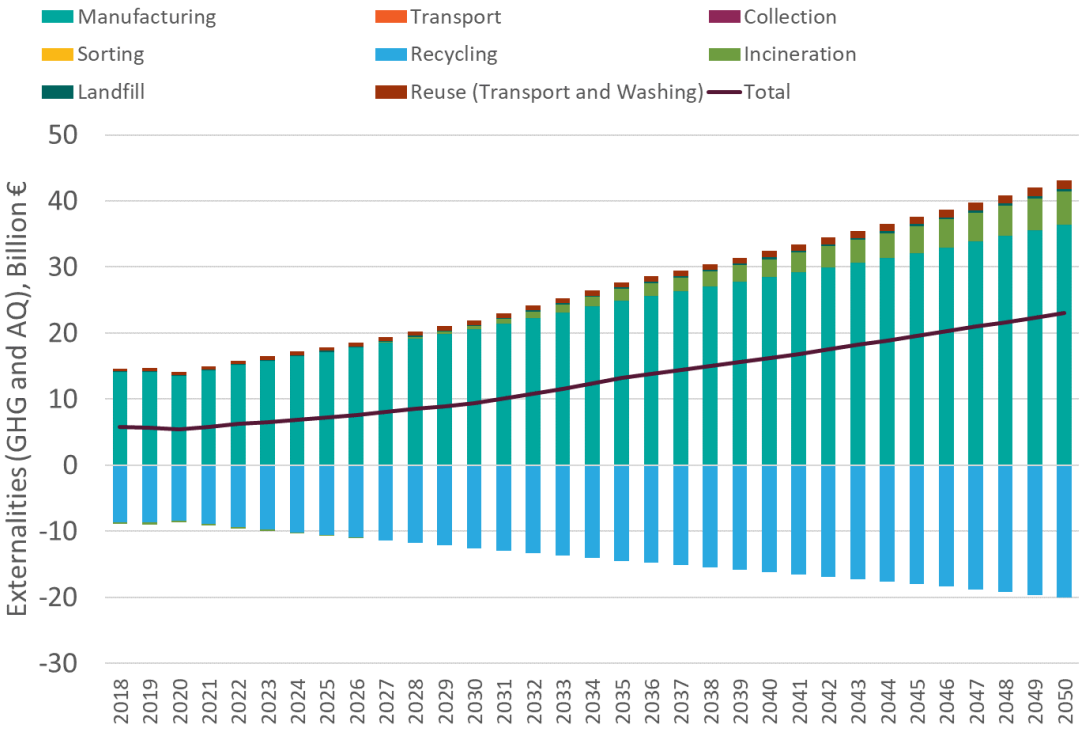
Figure 50. Greenhouse Gas Emissions, Thousand Tonnes CO_2e (2018)



8.2.2.2. Externalities

Environmental externalities include the combined damage costs of emissions from greenhouse gases and other air emissions, including substances such as NOx, SOx and particular matter. Externalities for the baseline over time are shown in Figure 51, which demonstrates similar trends in externalities as observed for GHG emissions. The environmental externalities are projected to increase from EUR 5.9 billion in 2018 to EUR 9.4 billion in 2030 and EUR17.1 billion in 2040, under business as usual. Annex 4 discusses monetisation of greenhouse gas emissions.

Figure 51. Environmental Externalities (GHG and AQ), Billion EUR



8.2.2.3. **Litter**

Environmental benefits from the reduced disamenity of litter have been modelled in previous work, for example the recent by ICF and Eunomia study in support of the Impact Assessment for the Single Use Plastics Directive.[372] These are not modelled in this study for various reasons.

Firstly, none of the policies modelled directly target any reduction in the rate of littering. This is in contrast to policies such as DRS and Extended Producer Responsibility schemes for litter (as modelled in the SUP work) which do have a direct impact, that is, by reducing littering rates and increasing collection rates respectively.

Some reduction in littering is likely for many of the measures modelled in this study. For example, waste prevention measures will lead to a lower tonnage of material placed on the market, and so, even if the littering rate – that is, the proportion of waste generated that is littered - remains unchanged, the tonnage of litter dropped will be lower. A similar outcome is likely for reusable packaging measures – with less single use packaging on the market there will be less potential for littering, even if consumer behaviour is largely unchanged (e.g. the rate of littering remains similar). Any reduction in littering, where it is

[372] ICF and Eunomia Research and Consulting Ltd (2018) *Plastics: Reuse, recycling and marine litter – Impact assessment of measures to reduce litter from single use plastics*, May 2018

likely to occur, is therefore more of a beneficial 'by-product' of the measures proposed, rather than a direct outcome.

Secondly, many of the measures proposed in this study lead to significant environmental benefits (prior to accounting for any benefit from reduced littering), for example, through a reduction in manufacturing, or increase in recycling. Any modelling of the reduction in litter disamenity would be in addition to these benefits, which already clearly demonstrate the benefit of many of the proposed measures quantified in this study. There is still a high degree of uncertainty on the precise value of the unit disamenity of litter, given the relatively few studies conducted on this to date. Due to these reasons, it was considered that the inclusion of littering in our environmental modelling would not improve the robustness of this study.

8.2.2.4. Overview of the baseline

The baseline model provides a clear indication of how packaging and packaging are likely to develop up to 2050 based on current trends and if policy action is not taken. **The projected increase in packaging waste, both in absolute terms and per capita, suggests that the ambitions of the Commission for climate-neutral, resource-efficient economic growth with an increasingly circular economy set out in the European Green Deal are not compatible with the baseline scenario**. Similarly the baseline scenario will not achieve the objectives of reducing over-packaging and ensuring that all packaging on the EU market is reusable or recyclable in an economically viable way by 2030 as set out in the nCEAP and adopted in March 2020. The baseline model also indicates that **the packaging waste and packaging sector will continue to contribute substantially to GHG emissions through to 2030, inconsistent with climate change obligations**.

The baseline model is only one possible scenario, assuming that no new policies are put in place to achieve the climate-neutral, resource-efficient economic growth with an increasingly circular economy put forward in the European Green Deal.

8.3. Identification of Measures and construction of policy options

This section describes the process for identifying measures to consider in this impact assessment, and the formation of the policy options that group them together.

- through reference to the Essential Requirements scoping study[373] and the support study for this impact assessment;
- stakeholder engagement, such as the Online Public Consultation, several workshops and dedicated interviews[374]; and
- stated objectives and measures in the European Green Deal[375] and new CEAP[376] (e.g. implementation of recycled content targets).

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[373]

[374] See Appendices F – Online Public Consultation and E – Stakeholder Synopsis Report of the support study

This longlist of measures was **screened against seven limiting criteria**:

- The measure cannot be phrased as 'a measure' and/or at EU level;
- The measure does not treat Member States of different types / income levels fairly;
- The measure does not treat different packaging materials fairly;
- The measure constrains the potential for innovation;
- The measure may lead to a further fragmentation of packaging across the single market;
- The measure is unfeasible to monitor and enforce; and
- The measure does not relate specifically to waste prevention and/or is already implemented.

If a longlisted measure met any of the seven limiting criteria, it was screened out from the process. Section 'Long list of measures' below identifies those which have been screened out and why. Overall, more than 40 measures were taken forward for further analysis. These are set out in Section 5 of the Staff Working Document of the Impact Assessment report and presented below. As well as the baseline, there are three policy options identified.

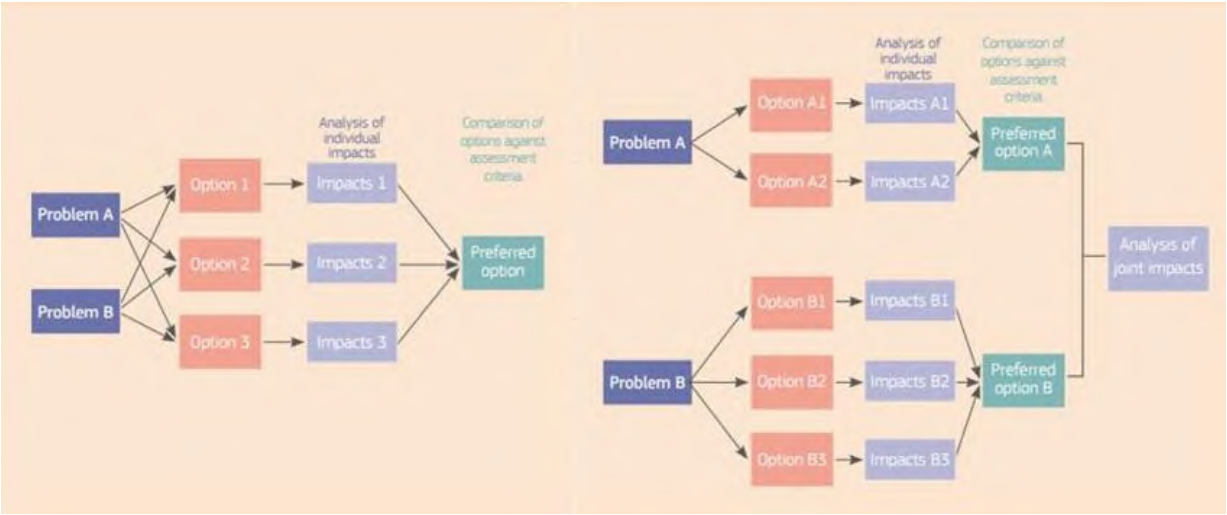
- The baseline scenario reflects the anticipated situation out to 2035 based on a "no policy change" scenario, i.e. it includes all relevant EU-level and national policies and measures which are assumed to continue in force and reflects possible developments of these in the absence of new EU-level action.
- Option 1 contains measures related to the **Better standardisation and clearer Essential Requirements**. These measures tend to be pre-requisites for measures in other groups.
- Option 2 contains **Mandatory targets and stricter requirements**.
- Option 3 contains the **far-reaching legal requirements and more ambitious mandatory targets**.

In general, the Commission has identified problem options as being linked or separate. Where problems are linked – as in this case – the best practice is to ensure that policy options respond to all problems together (see diagram below: source Regulatory Scrutiny Board Annual Report).

Figure 52. Alternative approaches to defining options

[375] European Commission, Communication From The Commission, The European Green Deal, Secretariat-General (2019) https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52019DC0640

[376] COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A new Circular Economy Action Plan For a cleaner and more competitive Europe, COM/2020/98 final



Annex 9 sets out the measures in each policy option (so their content) and provides analysis of each measure as a constituent part. This is done by the areas of intervention, to allow for easier comparison of alternative measures and to keep the analysis manageable. This is then brought together in analysis of the policy options overall, presented in the next section ("Overview of the policy options"). This allows for identification of the pros and cons not just of the policy options, but also of the measures making them up (in case a policy option could be improved by the removal of an individual measure).

This section provides an overview of the 3 policy options proposed as alternatives to the baseline scenario. Each policy option includes a set of measures, which are described in full detail in Annex 9, and listed in the policy options table in Chapter 5. As shown in that table, for a given policy option, the measures are grouped per the following intervention areas:

- Prevention and reuse
- Recyclability and compostability
- Recycled content, including biobased content
- Enabling measures

When a measure is relevant to several intervention areas, it is included in the one to which it is more closely related.

Option 1: Better standardisation and clearer Essential Requirements

This option contains a set of measures aimed at improving or promoting standardisation and clarifying certain aspects of the packaging Essential Requirements. Most of these measures are pre-requisites for measures in other policy options.

Four measures address **prevention and reuse** (M1, M10+M19, M5):

M1 Update of Essential Requirements to minimize over-packaging

This measure would entail:

- providing a more precise definition of the essential requirement related to manufacturing and composition of packaging (Annex I of PPWD), which would include a definition of the term "overpackaging", to facilitate appropriate prevention action by producers (in designing and specifying packaging) and enforcement action by market surveillance authorities;
- incorporating in an annex the list of function-critical performance criteria currently included in European Standard EN 13428, as basis to define overpackaging (a package is not oversized if any reduction in size would affect packaging performance under one of these criteria, preventing its placing in the market);
- updating the harmonised definition of reusable packaging, to be followed by an implementing act setting out enabling conditions for beneficial use of reusable packaging and standardisation of reusable packaging formats and effective reuse systems for certain packaging applications;
- harmonised definition of when reusable packaging is not classified as waste.

M10a Revision of existing CEN standard

The Commission would request CEN to update the current standard EN 13429:2004 with regards to definition of reusable packaging, reusable packaging format and design, reuse systems requirements, return infrastructure and incentivising consumers, supply chain and logistics as well as public engagement. The updated standard will provide a reference point for industry to improve the performance of reuse systems and facilitate their adoption. The effectiveness of this measure is increased when it is complemented by measures 10b and 10c. The administrative burden is mainly related to the development of an updated standard based on Commission's formal request. As with the current standard, the stakeholders would be able to show compliance with the essential requirement on reuse by complying with the harmonised standard, which however, will cover more issues. As a supporting measure, it is not possible to attribute any share of the outcomes assessed under economic, social and environmental impacts but it will support delivery of reuse. There is

broad support for CEN standardization from across the spectrum of stakeholders, as long as it takes into account current standards. Two criteria stood out as being of importance for the guidance: the recyclability of reusable packaging and the minimum number of rotations required.

M19 Providing clarity on the definition of reuse activity versus a "preparing for reuse" activity

The harmonised definition of when reusable packaging is not to be classified as waste would clarify that reusable packaging is waste only once it has reached the end of its useful life and is discarded. It would not be classified as waste, even if it is cleaned and reconditioned by a third party and is not returned to the same user. This definition would provide legal certainty and a simplified framework to allow for the development of a market for reusable packaging.

M5 Minimization of empty space in packaging in selected sectors, including e-commerce

This measure tackles the problem of packaging which has a substantial 'empty' or 'void' (non-product) space, which is relevant in particular in e-commerce/distribution sector. It was identified as problematic also for electronics, toys, hardware/Do-It-Yourself and cosmetics.

The measure would set a maximum % of allowed void space and would be set in such a way as to eliminate the worst offenders.

Further measures setting out packaging minimisation thresholds, be it in volume or weight in relation to the packed product would be specified with implementing measures in the context of the Sustainable Products Initiative, in particular for sectors where packaging represents an important sustainability issue, but excluding food and feed sectors.

In the area of **recyclability and compostability,** four measures are envisaged (M21, M22a, M28, M29a):

M21 Update of Essential Requirements: by 2030 all packaging to be reusable or recyclable, and reusable packaging to be recyclable (with exemptions)

This measure will set 2 requirements:

- all packaging in the market shall be either reusable or recyclable by 2030. In this way the energy recovery option through incineration will be gradually phased out, and focus will be on packaging waste prevention, reuse and recycling;
- reusable packaging placed on the market shall be recyclable by 2030.

M22a Qualitative definition of recyclable packaging

The objective is to set out a clear definition of the term 'recyclable packaging', which is currently missing in the EU legislation and is needed to make the essential requirements more implementable. The measure would help operationalising measure M21.

This measure would introduce a clear **qualitative** definition.

M28 Updates of Essential Requirements and EN 13432: clarifying biodegradability and compostability concepts

This measure would entail an update to the Standard EN 13432 on "Packaging requirements for packaging recoverable through composting and biodegradation" to ensure that actual composting conditions currently occurring within European biowaste treatment facilities are considered in the standard. It will also require removing the reference to the concept of biodegradability from the current essential requirements.

This will reduce the likelihood that compostable packaging causes operational problems with organic treatment systems, resulting in poor compost quality, and reduce the littering problem of compostable packaging, which does not readily biodegrade in all natural environments.

In addition, *M29a* would *allow both compostable and conventional plastics for selected plastic packaging types.* The use of compostable plastic packaging would not be allowed for other packaging types.

In the intervention area on **recycled content**, measure 37 on *Definition of Recycled Content and measurement method* is envisaged.

There is currently neither a definition of "recycled content" nor a methodology for measuring recycled content in packaging.

This measure provides a basis to introduce recycled content requirements in the legislation. A key objective of recycled content requirements is to support the market in secondary raw

materials. Themeasure is a necessary to ensure consistency, comparability and transparency in the use of terms and calculations.. It would involve establishing a harmonised methodology for the calculation, reporting and verification of recycled content levels in packaging. This would be done with a subsequent implementing act.

Finally, four **enabling measures** are included in this policy option:

M31 Update of definitions concerning hazardous substance

The current PPWD does not require that packaging should be kept free from all hazardous substances, including throughout the loop of recycling. This measure proposes to review the objectives of the Directive – Article 1- by including protection of human health and the whole life cycle of packaging, when establishing requirements on the content of hazardous substances in packaging. Furthermore, this measure proposes to update the Essential Requirements and replace the wording "noxious and other hazardous substances and materials" with "substances of concern" as defined in the Chemical Strategy.

M32a Expanding the information on hazardous substances based on existing information

Under this measure existing information is collected and analysed in order to obtain a better understanding about substances of concern in packaging, via some or all of the following approaches:

- Data analysis of substances of very high concern notified in packaging and packaging materials to the SCIP database
- Analysis of packaging-relevant notified uses under Article 7(2) of REACH and of relevant identified uses in REACH registration dossiers.
- Analysis of information on substances in packaging material in the scientific / technical literature and building upon relevant projects, such as the Plastics Additives Initiative[377].

Existing information would be used to identify and prioritise relevant substances of concern in packaging for which potential additional risk management actions, such as the imposition of limitations or restrictions could be envisaged.

[377] This joint project by ECHA and industry resulted in a list of over 400 functional additives or pigments used in plastics, including information on the polymers they are most commonly found in and the typical concentration ranges. The mapping considered substances registered under REACH at above 100 tonnes per year, and focused on plasticisers, flame retardants, pigments, antioxidants, antistatic agents, nucleating agents and various types of stabilisers. https://echa.europa.eu/plastic-additives-initiative

M27c-y Update of current material-based labelling

This measure further harmonizes the existing packaging labelling system based on the alphanumerical codes for different packaging materials as detailed in Article 8 of the Packaging and Packaging Waste Directive and Decision 97/129/EC[378] and envisages the review of the Decision.

Option 2*: Mandatory targets and stricter requirements*

Option 2 will introduce mandatory targets in order to substantially reduce packaging and packaging waste, increase the reuse of packaging and the uptake of recycled content in packaging, in particular in plastic packaging. Furthermore, this Option will introduce reinforced measures and stricter requirements compared to the baseline on recyclability and compostability and additional requirements in relation to enabling measures. As a result, this Option will allow to achieve higher impacts than the baseline and therefore significantly contribute to achieving the overall objectives for the internal market and the protection of the environment.

Under the intervention area on **prevention and reuse**, Option 2 introduces two new measures (M2b, and M8b) in addition to measures considered in the Policy Option 1**.** Therefore, Measures M1, M10a, M19 and M5 listed under Option 1 will be added to the following measures:

M10b Definitions and mandatory requirements for reusable packaging formats set in eu legislation and standard for some formats

This measure would improve the **legal definition of reusable packaging** in the legislation, including setting a **minimum number of rotations.** In addition, the Commission would issue a request for **standardisation of some reusable packaging formats** (e.g reusable food trays). The economic and social impacts would be higher than under measure 10a, but so would be the environmental performance. It is expected that this measure would contribute to attaining the reuse targets under Measure 8b.

Expected economic impacts include, on the one hand, increased cost for infrastructure development and replacement of the current formats, and on the other hand, reduction of manufacturing costs due to increased efficiency and easier deployment of reusable packaging systems.

378 97/129/EC: Commission Decision of 28 January 1997 establishing the identification system for packaging materials pursuant to European Parliament and Council Directive 94/62/EC on packaging and packaging waste (OJ L 50, 20.2.1997, p. 28 – 31)

Stakeholders agreed that the standardisation of the formats is the most contentious proposition; standards should be considered on a case-by-case basis depending on the sector and the type of reuse. In contrary, NGOs are very keen on standardisation of reusable packaging formats at EU level, as this would be the most effective way of creating a scalable model for major product groups.

M10c Definition and mandatory standards for reuse systems, in terms of incentives, infrastructure, logistics, required reporting etc., set in legislation and standard

This measure consists of improved legal definition of reusable packaging focusing on establishing **requirements for reuse systems,** both in the **legislation and via a request to CEN** to standardise specific reuse systems. Namely, due to a range of reuse systems (e.g., consumer led (refill) vs industry led (return), B2C vs B2B, home vs on-the-go), it is not possible to define a single set of definitions or requirements for all systems in the legislation. The improved legal definition and standard(-s) are expected to contribute to better defining reusable packaging and improve the performance of reuse systems.

In terms of **effectiveness**, this measure would contribute to the reliability of current reporting on reuse and the performance of existing reuse systems, and help drive a transition to reuse in the market. **Economic, social and environmental impacts** are similar to Measure 10a but slightly increased. The only clear s**takeholders'** view was the support for standardisation of reuse systems in the tertiary packaging sector.

M7 Phase out avoidable / unnecessary packaging

A significant element of over-packaging is caused by what might be regarded as 'unnecessary' packaging, including additional packaging layers that are not always necessary (e.g. a plastic tray within a card pack, a cardboard outer layer on a robust tube such as toothpaste), certain forms of collation/multi-pack packaging which are there primarily for the convenience of consumers in handling (and to encourage multi-buys, which can lead to over-consumption), single-serve/use items (such as hotel miniature shampoos, netting for fruit and vegetables, jam portions), and the use of single use packaging (such as cups) for eating in, where reusable and refillable items are perfectly practical.

In these cases, where the packaging is not seen as being strictly necessary to protect and preserve the product, it seems appropriate to aim for an outright elimination, to be phased in over time.

M2b Mandatory target of 5% reduction of packaging waste per capita by 2030 compared to 2018

Member States are given a target to reduce the absolute packaging waste figure in terms of the kg/person of packaging waste (which we might call packaging waste 'intensity'), relative to a 2018 baseline. The targets are normalized as a kg per capita figure, to take out the effects of population growth or decline in the EU and are to be achieved in 2030 and 2035. The measure takes into account that the waste generation is increasing and will reach 92.4 Mt in 2030 and 106.6 Mt in 2040 if no action is taken. Meeting the target of 5% would entail an overall absolute reduction of around 19% on average across the EU compared to the 2030 baseline.

In terms of implementation, this measure will have significant implications for Member States and potentially the sector organisations in coordination between and establishing the different actions that contribute to the reduction.

The measure will be complemented by measures M1 (over-packaging), M5 (void space) and M7 (phase out of unnecessary packaging) as well as measure 8b on reuse targets. Measure 3(weight limits), which could complement this measure is not in the preferred policy option, but will be enacted via sector specific implementing measures under the Ecodesign for Sustainable Products Regulation[379]

Finally, *M8b Mandatory targets to increase the reuse of packaging by 2030/2040 in selected sectors*, would set, for selected sectors (commercial and industrial packaging, HORECA and grocery/retail), an EU-wide mandatory reuse targets, expressed as a % of product sales/trips using reusable. For each selected sector, there would be one target for 2030 and another one for 2040. To quantify the effect on packaging waste generation, the quantity of packaging waste generated in EU in 2018 is estimated to be 77.8mt as a reference. Relative to the 2030 baseline, the measure achieves a reduction of 4.9%% less than would otherwise have been generated) representing the share of reused packaging of 5.9%. By 2040, this becomes a reduction of 13.3% representing 10.3% product sales/trips in reusable packaging, while the baseline models a decreasing share of reused packaging by 2030.

In the area of **recyclability and compostability** this policy option includes all measures of policy option 1 except for M29a, which is replaced by M29d providing clear split between applications using compostable and those using conventional plastic packaging. There are two additional measures under Option 2, Measure 22b that provides further elements on how to determine recyclable packaging based on "design for recycling" criteria and a related assessment methodology and Measure 23 that supports the implementation of

[379] https://www.actu-environnement.com/media/pdf/news-39371-reglement-ecoconception-produits.pdf

M22b on DfR by harmonizing Extended Producer Responsibility (EPR) across Member States.

M22b Definition of recyclable packaging based on design for recycling (DfR) criteria complemented by the recyclability assessment procedure and a negative list of non-recyclable packaging characteristics

Compared to M22a, measure M22b consists in the use of mandatory design for recycling (DfR) criteria to determine whether packaging is recyclable. The qualitative definition of M22a would still be included but would be further detailed through reference to design for recycling criteria and a procedure for the recyclability assessment based on self-assessment and certification of problematic packaging types. Packaging, which would not score above a certain recyclability threshold, would not be allowed on the EU market from 2030 onwards. Furthermore, a negative list of packaging characteristics, which impede recycling, would be developed and become applicable immediately.

M23 Harmonisation of EPR fee modulation criteria in an implementing act

This measure involves producers and gives them "financial responsibility" for the cost of recovering the packaging they put on the market. Extended Producer Responsibility (EPR) are fees based on the weight of packaging placed on the market. The harmonisation of EPR fee modulation criteria are implemented through implementing act. The aim is to enforce waste prevention at the producer level and to promote better design for recyclability by increasing the consistency of financial incentives across member states.

In the future, EPR fees will need to be modulated according to certain sustainability criteria to avoid any distortion of the single market and to incentivize a clear shift of producers towards recyclable packaging design. To this end, the harmonized Design for Recycling (DfR) requirements (Measure 22b) could provide a basis for developing modulation criteria.

M29d Mandatory compostability for certain out of the selected plastics packaging types and for the remaining ones and for the remaining ones compostable or conventional plastics possible

Similarly to measure M29a in policy option 1, this measure aims at prioritising the use of compostable plastic packaging in those applications where it can be demonstrated that compostable plastics are likely to add value over the use of conventional plastics. The packaging items that are addressed by this measure are divided into 2 groups:

- Packaging for which compostability offers the highest added value. For them, plastic compostability would be compulsory.
- The rest of packaging would need to be made of conventional plastics or allowed as compostable.

Regarding the intervention area on **recycled content**, Option 2 includes the measure M37 as described under policy option 1, and a new measure – M35em - introducing targets to accelerate the use of recycled content for plastic packaging.

M35em Broad targets for recycled content in plastic packaging based on contact-sensitivity for 2030 and 2040

This measure would set recycled content targets for plastic packaging to be met by economic operators placing packaging on the EU market on per packaging item level from 2030 onwards. The target levels have been set lower than is considered achievable for certain types of packaging in order to reduce the need for exemptions.

This measure will establish a clear regulatory requirement for increased use of recycled plastic in plastic packaging, by stimulating the collection and recycling of post-consumer plastic packaging waste to generate high quality secondary materials. By increasing the quantity and quality of secondary materials in plastic packaging, it also aims to improve the environmental performance of this packaging as it will lead to the reduction in the use of virgin materials and stimulate more and better quality recycling.

Finally, concerning the **enabling measures**, Option 2 includes, besides measures M31 (update of "hazardousness" definition) and M27c-x (update of the existing material-based labelling) under policy option 1, twelve additional measures addressing hazardous substances (M32b, M33), Deposit Return Systems (Mb, M26cc), labelling (M12u, M38j, M27c-y, Mj, My), green public procurement (M40b), harmonisation of reporting (M42b) and light plastic bags (MPCB).

M32b Notification of substances of concern in packaging

Under measure 32b, in addition to the use of existing information, described under 32a, a new legal obligation would be introduced in the legal proposal, according to which all substances of concern used in packaging would have to be notified. The duty-holders concerned by this obligation would be suppliers placing packaging and packaging materials in the EU market.

The substances to be notified would be all substances, meeting the definition of "substance of concern", having a harmonised classification in part 3 of Annex IV of the CLP

Regulation. A concentration threshold for the substance in the packaging, below which notification would not be required would also need to be defined.

The notification of this information could be envisaged according to three possible notification schemes:

- To a centralised European Database of substances of concern used in packaging.
- To Member State run EPR schemes (link to EU-database in measure 42a).
- Integrated in the information contained in a Digital Product Passport, most likely based on a decentralised IT architecture, as defined in the Commission proposal for a regulation on eco-design for sustainable products[380].

M33a Restrictions of substances under REACH

This measure addresses the problem of exposure to certain hazardous chemicals that can pose a threat to human health and the environment. The measure aims at restricting the use of hazardous substances in packaging when this is not covered by sectoral legislation (e.g.. food contact material legislation, specific requirements for cosmetics and pharmaceutical packaging). The Commission would request ECHA to assess the substances used in packaging and propose a list of substances that need to be restricted due to their potential risk in the whole life cycle of non-food contact packaging.

Ma&b Mandatory DRS and minimum requirements for all DRS

This measure would set minimum requirements for DRS provision in all Member States and mandatory deposit-return systems for certain types and sizes of beverage packaging. This will require Member States be obliged to set up such DRS systems for required materials by the end of 2027, and for new DRS systems to meet a selection of other minimum design requirements.

The minimum requirements will be designed so they allow for innovation and DRS designs that are suitable to local circumstances. This DRS measure primarily targets and captures single-use containers.

[380] Insert ref to the ecodesign proposal, once adopted.

Regarding the mandatory DRS, the packaging categories/materials in scope in the beverage sector would include plastics bottles (covered by a separate collection target in Art. 9 SUPD), aluminium cans, beverage cartons, and glass bottles of up to 3 litres.

M12-u Harmonised labelling for reusable packaging

This measure will introduce a symbol denoting reusable packaging in order to harmonize the labelling of reusable packaging. The purpose is to enable consumers to use reusable packaging correctly and optimize its performance. The use of the symbol would be voluntary, but it will preclude the use of other symbols on reuse of packaging.

Specific conditions for use (including possible certification) will be set out in the legislation.

M38-j Labelling criteria for Recycled Content

This measure will provide harmonised criteria and conditions for the use of a label on recycled content established by the Commission. Whether to communicate recycled content on packaging would be a choice for the economic operators, but if an economic operator chooses to communicate this information, then they will have to use the standardised symbol, rather than producing their own. The objective is to avoid that consumers are misled by labelling of recycled content in packaging.

M27c-y Labelling criteria to facilitate consumers´ sorting (advanced Nordic pictograms system)

This measure will introduce mandatory labelling for consumer sorting of packaging. It harmonises at EU level the current obligation on Member States to ensure that consumers obtain the necessary information about packaging waste disposal (Article 13 PPWD) via a new consumer-facing packaging labelling system inspired by the Nordic pictogram system. This system, already rolled out in several EU Member States (Scandinavian countries), involves all key actors:

- Manufacturers who need to put the pictograms for identifying the packaging material on packaging,
- Waste management operators and/or municipalities who need to put the pictograms for identifying the packaging material on waste bags/bins, and
- Consumers who need to sort waste according to the provided pictograms.

The development of this system has been done in coherence with the development of a more harmonised separate collection system in Europe.

M40b Mandatory minimum Green Public Procurement criteria for packaging

This measure will set out mandatory minimum Green Public Procurement (GPP) criteria for packaging of priority products and services representing a high potential for impact. An initial selection of 13 product groups based on the Common Procurement Vocabulary (CPV) has been identified based on factors such as the amount of packaging, the relative impacts of different types of packaging and the potential for influence and change. It would be applied by Member States' contracting authorities for contracts above a certain financial threshold. Such criteria would constitute minimum compliance requirements that must be met by all tenders. Offers not complying with the technical specifications must be rejected. Technical specifications are not scored for award purposes.

A competent body (eg JRC) will be responsible for developing and updating the minimum GPP criteria, which will be set in an implementing act.

M42b Harmonization of extended producer responsibility reporting system for packaging producer above a threshold

This measure will develop harmonized reporting requirements for Extended Producer Responsibility (EPR) schemes across the EU by establishing the level of data granularity that producers are required to report at, the frequency and timing of reporting by producers to EPR schemes, and the frequency at which Member States are required to gather it. The objective is to reduce the administrative burden for producers by preventing further diversification of reporting requirements while at the same time increasing the granularity of packaging data available across the EU. A minimum threshold above which all producers will report will be established. This data will be consolidated at the national level and transferred to the Commission to allow for better-informed decision-making regarding future packaging waste management system developments.

Measure PCB: Reporting obligation on plastic carrier bags (PCB)

In 2018, the PPWD introduced provisions aiming to reduce consumption of lightweight plastic carrier bags (LPCBs) in order to combat littering and promote waste prevention. LPCBs are bags with a wall thickness of 0<50 micron, while lightweight plastic carrier bags (VLPCBs) are bags with a wall thickness of 0<15 micron. In view of the objectives above, Member States must report annual consumption data on all LPCBs, while data on VLPCBs, LPCBs of 15<50 micron and PCBs ≥50 micron is voluntary.

A study on the efficacy of the measures in the PPWD as regards PCBs unveiled a lack of data on consumption of VLPCBs and PCBs ≥50 micron in order to assess, if the consumption of these bags has increased in response to reduction measures targeting LPCBs of 15<50 micron as a substitution effect. Further, there is evidence that PCBs ≥100 microns are intended to have a long lifetime and to be reused many times and have only a small littering potential. The measure therefore extends the current reporting requirements on Member States to include

- reporting of PCBs 50<100 micron mandatorily and PCBs ≥100 microns voluntarily.

- mandatory disaggregation of the LPCBs data in <15 micron (VLPCB) and 15<50 micron.

The study above underpins that closing these data gaps would efficiently ensure that the objectives in the PPWD are not undermined. Implementation should not lead to problems as reporting regimes exist already for LPCBs and the majority of the Member States already collects the data which will become mandatory on a voluntary basis. The one-off and annual administrative burden, economic, environmental and social impacts on top of those for measure PCB1 would be negligible. Stakeholder were pretty favourable to the measure.

Measure PP: Mandatory corporate waste prevention plan

This measure obliges operators placing packaging on the market to develop plans to reduce packaging waste, make it publicly available and issue annual reports on its implementation, which should be also publicly available. The plans could be checked as part of compliance checks with private standards. The plans must not be reported to the authorities but to the EPR organisations, for which this information would be useful.

Such requirement already exists for instance in Spain, and many operators have voluntarily similar systems in place and use it for their SDG reporting. Nonetheless, the measure would entail significant administrative burden especially for the operators to develop the plans and report about their implementation. Therefore, an exemption of SMEs should be envisaged. The Commission could, together with the Member States, elaborate guidelines for the operators, to help them with the elaboration of the plans; this would entail some limited administrative burden. The measure would have harmonised obligations across the EU and mobilise operators in particular to reach the waste reduction targets, but also foster reuse systems.

Option 3: Far-reaching targets and legal requirements

Option 3 takes up some of the measures already proposed (and described) in Options 1 and 2 by reinforcing some of them with higher targets or by proposing additional measures. The aim is to achieve a maximum ambition through the most up-scaled measures possible.

In the area of **prevention and reuse,** 2 measures (M2c, M3) are envisaged to complement or replace the measures proposed in Option 2.

M2c Mandatory target of 10% reduction of packaging waste per capita by 2030

This measure reinforces measure M2b (in Option 2) by proposing a higher target of 10% (instead of 5% in M2b).

Forecast models shows that meeting the target of 10% would mean an overall absolute reduction of packaging waste by 32% while meeting the target of 5% would mean an overall absolute reduction of packaging waste by 27% on average across the EU.

M3 Banning by 2030 of heaviest packaging for selected items based on existing lighter alternatives

Some packaging formats are heavier even though they serve the same function and are made of the same material. Containers vary significantly in weight for marketing reasons (especially at the top end of the market).

The objective is to set maximum weights, linked to actual EU best-in-class data, for a range of items that are a) known to vary in weight within a given category of products and b) can be clearly defined in terms of their type and size.

The measure would set a maximum weight for a range of plastic and glass bottles, and potentially jars. The aim would be to bring these containers to a weight no greater than the best (minimum) weight in their category , plus, a reasonable percentage of additional weight (+ 20%) to allow flexibility for producers, over a period of several years to allow for market adaptation.

The legal threshold would eliminate from the market only the most disproportionate packaging. Reusable packaging and plastic packaging with recycled content would have their own categories within the system or be excluded. Regarding the intervention area on **recyclability and compostability,** two measures (M22c, M29b) are envisaged to complement or replace measures proposed in Option 1 (i.e. M21 "Update of Essential Requirements: all packaging to be reusable or recyclable by 2030; and all reusable packaging to be recyclable by 2035", M22a "Qualitative definition of recyclable

packaging", M28 "Updates of Essential Requirements and EN 13432: clarifying biodegradability and compostability concepts").

M22c – Quantitative definition of recyclable packaging

A quantitative definition of recyclable could be developed based on actual recycling rates within a product category or product level basis. A packaging would be considered as recyclable, if it is recycled over a certain threshold across the EU. An EU-wide approach only is considered as Member State level recycling rates would be highly variable and could therefore distort the single market. As the granularity of the data currently precludes such an approach, but it is appropriate to mandate a re-consideration of this approach by 2030.

M29b Mandatory compostability for all selected plastics packaging types

M29b is a variant and an alternative to of measure M29a (i.e. "Both compostable and conventional plastics allowed on the market for the applications under consideration") in Option 1.

For a specific group of products (fruit and vegetable labels, lightweight plastic carrier bags, very lightweight plastic carrier bags, fast food trays unsuitable for reuse, tea bags, coffee bags, plastic films for perishables, film for food trays and trays for fruit) the use of compostable plastics becomes mandatory (if the choice is between conventional plastic or compostable plastic; this measure is not designed to exclude other materials, such as aluminium or paper).

M29b is assumed to be more effective at moving products from conventional plastic to compostable polymers and consumer confusion is further reduced. Nevertheless, for other products – such as the films covering putrescible materials – consumers are, will still not consistently recognise that the packaging should be treated via a composting collection scheme. This is because some other films (e.g. those not used in food production) will not be treated via this route. As such, the potential for confusion remains.

Under the intervention area on **recycled content,** 2 additional measures (M34b, M35eh) are envisaged to complement a measure proposed in Option 1 (i.e. M37 "*Definition of Recycled Content and measurement method*").

M34b Mandatory reporting requirement for recycled content for all packaging

The lack of data on recycled content in packaging needs to be filled to identify the causes of the low use of recycled content in packaging. The aim is to collect accurate data using a harmonised methodology.

It is proposed that from 2025 onwards, economic operators will be required to provide Member States with mandatory data on the quantities of recycled content in their packaging at the level of a specific type of packaging placed on the market. These data will be reported to the Commission and made publicly available. These data could include commercially sensitive elements, which will need to be considered when making them public.

Where it is not possible to incorporate recycled content for reasons of consumer health and safety, or due to legal restrictions, this must be included in the declaration. Additional information includes the source of the recycled materials used, the production process used and any loss of materials resulting from the use of recycled materials.

M35eh Higher ambition, broad targets for recycled content in plastic packaging based on contact-sensitivity for 2030 and 2040

Based on measure 35em described in option 2, M35eh reinforces this measure by carrying a higher ambition. This means that measure 35eh sets higher targets (to be defined) than 35em.

This measure would set recycled content targets for plastic packaging to be met by economic operators placing packaging on the EU market (potentially at brand level, although the definition of this term needs to be clarified) from the year 2030. The target levels should set lower than is considered achievable for certain types of packaging in order to reduce the need for exemptions, but higher than M35em.

Finally, five **enabling measures** (M40c, M32c, M33b, M26cc, Mc) are envisaged to complement or replace several measures proposed in Option 1 (i.e. M31 *Update of 'hazardousness' definition, Mx Update of current material-based labelling*) and Option 2 (M12 *labelling criteria for reusable packaging*, M42b *Harmonization of extended producer responsibility reporting system for packaging producer above a threshold*, Mab *Mandatory DRS and requirements for DRS*, M38-j *Labelling criteria for Recycled Content*, M27c-y Labelling criteria to facilitate consumers´ sorting (advanced Nordic pictograms system)).

M40c Mandatory minimum Green Public Procurement criteria for packaging of all products and services

While measure 40b (in option 2) describes a product-specific approach, measure 40c proposes a horizontal approach to mandate the use of a general set of packaging criteria in all public sector contracts where packaging is used.

This measure would mandate the procurement of products and services with sustainable packaging in all areas of public procurement. This measure would exceed the effectiveness

of measure 40b through application to a wider range of products and services but would be less targeted.

M32c Notification of all substances in packaging

Without comprehensive publicly available records of chemicals used in plastic packaging, little information is available on the use of hazardous substances in packaging, although the use of hazardous chemicals in plastic packaging is suspected to be extensive.

The primary objective of this measure is to increase the knowledge base on the presence of substances of concern in packaging by gathering information of the chemical composition of packaging to determine if there is presence of substances of concern in packaging. Three different methods have been identified to gather relevant data:

› assessment of the information provided through the SCIP notification SCIP database (SCIP meaning Substances of Concern In articles as such or in complex objects (Products)) is managed by ECHA and comprises information pursuant to Article 33(1) of REACH Regulation;

› assessment of substances with harmonised classification under CLP (Classification, labelling and packaging) Regulation with information to be provided to an expanded SCIP database or to EPR schemes;

› assessment of all substances used/present with information provided to ECHA or to EPR scheme

M33b Restrictions of substances under the reviewed PPWD

This measure is conceptually similar to measure 33a. It provides a mechanism for restricting substances used in packaging and packaging components, relying on an assessment by the ECHA of restriction dossiers presented. It differs from measure 33a in that the procedure to make these restrictions into law would be carried out under the legal proposal itself, via delegated acts and by introducing the list of restricted substances in an annex, to be created for this purpose in the Regulation. The text of the Directive would also have to be modified in order to clearly assign to ECHA this task under the PPWD, together with the required budgetary allocation, indicated in its financial fiche.

Consequently, under this measure, the restriction procedure for substances in packaging would be contained, as a self-standing process under the PPWD, and would have to be specified via articles to be introduced in the amended legal proposal.

M26cc Waste collection targets for certain packaging types

The measure will require achieving a 90% mandatory return rate for specified beverage containers, including glass, with some exceptions for some materials (for beverage cartons it could be a lower target).

Single use plastics directive already specifies this for plastic beverage bottles (77% by 2025; 90% by 2029).

Mc Prioritized use of recycled packaging from Deposit Return Systems

This measure will give priority access to recycled packaging materials collected through the deposit return system, to each container producer that is registered in the deposit return system and that places such deposit containers on the market. It would be an addition to measure Ma/Mb.

The right of access access to the collected materials is based on the share of the products they have placed on the market taking into account losses from collection, sorting and the recycling processes. The 'share' of recycled packaging for each producer is calculated by multiplying the weight of the containers with the return rate of the containers in a given category.

The mechanism proposed to ensure priority access via a right to first refusal is by an addition to the "minimum requirements" for a DRS[381]. The minimum requirements already specify an independent non-profit and producer-led system operator, and that the system operator should own the material collected by the system. This measure would add the following features:

- Decisions on material sales by the system operator are agreed by the producers, even if other actors (e.g. retailers) are part of governance and ownership for the system operator as a whole
- The system operator must make provision to offer material on a "right to first refusal" basis to economic operators placing containers into scheme scope

[381] An alternative approach was considered but not progressed. Theoretically, the Commission could alternatively specify in detail the mechanism and process whereby producers could obtain recyclate from the system operator. However there seems little benefit to this approach, which could be overly restrictive and limit opportunities for tailored national solutions. As system operators will remain national in scope, so too will claims for material (with economic operators working in multiple markets having to make multiple claims in any case). This limits the value of a uniform approach - a cross-border economic operator would still be completing multiple claims to different systems.

- Material offered to individual economic operators on a "right to first refusal" basis must be offered proportionally to the amounts and types of the material they place into the scheme. In the event of a surplus (more material availability than accepted at first pass), the scheme operator, guided by the producers, should continue to allocate material proportionally to satisfy producers that would like a greater allocation, before considering the wider market.
- Material taken by economic operators on a "right to first refusal" basis should only be sold or passed on for closed loop (container-to-container) recycling, though this might be challenging to guarantee
- Priority access must not be overly burdensome for SMEs. Specific thought should be given in drafting the directive to whether SME would need to be defined uniquely for this purpose (e.g. by market share).

8.4. Initial long list of measures

As a reference, the table below sets out the initial long list of measures that were developed through the early stages of the impact assessment, including through consultation with stakeholders and Member States.

Each measure was screened against a set of criteria:

- Criterion A: The measure cannot be phrased as 'a measure' and/or at EU level;
- Criterion B: The measure does not treat Member States of different types / income levels fairly
- Criterion C: The measure does not treat different packaging materials fairly
- Criterion D: The measure constrains the potential for innovation
- Criterion E: The measure may lead to a further fragmentation of packaging across the single market
- Criterion F: The measure is unfeasible to monitor and enforce
- Criterion G: The measure does not relate specifically to waste prevention and/or is already implemented

If the measure was defined by any of these tests an "X" was included in Table 17, in the relevant column, and it was screened out. A shortlist was developed (described in detail in Annex 9) - some measures were combined or rephrased for the final options shortlisting.

Table 17. Initial long list of measures

Sub type	**Measure Name**	**Criteria**	**Initial short-listing**

		A	B	C	D	E	F	G	
Bans	Bans on certain single- use plastics			x					No
Bans	Ban of plastic packaging for fruit & vegetables			x					No
Bans	NEW (CEAP) "Restrictions of single use/disposable [e.g. plastic] packaging where reusable products or systems are possible"								Yes
Bans	Bans on specific packaging formats (for example, some single-use packaging items (not only plastic packaging))								Yes
Bans	NEW (CEAP) targeted measure re: "Restricting use of packaging where consumer goods can be handled safely without packaging"								Yes
Bans	EU wide restrictions / bans on specific packaging types where alternatives are available (e.g. compostable) or where the packaging is								Yes

	considered unnecessary									
Bans	Member States implement either 1) restrictions / bans on specific packaging types OR 2) 'no giving away free / minimum pricing' measures where alternatives are available or where the packaging is considered unnecessary	x								No
Bans	Mandatory reusable tertiary packaging									Yes
Bans	Landfill bans		x		x		x	x		No
Bans	Restriction of hazardous substances in packaging									Yes
Harmonisation	Harmonisation of waste prevention strategies across Member States	x								No
Harmonisation	Harmonisation of EPR reporting across EU									Yes
Harmonisation	Create a single market for reusable packaging									Yes

Standards	Standardisation for reusable packaging on EU level								Yes
Standards	Definition and standards for a reuse system (in terms of logistics, required documentation etc)								Yes
Standards	Commission Communication on harmonisation of reuse systems (e.g. as per on DRS to avoid fragmentation of the single market)								Yes
Standards	Updating the essential requirements for packaging to better align them with the waste hierarchy								Yes
Standards	More strictly and explicitly defining the requirements for packaging, with fewer exceptions								Yes
Standards	Setting product:packaging ratios								Yes
Standards	Setting best-in-class weight limits								Yes

Standards	Measurable standards for packaging types	x							No
Standards	Packaging design should minimize the possibility of becoming litter						x	x	No
Standards	Dimension limits for e-commerce packaging i.e. reduction of unnecessary void space								Yes
Standards	Limit complexity of packaging (number & type of materials)								Yes
Standards	Eco-design requirements	x							No
Standards	Defining recyclable packaging and high quality recycling								Yes
Standards	Restrict unrecyclable packaging materials, formats and additives							x	No
Standards	Guidelines for food content packaging with recycled materials							x	No
Standards	Harmonisation of end-of-waste criteria for								Yes

	reusable packaging								
Standards	Guidance on effective reuse systems developed through reference to a European Standard.								Yes
Standards	Harmonised definition and measurement method for recycled content in packaging								Yes
Standards	Packaging criteria in GPP								Yes
Standards	Environmental award criteria in GPP								Yes
Standards	Alignment of the definition of ‘hazardousness’								Yes
Standards	Clarification on the terms ‘biodegradable’ and ‘compostable’								Yes
Targets	Targets for eliminating unnecessary single-use packaging and packaging waste reduction	x							No
Targets	Indicators by which the development of plastic waste prevention can be measured and	x							No

	distance to target can be assessed									
Targets	EU wide overall packaging waste reduction target or waste generation limit		x	x						No
Targets	EU wide target to ensure zero or lower growth in packaging waste per GDP / capita over previous 5 years		X							No
Targets	EU wide material-specific packaging waste reduction targets or waste generation limit		X							No
Targets	EU wide packaging type specific reduction targets e.g. proportion of product sold loose as % of total		x							No
Targets	Member State packaging type specific reduction targets OR packaging tax / charge implemented									Yes
Targets	Packaging placed on market reduction targets							x		No
Targets	Per capita packaging consumption targets on									Yes

	number of units								
Targets	MS level packaging waste reduction target(s) taking into account per capita GDP and waste generation levels.								Yes
Targets	Consumption reduction targets or limits targeting specific packaging types or applications		x						No
Targets	Plastic waste prevention targets e.g: targets for specific waste materials, reduction targets in relation to economic indicators, reduction target combined with quantitative target, quantitative target for reuse.				x				No
Targets	Measures and targets on reusable packaging e.g. refill quotas								Yes
Targets	Targets for reuse within supply chains								Yes
Targets	Mandate reuse for some transport packaging								Yes

Targets	Sector based targets for packaging reuse, rather than material based e.g. food boxes, beverages etc.								Yes
Targets	Specific packaging type collection/recycling targets								Yes
Targets	Measuring and reporting on packaging reuse								Yes
Targets	Proportion of on-the-go market delivered through reuse systems								Yes
Targets	Recycled content targets for packaging								Yes
Targets	Polymer substitution quotas								Yes
Obligation	DRS obligation for single-use beverage packaging							x	No
Obligation	Re-use and return scheme for e-commerce							x	No
EPR	EPR fee reduction. The current system includes, inter alia, a	x							No

	bonus of 8 % on the licence fee if the producer can prove an overall volume reduction, for example due to product concentration or deployment of refills.								
EPR	Harmonisation of EPR modulation criteria								Yes
EPR	EPR modulation for recycled content								Yes
EPR	Incentives for refillable / reusable packaging under modulation of fees under the EPR schemes for packaging								Yes
EPR	EPR fees modulation to incentivise lightweighting								Yes
Incentives	Reusable packaging exempt from licensing obligations/EPR fees								Yes
Incentives	Incentives for reusable models								Yes
Incentives	Reduced government-imposed fees to reward proven waste prevention or reuse systems	x							No

Packaging levies	Pay-as-you-throw fees							x	No
Packaging levies	Levies / taxes on packaging applied at the Member State level to meet EU level packaging waste reduction targets		X						No
Packaging levies	Carrier bag levies							x	No
Packaging levies	Levies on packaging for specific formats (for example, single-use cups, plastic or otherwise)							x	No
Packaging levies	Hypothecating a percentage of fees for promotion of waste prevention projects, such as water fountains to reduce the consumption of packaged drinks	x							No
Packaging taxes	Green taxes on packaging e.g. potential to adjust Own Resources Budgetary allocation based upon unrecycled plastic packaging waste.	X							No
Packaging	Reduced VAT on refillable / reusable								Yes

taxes	items								
R&D	Provision of funding for research and development e.g. collecting data on reuse and conducting LCA of different types of reusable packaging.								Yes
Actions	Digital solution to allow whole supply traceability	x					x		No
Actions	Made to measure, design to order products, could reduce production of unwanted items	x					x		No
Actions	Requirement for Member States to include sectoral waste prevention plans from industry in national Waste Prevention Programmes (required by WFD)							x	No
Actions	Member States to implement requirement for obligatory corporate packaging prevention plans							x	No
Actions	Requirement on producers to introduce and update sectoral packaging waste							x	No

	prevention plans								
Actions	Member States to report on their enforcement activities								Yes
Actions	Member States to reinforce market surveillance authorities								Yes
Actions	Assessment of hazardous substances in packaging								Yes
Commitments	Supermarket commitments to allowing consumers to bring their own reusable boxes when buying meat or cheese at fresh produce counters	x							No
Commitments	Voluntary agreements for the use of reusable commercial packaging in HORECA channel	x							No
Commitments	Voluntary industry commitments (e.g. European Plastics Pact) or alliances	x		x					No
Commitments	Voluntary agreements with restaurants and refreshment outlets in shopping centres, cafes or fast-food shops to	x							No

	make sure that customers have the opportunity to return their plastic dishes									
Promotions	Promotion of reusable beverage cups e.g. for coffee and beer/soft drinks	x								No
Awards	Competitions encouraging alternative re-use	x								No
Awards	Prevention awards, to producers who have redesigned packaging to have lower environmental impact	x								No
Eco-design	Waste consultancy training in the packaging sector, through the packaging coordination centre	x								No
Eco-design	Circular economy skills development in eco-design to reduce the quantity of materials used and in extending lifespans of packaging	x								No
Eco-design	Development of benchmarking tools allowing comparative evaluation	x								No

Eco-design	Online bespoke guidelines on eco-design features	x							No
Eco-design	Certified waste prevention training course	x							No
Eco-design	PRO providing free packaging optimisation services to producers	x							No
Forum	Guidance on best practise for refill stores	x							No
Forum	Open forum between producers to streamline packaging design guidelines	x							No
Forum	System by which consumers can communicate examples of overpackaging								Yes
Forum	Database dedicated to products, packaging and waste management to enable monitoring of waste prevention								Yes
Forum	Implementation of a national business advisory body for reusable products and packaging								Yes

Information campaign	Requirement on anyone selling or giving away plastic bags to provide information about how plastic bags affect the environment and how consumers can reduce their consumption							x	No
Information campaign	Financial support for waste prevention projects[1]	x							No
Information campaign	Promotion of marketability of re-used products	x							No
Information campaign	Awareness raising campaigns on impacts of packaging waste generation for items not covered by SUP Directive								Yes
Information campaign	Information campaigns, including on environmental benefits of reuse and how to reduce packaging consumption								Yes
Information campaign	Customer awareness messaging on specific problem packaging (e.g. compostable)								Yes

Information campaign	Guiding packaging principles for e-commerce	x							No
Information campaign	Requirement to promote points of sale for loose/bulk products in all stores over Xm2	x							No
Information campaign	Consumer awareness & education programmes for the reduced use of lightweight plastic bags							x	No
Labelling requirements	Reduced labelling requirements to allow smaller print surface							x	No
Labelling requirements	Reuse labels								Yes
Labelling requirements	When charges and levies are applied on particular packaging types these should be fully advertised fully on the packaging	x							No
Labelling requirements	Harmonised standards for labelling of recycled content								Yes
Labelling requireme	Harmonised standards for labelling of								Yes

nts	recyclability								
Local initiative	Public water fountains to reduce plastic water bottle use							x	No

ANNEX 9: MEASURES IN EACH OF THE POLICY OPTIONS

INTERVENTION AREA WASTE PREVENTION

9.1 Introduction

This intervention area analyses the issue of increasing packaging waste generation in both absolute terms and on a per capita basis for more than 10 years. The objective of the measures under this intervention area is to prevent, reduce or minimise the generation of packaging and packaging waste.

Key issues identified are the following:

- A shift from reusable packaging to single use packaging, partially due to a lack of a level playing field causing unfair competition between single use packaging versus reusable packaging
- Increasing use of excessive and avoidable packaging (retail, e-commerce), amplified by increasing on-the-go consumption and e-commerce.
- There is currently no explicit target on packaging prevention and minimisation. The reference to packaging waste minimisation in the Annex II of the PPWD (Essential Requirements) is rather vaguely worded and difficult to implement, stating that "*Packaging shall be so manufactured that the packaging volume and weight be limited to the minimum adequate amount to maintain the necessary level of safety, hygiene and acceptance for the packed product and for the consumer".* There is therefore no clear definition of over-packaging. The related Harmonised European Standard (EN) on reduction at source, EN 13428:2004, which provides presumption of conformity with the above requirement, remains voluntary, and leaves too much flexibility under the so-called "key performance criteria". Several of these criteria, including "product presentation and marketing" and "user/consumer acceptance" undermine the effectiveness of the Standard.

<u>Measures discarded and not analysed in depth:</u>

- Measure 4. Pack-to-Product weight ratios
- Measure 6. Eco-modulation to incentivise light weighting
- Measure 9: Mandatory MS level 'overarching cross-sectoral' reduction targets:
    - Measure 9a – Target as % of reduction of SU items.

Measures analysed in depth but not carried forward to the options table:

- Measure 2: Mandatory Member State reduction targets
  - Measure 2a – Unit weight reduction target
- Measure 9: Mandatory MS level 'overarching cross-sectoral' reduction targets:
  - Measure 9b – General packaging waste per capita reduction (10%) – 5% reduction to be met by reuse.
  - Measure 9c – General packaging waste per capita reduction (20%) – 10% reduction to be met by reuse.

Measures analysed in depth and included in the options table:

- Measure 1: Update of Essential Requirements to minimize over-packaging
- Measure 2: Mandatory Member State reduction targets
  - Measure 2b – Mandatory target of 19% reduction of packaging waste per capita in 2030 compared to the baseline
  - Measure 2c - Mandatory target of 23% reduction of packaging waste per capita in 2030 compared to the baseline
- Measure 3: Banning by 2030 of heaviest packaging for selected items based on existing lighter alternatives
- Measure 5: Minimization of empty space in packaging in selected sectors, including e-commerce
- Measure 7: Phase out Avoidable / Unnecessary Packaging

9.2 Measures analysed in depth and included in the options table

Measure 1: Update of Essential Requirements to minimize over-packaging

9.2.1. Description of the measure

The current Directive requires packaging to be minimised in weight and volume terms, as the top of the waste hierarch; however, there is no clear definition of over-packaging and the related Harmonised European Standard (EN) on reduction at source, EN 13428:2004, remains voluntary and does not provide for the necessary metrics and thresholds.

Standard EN 13428 provides a procedure for assessing compliance on prevention by source reduction, relying on the identification of a **'critical area'**, namely a specific performance criterion or criteria (more accurately a limiting factor or factors) that prevent/s further reductions in the weight and/or volume of packaging within a given category/material.

This measure would entail an update to the Essential Requirements to provide **a more precise definition of the term "overpackaging"** and hence to facilitate appropriate prevention action by producers (in designing and specifying packaging) and enforcement action by market surveillance authorities.

In addition, the Essential Requirements would be complemented with **a list of performance criteria** which are currently included in European Standard EN 13428, limited however to criteria that are **function critical**. There is little detail currently in the Standard on how to test and verify the 'critical area', and an update of the current standard seems required in this regard.

The performance criteria are specified

1. Product protection
2. Manufacturing process
3. Packing/ filling process
4. Logistics
5. Product presentation and marketing
6. User/ consumer acceptance
7. Information
8. Safety
9. Legislation
10. Other issues

This list has no hierarchy or weighting within the criteria, all being considered equal. It is therefore suggested that the **performance criteria included in EN 13428 on prevention by source reduction should be revised to focus only on core functionality criteria** that reflect product protection, safety and legal requirements, e.g., for information labelling, and hence to reduce emphasis on more subjective criteria that are believed to allow excessive packaging to be produced, and to inhibit the ability to enforce the Essential Requirements on reduction at source.

The legal proposal would include **the core performance criteria** (for determining the 'critical area'), rather than under a voluntary standard as currently done under EN 13428.

Marketing and consumer acceptance (or convenience) **alone should no longer be allowed to be the limiting factors that cause a pack to be larger or heavier** than they would otherwise be unless they are justified for particular cultural reasons or tradition.

The core list of performance criteria would include the following:

1. **Product protection** to prevent significant product waste, including measures to prevent damage and preserve the product, as appropriate for the product and supply chain in question.
2. **Manufacturing processes** regarding the pack itself (i.e., converting) and in pack-filling of the pack (e.g., related to handling and line speed issues).
3. **Logistics to allow safe handling in distribution** (transport and warehousing) and adequate handling and display in retail settings (for physical demands, e.g., the strength to act as shelf-ready packaging, rather than purely for sales and marketing purposes) by staff in the supply chain.
4. **Information requirements** that are essential for those in the supply chain and consumers, for example regarding safety and marking of ingredients.
5. **Handling and safety considerations**, regarding handling and pack opening by consumers, during and after a product purchase.
6. **Legislation**, i.e., other legal requirements, such as those required for pharmaceutical products.
7. **Recycled Content, Reuse and Recyclability,** where the product weight or size may have to be increased, beyond what would otherwise be possible regarding the other six performance factors, to facilitate inclusion of recycled content, to enhance recyclability (e.g., when moving to a mono-material) and when the system is specifically designed to be refilled many times in an established reuse system in the Member State in question.

It is proposed that the performance criteria will be specified through the update of the existing standard EN 2004:13428. It is also proposed that the current definition (Annex II of the Essential Requirements) regarding minimisation is adapted as follows:

"Packaging shall be manufactured and used in a way that the packaging volume and weight be limited to the minimum amount that still allows that the core areas of functionality (set out in xxx as performance criteria) are maintained.

An excess packaging is defined as one where there is inadequate evidence that one or more core performance factors criteria limit the ability to reduce pack size and/or weight further, or where a reusable or refillable alternative can adequately replace a single use pack with a resulting reduction in overall packaging use (whilst maintaining the core areas of functionality). "

9.2.2. Effectiveness

This measure would **reduce subjectivity** faced by enforcement authorities in Member States, and hence allow the ability to be firmer in enforcing the requirements on

minimisation. This measure is **not considered however to have sufficient effect on its own**.

9.2.3. Ease of implementation

This measure **can be easily implemented through an amended text in the legal proposal**, without the need for standards, and should enable market surveillance authorities to undertake their role more easily regarding enforcing packaging minimisation. A request for update of the existing standard to improve the measuring method will, however, remain in scope.

9.2.4. Administrative burden

This measure **will not create any significant administrative burden** on producers, Member States or the Commission. There will be some administrative burden to update the current standard. It is noted, however, that making this aspect of the Essential Requirements more easily enforceable should increase the willingness of market surveillance authorities to act, which would require more resources in practice.

9.2.5. Economic impacts

The specific economic impacts of this measure **could not be quantified**. Overall, the qualitative assessment indicates that impacts on economic operators will be **minimal**.

One area where this measure could have an impact is when packaging is mostly used for **marketing** purposes, e.g. by making a packaging bigger to draw the consumer's attention (e.g. toys, cosmetics). By setting a harmonised requirement across the EU market producers would be sure of **a level playing field** and equal treatment (if imported packaging is properly held to the same standards).

9.2.6. Environmental impacts

The specific environmental impacts of this measure **could not be quantified**. Overall, it is expected that this measure would set a clearer legal framework for economic operators to reduce the use of excessive or unnecessary packaging, and enable other measures described further down (measures 2, 3 and 4), leading to **positive** environmental impacts.

9.2.7. Social impacts

The specific social impacts of this measure **could not be quantified**. **Negative impact on jobs** is expected, although the **scale of the reductions is likely to be relatively smal**l for most materials, and to a significant extent outside of the EU (packaging imported into the EU on products).

9.2.8. Stakeholder views

The following views summarise the key points raised at the stakeholder workshop of 28th January 2021. Overall, it was noted that **over-packaging should be clearly defined**, as packaging is sometimes designed for technical or acceptance reasons that are not always identifiable for the final consumer. Some stakeholders further requested that these definitions should be part of the primary legislation.

In some cases, it was also noted that having a fixed definition could have the unintended consequence of acting as a significant barrier to future packaging product applications and functions.

Under-packaging should be considered as well as over-packaging.

"Fitness for purpose", around core criteria, prevents waste and should be introduced as the key approach for all packaging, following the ISO 18602:2013(E) concept for "optimum pack design".

Several stakeholders (although not all) accepted that the **need for sustainability should be prioritised before marketing;** however, it was pointed out that packaging can play a critical role in changing consumer behaviour via the messaging it contains. There are many messages that need to be displayed on packaging to convey information regarding health and safety, ingredients, and other legislative requirements. Some noted that the different criteria could be weighted or prioritised, so that marketing is still accepted, but not at the detriment of quantity of packaging used.

Most of participants thought that **the approach to minimisation** (by defining a critical (limiting) area (parameter)) **should be material neutral and should be applied to each packaging material/pack type in isolation**.

It was also noted that the drive towards **higher recycled content**, 100% recyclability, and further reuse targets, **may affect the ability to lightweight within a particular product type**. As such, this trade-off should be also considered as core criteria that could potentially limit the ability to optimise by weight.

9.3 Measure 2: Mandatory Member State reduction targets

Waste prevention has been a priority in EU waste legislation for many decades and it features prominently in UN SDG targets. Over the past decades, Union legislation has become more and more detailed in terms of what Member States should do to prevent waste. Since 2013 Member States must adopt Waste Prevention Programmes and in 2018 the list of areas in which Member States have to stimulate waste prevention has been expanded significantly.

The European Environment Agency (EEA) reviews these national programmes and the general progress on waste prevention. Their latest report concludes that *"there are **no signs that the overall objective of reducing waste generation** in a growing economy is close to being achieved"*. They furthermore note that Member States rarely set targets and indicators in their Waste Prevention Programme, **hampering the monitoring of waste prevention and measures** that are most effective and replicable across the EU.

This measure is closely linked to the work on the **Ecodesign for Sustainable Products Regulation**. The Sustainable Products Regulation aims to ensure that products placed on the market are made more durable, reusable, upgradable and repairable. This means products will last longer and less waste will be created in the first place. The ESPR will have a strong impact on waste generated and the management performance when the ESPR is being fully implemented. This measure also links to the ongoing revision of the Waste Framework Directive.

This measure would **set waste prevention targets for Member States** and allow them to decide how such reductions might be achieved. This measure on mandatory Member State reduction targets has two different alternatives M2b and M2c.

9.3.1 Measures 2b and 2c – Mandatory targets of 19% and 23% reduction of packaging waste per capita in 2030 compared to the baseline

9.3.1.1. Description of the measures

Member States are given a target to reduce the absolute packaging waste figure in terms of the **kg/person of packaging waste** (which we might call packaging waste 'intensity'), **relative to a 2018 baseline**. There is a need to speed up the efforts to reduce waste generation, but at the same time acknowledge the challenges of reducing waste generation within the current system lock-ins. The measures targets are normalized as a kg per capita figure, to take out the effects of population growth or decline in the EU, and are to be achieved in 2030 and/or 2035:

- Measure 2b) a 4% absolute 'intensity' reduction in 2030
- Measure 2c) a 9% absolute 'intensity' reduction in 2030 as a higher ambition target.

Keeping in mind that the waste generation is increasing and will reach 92.4 Mt in 2030 and 99.5 Mt in 2035 if no action is taken, **meeting a target of 4% reduction in 2030 compared to 2018 would entail an overall absolute reduction in 2030 of around 19% on average across the EU compared to the 2030 baseline.** Meeting a **target of 9% reduction in 2030 compared to 2018 would mean an overall absolute reduction in 2030 of around 23% compared to the 2030 baseline.** It should be noted that taking out population growth effects, through using the 'intensity' approach, makes minor difference overall since Eurostat data for the EU27 shows population growth of only about 0.5% from 2019 to 2030. It would make a difference at a country level.

These targets could be met through:

Waste prevention measures	On the one hand, waste prevention can be achieved through unit weight reduction at the Member States level. Member States would impose measures to reach the reduction of packaging units through mostly 2 types of actions/measures: • Further optimising the weight of each packaging unit: o For example, a 'best-in-class' (as per Measure 3) approach should be able to provide at least 20% weight reduction, and quite possibly 30% overall in glass and plastic bottles (as a whole category), through unit weight reduction. o Aluminium and steel cans are only a small part of the overall packaging market and are already very well optimised with very little variation (for example the vast majority of aluminium cans are 330ml and weigh 13g, further optimisation would not bring a significant change). The potential contribution from metals is therefore small. • Optimising the size of the packaging and limiting voids in packaging: o Paper and card packaging unit weight can be reduced in part through optimised construction (e.g. of corrugated board) and through limiting void space (as per Measure 5) which was estimated could result in a saving of around 15% by weight in cardboard packaging overall across the applicable sectors. This measure would be

	especially relevant for e-commerce packaging and packaging waste. On the other hand, specific bans or restrictions for the use of certain packaging considered as avoidable could bring further waste reduction under the prevention measure. With this measure, Member States would either ban certain single-use packaging or impose a 100% multiple-use packaging for certain types of packaging, in which case such a measure would count as reuse (as per Measure 7)
Reuse measures	Under reuse measures, Member States would promote and/or impose the use of multiple-use packaging (reuse/refill) at the Member States level for different types of packaging and sectors. This measure would enable a switch from single-use to multiple-use packaging, which will in return bring material savings and waste reduction. As part of the overall approach, sector specific reuse targets could be also set (as per Measure 8).

The assumption made for the purpose of assessing the impact of the medium (19% in 2030) and higher (23% in 2030) ambition measures (respectively 2b and 2c) is that the overall reduction is met through 50% waste prevention and 50% reuse. However, this measure does not impose this 50-50% split. A Member State could set higher reuse ambitions to reach the target by e.g. 70% reuse and 30% waste prevention and vice-versa.

In addition, for the purpose of assessing the impact, general unit weight reduction was assumed to take place across all packaging items. The relative reductions in unit weight were assumed as follows:

- 7.0% for glass and plastic;
- 5.0% for paper / board;
- 1.0% for steel, aluminium and wood; and
- 0.0% for other.

Finally, void space limit thresholds were considered in this measure as employed either explicitly (i.e. stipulated by Member State in policy) or implicitly (voluntary approach).

Furthermore, banning of unnecessary and/or avoidable packaging was also considered and counted towards waste prevention, but also reuse, as bans on single-use packaging may lead to switches to reusable packaging. Eventually, the forecast model factored up and down all reduction parameters as required using a goal seek mechanism, until the required contribution from each waste prevention measures was achieved.

The reuse measures were considered as contributing to the target since the amount of waste produced by one unit of consumption of multi-use packaging is assumed equivalent to the inverse of the total number of uses of the multi-use packaging before waste, and this is eventually lower than the amount of waste generated by the equivalent single-use packaging units. As for waste prevention measures, the model calculated the degree of switching required from single-use packaging to multi-use packaging, which therefore led to a net reduction in waste generation equivalent to the cross-sectoral targets as defined (goal seek mechanism).

These measures 2b and 2c do not consider any additional conditions or plastic-specific measures to ensure that no significant material switches to plastic packaging occur. The measures on weight reduction and bans were considered sufficient to limit the increase of plastic packaging compared to other packaging materials.

9.3.2. Measure 2b: Mandatory target of 19% reduction of packaging waste per capita in 2030 compared to the baseline

9.3.2.1. Effectiveness

Table A-2 shows the avoided packaging waste generation in 2030 compared to the 2030 baseline, as a result of the waste reduction target of 4% compared to 2018, resulting in a -**19% reduction**. The greatest impacts would take place for wood, paper/board and plastic packaging. As regards plastic, the impact of the measure on plastic packaging waste generation was modelled to be –17.2% compared to the 2030 baseline (increase of plastic packaging waste from 2018 to 2030 of ~42%). This means that the forecasted amount of plastic packaging waste in 2030 with the measure in place (~17Mt) is higher to the initial amount of plastic packaging waste in 2018 (~15Mt). Therefore, the -17.20% plastic reduction driven by the measure in 2030 does not cancel the modelled plastic waste packaging growth in the baseline in 2030 but reduces it: about +2Mt with the measure instead of +6Mt without any policy change (baseline). Nevertheless, the measure provides a ~17,7Kt reduction in the total amount of packaging waste from ~92Mt in the Baseline to ~74Kt as a result of Measure 2b in 2030 (or ~19% reduction).

In addition, since a waste reduction target could have led to a switch to lighter plastic packaging, it is important to highlight that the modelled reduction of glass, aluminium and

plastic packaging waste reduction is of the same order of magnitude, -12.8% for glass compared to no policy action (2030 baseline), -9% for aluminium and –17.2% for plastic. Therefore, based on the modelling, this measure does not lead to significant switches from glass and aluminium packaging (which have high embedded energy) towards plastic packaging.

Table 17. Summary of packaging waste generation changes for measure 2b, 7

	2030 – measure (thousand tonnes)	**Change vs 2030 baseline (%)**
Glass	12,970	-12.80%
Steel	2,687	0.50%
Aluminium	909	-9.00%
Paper / board	29,576	-21.60%
Plastic	17,374	-17.20%
Wood	11,030	-26.10%
Other	204	0.00%
Total	**74,749**	-19.10%

9.3.2.2. Ease of implementation

This measure should be **easy to implement for the Commission.**

Member States, instead, will face some challenges to ensure packaging reduction. Member States will have to install the right measures for waste reduction, building up infrastructure, increasing investments in reduction activities, changing consumer behaviour patterns and so on. **Member States have the flexibility to meet the target.** Member States can require industry sectors or PROs to be mandated (or asked under a voluntary arrangement) to reduce the packaging placed on the market.

Furthermore, it may be difficult for any industry lead organisation to sufficiently drive action within its business cohort unless the latter are contractually obligated. Individual businesses could not be expected to all meet the reduction target since some will have done far more already than others, or may use a particular material more than others, and may not have the potential. This then risks putting too much pressure on some brands to reduce packaging which in turn could result in product waste, which is counter-productive in environmental and commercial terms.

The responsibility may have to fall on the sector through a voluntary and collaborative approach (as per the current Plastic Pacts). Voluntary agreements, however, are not considered reliable enough to ensure sufficient progress in reasonable timescales, and thus may not deliver the set targets.

Giving the Member States the flexibility might result in some variation in approach by Member States, and the potential for single market distortion, and a lack of harmonisation across the EU. **Combining this top-down measure with Measures 3 on best-in-class weight limits, Measure 5 on void-space limits, and Measure 7 on bans as well as reuse targets M8, at the EU level rather than separate national approaches**, would reduce the level of uncertainty in achieving the outcomes, increase EU harmonisation and reduce the risk of market distortions.

In addition, extra cost of implementation may be required given the need for multiple initiatives on unit weight reduction and reuse measures, combined with EU-level bans, to achieve ambitious targets in absolute terms.

9.3.2.3. Administrative burden

As noted above, this measure has a medium **administrative burden for the Commission**, but a **significant potential burden for Member States and potentially PROs or sector organisations** in co-ordinating action.

9.3.2.4. Economic impacts

Qualitatively, the impacts are like those described to Measure 2a. However, the **quantitative impacts modelled are significantly higher**:

- Savings of 4,221 € million in waste management costs.
- Avoided costs of DRS of 429 € million.
- Loss of producer revenues of 52,218 € million.
- Savings of 11,078 € million in material costs; and
- Costs of 4,090 € million in reuse schemes.

As with Measure 2a, how these impacts fall on different sectors (and packaging materials) will depend on how Member States choose to implement to meet the targets.

9.3.2.5. Environmental impacts

Based on the quantitative tonnage reductions noted above, significant environmental benefits are expected to result as indicated in the table below.

The measure provides a reduction of 11.8 million tonnes of CO_2e compared to the baseline. This confirms that the measure does not lead to any significant material switch, which could lead to a significant negative environmental impact on GHG emissions.

Table 18. Summary of Environmental Impacts for Measure 2b

Summary of Environmental Impacts; change in 2030 relative to baseline	
Change in GHGs, million tonnes CO_2e	-11.8

Change in GHG/Air Quality (AQ) externalities, € million	-3,662

9.3.2.6. Social impacts

This measure would result in a loss of 446 thousand jobs as a result of the overall packaging being placed on the market, the vast majority (91%) coming from manufacturing and the remaining 9% from the waste management industry – recycling, residual waste treatment and DRS.

However, this measure is also expected to generate around 424 thousand jobs in the reuse sector, thus leaving a **net job loss of 22 thousand jobs**.

9.3.2.7. Stakeholder views

Some stakeholders had expressed **preference for a per capita target compared to unit weight reduction**. It is worth noting that a country that already has a small packaging waste 'intensity' (kg/capita) will have less to do in absolute terms than one with a high 'intensity' because of the use of a % reduction target. Similarly, a country with expected population growth will have this taken into account by the nature of the per capita 'intensity' target, and hence will not have more to do in absolute terms as a result of that growth.

9.3.3 Measure 2c: Mandatory target of 23% reduction of packaging waste per capita in 2030 compared to the baseline

9.3.3.1. Effectiveness

Table A-4 shows **the avoided packaging waste generation in 2030 compared to the 2030 baseline**, as a result of the waste reduction target of 9% compared to 2018, resulting in a **-23% reduction**. The greatest impacts would take place for wood, glass and paper/board packaging.

In the case of plastic, the impact of the measure on packaging waste generation was modelled to be –19.30% compared to the 2030 baseline, which takes into consideration an increase of plastic packaging waste from 2018 to 2030 of ~42% (~21Mt of plastic waste).

This means that the forecasted amount of plastic packaging waste in 2030 with the measure in place (~17Mt) is slightly higher than the initial amount of plastic packaging waste in 2018 (~15Mt). Therefore, the -19.30% plastic reduction driven by the measure in 2030 does not cancel the modelled plastic waste packaging growth in the baseline in 2030, but reduces it: about +2Mt with the measure instead of +6Mt without any policy change. Nevertheless, the measure provides a ~21.6Mt net reduction in the total amount of packaging waste from ~92,405kt in the Baseline to ~70,815Kt as a result of Measure 2c in 2030 (or ~23% reduction).

In addition, since a waste reduction target could have led to a switch to lighter plastic packaging, it is important to highlight that the modelled reduction of glass, aluminium and plastic packaging waste reduction is of the same order of magnitude, -26.20% for glass compared to no policy action (2030 baseline), -10.20% for aluminium and –19.30% for plastic. Therefore, based on the modelling, this measure does not lead to significant switches from glass and aluminium packaging (which have high embedded energy) towards plastic packaging.

Table 19 Summary of packaging waste generation changes for Measure 2c, 7, 3

	2030 – measure (thousand tonnes)	**Change vs 2030 baseline (%)**
Glass	10,969	-26.20%
Steel	2,690	0.60%
Aluminium	896	-10.20%
Paper / board	28,635	-24.10%
Plastic	16,940	-19.30%

Wood	10,480	-29.80%
Other	204	0.00%
Total	70,815	-23.40%

9.3.3.2. Ease of implementation

The implementation of this measure is like Measure 2b, however, this measure is potentially more onerous, given the need for multiple initiatives on unit weight reduction and reuse measures, combined with EU-level bans, to achieve ambitious targets in absolute terms.

9.3.3.3. Administrative burden

Very similar to Measure 2b.

9.3.3.4. Economic impacts

The qualitative impacts will be very similar to those described for Measure 2b however quantitatively they are significantly higher in 2030:

- Savings of 4,852 € million in waste management costs.
- Avoided cost of DRS of 160 € million.
- Loss of producer revenues of 59,911 € million.
- Savings of 12,875 € million in material costs and
- Costs of 4,765 € million in reuse schemes.

As with Measure 2b, how these impacts fall on different sectors (and packaging materials) will depend on how Member States choose to implement to meet the targets.

9.3.3.5. Environmental impacts

Based on the quantitative tonnage reductions noted above, **significant environmental benefits are expected** to result as indicated in the table below.

As reduction of GHG emissions is observed when compared to the baseline.

Table 20 Summary of Environmental Impacts for Measure 2c

Summary of Environmental Impacts, change in 2030 relative to baseline	
Change in GHGs, million tonnes CO_2e	-14.6
Change in GHG/Air Quality (AQ) externalities, € million	-4,902

9.3.3.6. Social impacts

The qualitative impacts will be **very similar to those described for Measure 2b** however **quantitatively they are higher in 2030:**

This measure would result in a loss of 514 thousand jobs because of the overall packaging being placed on the market, the vast majority (92%) coming from manufacturing and the remaining 8% from the waste management industry – recycling and residual waste treatment and DRS. However, this measure is also expected to generate around 496 thousand jobs in the reuse sector, thus leaving a **net job loss of 18 thousand jobs**.

9.3.3.7. Stakeholder views

As per Measures 2b.

9.3.4. Measure 3: Best-in-Class weight limits

9.3.4.1. Description of the measure

This measure would address the fact that certain packaging types are significantly heavier than what is required for their functionality.

Provided that the cost of raw materials would not rise to the extent that it would become a deterrent, **this problem is likely to persist**, given that it is based on a market failure.

Therefore, the objective is to set maximum weights, related to actual 'best-in-class' data for the EU, for a range of items that are a) known to a wide weight range within a given category and b) can be defined clearly regarding their type and size. The aim is to provide a single point of reference for producers and enforcement bodies and a means to exclude the heaviest packaging from the market. Consequently, the measure is aimed at bottles (and potentially jars), to eliminate the worst offenders in this regard, and hence reduce packaging material use significantly and thereby carbon and packaging waste quantities.

Measure 3 sets out to define **'best-in-class' benchmarks** – the lowest weight, and potentially mean/median or potentially quartile data, for a given category of pack, **to define over-packaging thresholds within a sub-category** and provide a single point of reference for producers and enforcement bodies and a means to exclude the heaviest packaging from the market.

Since this threshold weight limit are set as a percentage over and above the minimum best-in-class benchmark weight, the measure allows som**e flexibility.** Based on the data available for glass and plastic containers, it is proposed that a figure of **20% above the minimum best-in-class figure** is set as the **legal threshold value**.

Exemptions would be foreseen for reusable packaging and packaging with high levels of recycled content.

The measure would involve the **exclusion from the market** of items exceeding the legal threshold by 2030, with updates thereafter (e.g., every two years). This would be done **through an implementing act** that would have direct effect across the EU and place an obligation on producers directly without the need for Member States to transpose anything into national law and ensuring EU harmonisation. This measure would thus only focus on **packaging items that are:**

- **easy to define and relatively simple** in their nature, i.e., with little variation apart from size;
- known to have high **weight reduction potential.**

As such it is proposed that it would **initially only be targeted at bottles**, with the possible addition of jars, made of plastic and glass, across all the standard sizes, with allowances to reflect the heavier weight of bottles required to contain the pressure exerted internally in sparkling and carbonated drinks.

The table below gives an indication of the key items:

Table 21. Key items and packaging sizes for Measure 3

	100ml	**250ml**	**330ml (drink)** **300 to 340 ml (food)**	**500ml**	**700ml (spirit)** **750ml (wine)**	**1,000ml**
Beer			x	x		
Spirits					x	x
Still wine					x	x
Sparkling wine					x	x
Still soft drinks	x	x				
Carbonated Soft drinks	x	x				

	100ml	250ml	330ml (drink) 300 to 340 ml (food)	500ml	700ml (spirit) 750ml (wine)	1,000ml
Food jar (as a possible addition)			x			

The data for this reduced set of items could be provided by various means:

- Through **harmonised reporting requirements under EPR**, such that the PROs would be required to provide the weight-based data for specific categories of bottles (and potentially jars). This would have the advantage of providing comprehensive data for the EU market and hence very accurate benchmarks but would still require considerable effort for producers and PROs.
- **Annual data already acquired by PROs**, as a proxy for EU-wide data.
- **Commercial packaging weight data** as stand-alone data or to complement the existing PRO data.

Regardless of the source of data, **it would be necessary for the Commission to develop an EU-wide tool to provide the benchmark data** in an easily accessible format for PROs, producers and regulators. In addition, the 'best-in-class' benchmark weight **would need to be updated quite regularly** (e.g., every two years), providing a dynamic 'top-runner' approach, i.e., a benchmark that is occasionally refined in a semi-automatic way, minimising bureaucracy.

It would not be reasonable to expect every business to be able to reach the very lowest packaging 'best-in-class' weight for their packaging, given that they may have production or distribution constraints, or may not easily (e.g., as an SME) be able to procure the lightest packaging, which may only be available at a viable cost for the largest brands. Consequently, these **thresholds would be set at a relatively comfortable level**, the aim being to eliminate only the worst offenders that are responsible for a disproportionate share of the over-packaging problem.

9.3.4.2. Effectiveness

Based on an assumption that the measure would lead to a 15% reduction in glass bottle weight and a 5% reduction in plastic bottle weight, the model finds that this would lead to **a reduction of 2.7% in overall waste generation** as compared to the baseline, equivalent to a reduction of 2.484 million tonnes of avoided packaging waste in absolute terms. This can be attributed to **a reduction of 14.8% in the use of glass** and a **1.3% reduction of plastic** as compared to the baseline (see Table below).

Table 22. Summary of packaging waste generation changes for Measure 3

	2030 – measure (thousand tonnes)	**Change vs 2030 baseline (%)**
Glass	12,668	-14.8%
Steel	2,674	0.0%
Aluminium	999	0.0%
Paper / board	37,747	0.0%
Plastic	20,694	-1.3%
Wood	14,927	0.0%
Other	204	0.0%
Total	**89,912**	**-2.7%**

9.3.4.3. Ease of implementation

Even if this measure would be limited to bottles only, **there are a number of issues that make the implementation of this measure rather complicated**. These issues include the need to gather a substantive number of data, the need to regularly update the benchmarks and the difficulties to enforce the measure in practice.

For this reason, the remaining impact categories are not discussed in further detail in this report. Further details can be found in the Eunomia support study.

9.3.4.4. Administrative burden

The administrative burden (and economic costs) **would depend on the source of benchmark data**; comprehensive EU data or more limited from a few Member State PROs and/or commercial sources. Some additional effort may be required by the PROs, to extend their reporting requirements, and by producers to provide more granular data for bottles (as already done to a degree in some Member States, e.g. France and Belgium).

To minimise the administration burden on the Member State regulatory authorities, a requirement could potentially be made for packaging EPR schemes (PROs) **to ensure that the best-in-class threshold is checked when compiling the annual data for their member producers.**

This EU wide approach would also allow the single market to operate without hinderance or risk of market distortion, and the potential administrative impact of dealing with any such Member

9.3.4.5. Economic Impacts

The potential economic effects of light-weighting in global markets is difficult to assess, but various factors can be identified:

- **Light-weighting of a current design** (or selecting a lighter standard bottle) **saves material costs** which offers a small competitive advantage, especially for large producers where the aggregate saving can be very large. The CBA model indicates:
    - 294 million EUR in 2030
    - 393 million EUR in 2050
- The industry might need to invest in **new tooling,** although in terms of glass, it is known that the range of bottles currently available in container manufacturer catalogues includes light-weighted bottles, i.e., they are available off the shelf from

existing manufacturing facilities. In terms of plastic bottles, the issue is often optimisation in pre-form production and blowing, rather than the replacement of equipment. Any extra capital/one-off cost here are paid back quickly through material cost savings.

- Some **premium brands see a sales and marketing advantage of heavier bottles;** however, if this measure is applied across the EU, there will be no disadvantage to any single EU producer as all will be treated equally, so long as imported bottles are also treated the same way and enforcement is effective.
- **EU SMEs could also struggle to obtain the very lightest bottles**, however there is a significant margin proposed (+20%) to allow for any such difficulties, or other peculiarities of production (e.g., filling line limitations) and distribution (e.g., around robustness) in all companies no matter of what size.
- In terms of waste management and EPR cost savings (which would be spread across producers and waste disposers), the CBA model indicates:
  - 81 million EUR in 2030
  - 113 million EUR in 2050
- **In terms of ongoing costs, the Commission would develop and maintain an EU-wide tool**, to provide the benchmark data in an easily accessible format for PROs, producers and regulators. This would require one or two FTEs in terms of staff resources. Member States would also potentially need to undertake awareness raising around the measure, although this obligation could be placed on PROs.

9.3.4.6. Environmental impacts

Based on the quantitative tonnage reductions noted above, **significant environmental benefits are expected to result** as indicated in the table below.

Table 23. Summary of Environmental Impacts for Measure 3

Summary of Environmental Impacts, change in 2030 relative to baseline	
Change in GHGs, thousand tonnes CO_2e	-766
Change in water use, thousand m^3	-39
Change in GHG/AQ externalities, € million	-104

9.3.4.7. Social impacts

This measure only affects raw material suppliers in the EU, and **the impact on jobs in the EU should be very small**. More cost-effective packaging may also help to give EU packaging and product brand businesses a slight commercial advantage in the markets in which they operate, helping to increase EU jobs.

In terms of the **reduced waste** that will result, the CBA model indicates that this measure would result in **the loss of around 3,700 FTEs in 2030 and 4,700 in 2050**. The vast majority would be losses in recycling jobs and the remaining in residual Treatment jobs.

9.3.4.8. Stakeholder views

The use of a 'best-in-class' reference threshold (a weight-based measure at a packaging sub-type level) got some support from the stakeholders, noting that it could be a powerful approach. However, there was a **general concern regarding the availability of the data** required for such a measure at the EU-level and the need to keep that data up to date.

The 'best-in-class' dataset would have to be *very* granular if it is to effectively deal with the same packaging type being used for different products with different needs. An example given was carbonated water which places increased functional requirements on the bottle and should not be compared to bottles of the same size designed for still water.

It was suggested that there is **complexity** in how a measure of this type may be applied:

- Firstly, it would need to consider the **variations in international supply chains and distribution channels**.
- Secondly, it would need to ensure **brand intellectual property rights** and **confidentiality is protected** (e.g., which brands have the lowest weight packs and how).
- Thirdly, it would need to be able to **account for cultural differences** which affect packaging design and now this may impact the 'best-in-class' limits.
- It was also noted that non-EU suppliers may have limited ability to reduce their packaging weights to the required threshold.

Several **stakeholders questioned how the impacts on SMEs of this measure would be minimised**, pointing out that they would not have access to the innovative packaging designs and technologies needed to meet any best-in-class thresholds. SMEs have limited influence to change packaging design as they a) may not have access to the most innovative suppliers and b) are often not able to invest in new production lines suitable for a different packaging type.

Several stakeholders **questioned the appropriateness of a legislation-driven approach**, noting that efforts already made by the packaging industry to minimise packaging should be better acknowledged and that there was already enough economic incentive to reduce packaging (in material weight terms). It was also noted, however, that the benefit of marketing and extra sales (driven by size, e.g., in toys, or weight in premium products) can be far greater than the cost of additional material, significantly weakening this effect. This is particularly true where the value of the product is high compared to that of the pack itself (which is often just a few €uro cents in cost).

Furthermore, it was noted that **such weight-based optimisation must be within a material/pack category,** or it will lead to a further switch to plastic. Furthermore, it was noted that **changes for recyclability reasons** (e.g., 100% mono-polymer in plastic) **should not be penalised if this approach makes a pack heavier**. Similarly, the use of recycled content in cardboard can make material heavier for the same level of performance and this also needs to be considered. Similarly, **the most effective design may not always be compatible with the minimum weight** for example a square bottle which offers transport and logistic advantages requires more glass than round bottles.

Some stakeholders are in favour of measure 3 and some even say that it could be extended to the other major packaging types. A stakeholder suggested that **a corporate best-in-class would be preferrable to a sectoral approach**. Other stakeholders would exclude packaging that is reusable and/or contains recycled content. Other stakeholders highlight the need for the classes to be well defined. There was **m**ore agreement around the possibility of setting such 'best-in-class' **thresholds first as voluntary/advisory approach**, allowing the gathering of further data before setting a mandatory limit to prohibit placing on the market.With regards to the threshold, some stakeholders argued that the **proposed 20% benchmark would have a disproportionate impact on the market**, as the best-in-weight bottles are not necessarily representative of the market.

9.4 Measure 5: Minimization of empty space in packaging in selected sectors, including e-commerce

This measure aims at addressing the problem of **packaging of excessive volume**, i.e., which have a substantial 'empty' or 'void' (non-product) space. This problem is of particular concern in the **following sectors**: e-commerce/distribution (a fast-growing sector that is causing large volumes of waste cardboard), electronics, toys, hardware/DIY and cosmetics.

While extra pack material costs brands more in packaging terms, this is often very marginal compared to the real (or perceived) benefit in terms of **sales and marketing** – either in terms of shelf presence in physical retail (e.g., toys) or in terms of the customer

experience when receiving a premium product (such as a mobile phone or laptop). In **e-commerce** distribution, the large packaging used is often the result of the economy of scale benefits of buying large quantities of a relatively small number of box sizes, and the need for high packing rates at packing stations, where large numbers of box sizes (to allow more optimised fit to product) slows the largely manual process.

Given the projected growth rates in **e-commerce** and the fact that corrugated another board boxes for tertiary packaging are the most prevalent packaging type in terms of volume, this specific problem is **likely to contribute significantly** to the projected general increases in packaging waste generation.

In a recent survey by Forbes Insights and DS Smith, **60% of e-commerce executives indicated that more than a quarter of their packaging (25%) is empty space**, while separate research across product categories indicated that the empty space in e-commerce packaging ranges from 18% for clothing and footwear to 64% for glassware.[382] According to a recent **JRC study**, an additional layer of packaging (excluding inner protective materials) provides **an additional demand for almost 1.5 million tonnes of cardboard and around 26,000 tonnes of light density polyethylene foil** for Europe generated by e-commerce.[383] The JRC study presented a baseline scenario data for 2030, which showed that under the conditions where expected annual revenue growth rates between 2019 and 2021 can be applied for the linear increase of fulfilled units, packaging materials can be expected to roughly double in total for cardboard and LDPE film by 2030.

Currently there is **no harmonised legal instrument** in place that addresses the problem of excessive void spaces in packaging in the EU.

9.4.1. Description of the measure

This measure would set **a maximum void (empty) space limit** for e-commerce and distribution packaging, and packaging in the electronics, toy, hardware/DIY and cosmetics sectors.

The percentage void thresholds could be set in such a way as to eliminate the worst offenders, and hence the thresholds can be set with quite a large tolerance to allow for some variety within a product category, distribution conditions etc.

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[382] Forbes Insights & DS Smith (2018) The Empty Space Economy.

[383] Romagnoli, V., Aigner, J.F., Berlinghof, T., Bey, N., Rödger, J. and Pätz, C. (2020), Identification and assessment of opportunities and threats for the Circular Economy arising from E-commerce. Ed. Orveillon, G., Garbarino, E. and Saveyn, H. Luxembourg, Publications Office of the European Union.

Further details would be specified via the Sustainable Products Initiative. For the purpose of this Impact Assessment some **preliminary modelling** has been carried out based on the following assumed void space ratios (i.e., void space as a proportion of the whole pack):

- 40% for e-commerce and distribution packaging.
- 25% for loose products that need to settle after packing in production, or multiple items that need to be separated within the pack for reasons other than sales and marketing.
- 15% for other products, including electronics.

9.4.2. Effectiveness

This measure would only have an impact on the use of cardboard and plastics, as these are the materials that are predominantly use in the applications that would be targeted. According to the model **this would lead to an overall reduction in waste generation of 1.7% as compared to the baseline**, which can be attributed to a 3.5% reduction in the use of cardboard and a 1.1% reduction in the use of plastic packaging (see Table below).

Table 24. Summary of packaging waste change for Measure 5 (absolute amounts in thousand tonnes)

	2018	2030 - baseline	2030 - measure	Change (total)	Change (%)
Glass	14,493	14,873	14,873	0	0.0%
Steel	2,935	2,674	2,674	0	0.0%
Aluminium	970	999	999	0	0.0%
Paper / board	31,817	37,747	36,417	-1,330	-3.5%

	2018	2030 - baseline	2030 - measure	Change (total)	Change (%)
Plastic	14,797	20,974	20,742	-232	-1.1%
Wood	12,574	14,927	14,927	0	0.0%
Other	218	204	204	0	0.0%
Total	**77,805**	**92,397**	**90,835**	**-1,562**	**-1.7%**

Table 25. Summary of packaging waste generation changes for Measure 5

	2030 – measure (thousand tonnes)	Change vs 2030 baseline (%)
Glass	14,873	0.0%
Steel	2,674	0.0%
Aluminium	999	0.0%
Paper / board	36,417	-3.5%
Plastic	20,742	-1.1%

	2030 – measure (thousand tonnes)	Change vs 2030 baseline (%)
Wood	14,927	0.0%
Other	204	0.0%
Total	**90,835**	**-1.7%**

9.4.3. Ease of implementation

As this measure would be implemented via the Sustainable Products Initiative, the ease of implementation is **not assessed in this Impact Assessment**.

9.4.4. Administrative burden

As this measure would be implemented via the Sustainable Products Initiative, the administrative burden of this measure is **not assessed in this Impact Assessment**.

9.4.5. Economic impacts

Reducing void pack space would lead to reduction in the use of materials, and thus to some **cost savings** (materials and EPR fees).

In particular:

- **Reducing the volume of the pack reduced material use**, which saves costs which offers a small competitive advantage, especially for large producers where the aggregate saving can be very large. **The CBA model indicates material savings of 983 million EUR in 2030 and 1,368 million EUR in 2050**.
- In terms of waste management and **EPR cost savings** (which would be spread across producers and waste disposers), **the CBA model indicates 235 million EUR in 2030 and 335 million EUR in 2050.**

Some premium brands see a **sales and marketing** advantage of larger packs, to improve shelf-presence (e.g. for toys) or to provide an enhanced customer experience, however if this measure is applied across the EU, there will be **no disadvantage to any producer** as all will be treated equally.

9.4.6. Environmental impacts

A reduction in material use, predominantly cardboard (corrugated and carton board) with a smaller amount of plastic, results in **some positive environmental impacts in terms of GHG emissions and water use** (see table below). In addition, the monetary value of the reduction in GHG emissions and air pollution is estimated to be 217 million.

Table 26. Summary of packaging waste generation changes for Measure 5

Summary of Environmental Impacts, change in 2030 relative to baseline	
Change in GHGs, thousand tonnes CO_2e	-1,109
Change in water use, thousand m^3	-31
Change in GHG/AQ externalities, € million	-217

9.4.7. Social impacts

The impacts of this measure on employment are expected to be minimal. The preliminary modelling indicates potential job losses of approximately 3300 FTEs in 2030 and 4,700 in 2050 in the waste management sector. Compared to a total of 211 million jobs in the EU[384] in 2020, this number is negligible.

[384] https://ec.europa.eu/eurostat/web/lfs/visualisations

9.4.8. Stakeholder views

The **Open Public Consultation** that accompanied this Impact Assessment showed that **68% considered that there is currently too much packaging** (37% indicated too much packaging and 31% indicated far too much packaging) around products placed on the EU market in general, with a particular concern over electronics/electrical equipment, toys, cosmetics, ready meals and fashion accessories (in declining order from 82% to 66% noting too much or far too much packaging).

Overall, some clarifications were required around **how the threshold was determined**, the definition of void space and the methods used to calculate it, the role of void fillers and how measure 5 interacts with measure 1 and measure 3.

It was also noted that **void space in e-commerce and other distribution packaging** would need to only consider the space between the primary product pack and the outer box or bag, given that any void within the primary pack is without the control of the fulfilment company.

It was pointed out by various stakeholders that detailed limits for various products may be difficult to implement and a more general "common sense" target, with a quite large tolerance band (e.g., 30% void space) would be sufficient. It was noted, however, that a target could in some cases encourage more void space than necessary (i.e., where it was less than the target value beforehand).

Some stakeholders raised that this measure could require customised packaging which can **disproportionately target smaller businesses.** There were suggestions for a voluntary approach and the setting of recommendations instead of mandatory targets. Other stakeholders believe that this measure can be addressed as part of either measure 1 or measure 2 instead.

Some stakeholders argued that there are conflicting objectives such as recycled content and smaller food portions to combat food waste and portion control, so **some packaging should be exempt from measure 5**. Fragile products or multiple products sent in one package require sufficient filling to protect them, so there are questions around how void space will be calculated in these cases.

9.5 Measure 7: Phase out Avoidable / Unnecessary Packaging

Over-packaging is caused mainly by **'unnecessary' packaging**. It includes additional packaging layers that aren't always necessary (e.g. a plastic tray within a card pack, a

cardboard outer on a robust tube such as toothpaste), certain forms of collation/multi-pack packaging which are there primarily for the convenience of consumers in handling (and to encourage multi-buys – which can lead to over-consumption), single-serve/use items (such as hotel miniature shampoos or jam portions), and the use of single use packaging (such as cups) for eating in, where reusable and refillable items are perfectly practical.

Businesses themselves acknowledge the use of 'unnecessary' packaging in their agreement to plastic pact commitments. For example, the Ellen MacArthur Foundation's Global Commitment includes a commitment to reduce unnecessary plastic[385].

At present there are only bans, at the EU level, of certain types of plastic takeaway food packaging, for example those made of EPS, through the SUP Directive.

9.5.1. Description of the measure

There are a number of packaging items that are already being removed by some of the more pro-active brands and retailers in the EU, where the packaging is not seen as being strictly necessary to protect and preserve the product. It is therefore suggested that the following items, which have some precedent for removal already, could be gradually eliminated from the EU market:

Transit packaging

1. **Single-use transit packaging used between sites and subsidiaries of a company, or group of companies, within the EU**. This measure would include) but not be limited to) pallets, pallet systems, boxes, trays, crates, intermediate bulk containers (IBCs) (rigid and flexible), drums and cannisters of all sizes and materials.
2. **Single-use large transit packaging,** notably pallets, pallet systems, boxes, IBCs, drums and crates, above a certain size (to be determined), used between companies for deliveries within a Member State.

Retail packaging

3. **Single use plastic multi-pack collation/secondary packaging for cans, tins, pots, tubs, and packets** (e.g., for snacks), where these are predominantly designed for the convenience of final domestic consumers to take them away from retail (rather than primarily to facilitate handling in distribution). This would include can rings, sometimes called hi-cones or yokes, and collation

[385] NEW PLASTICS ECONOMY GLOBAL COMMITMENT PROGRESS REPORT OCTOBER 2019

films and shrink wrap for example. It should be noted that this would not prevent multi-buy discounts, with consumers using their own reusable packaging.

4. **Single use multi-item collation packaging (e.g., netting) for fruit and vegetables, where there is less than 1.5kg of produce** (to reflect the difficulty for consumers of handling large quantities of items using no packaging or their own packaging).
5. **Very lightweight plastic carrier bags VLPCBs for in-store loose fruit and vegetabl**e picking by domestic consumers.
6. **All single-use packaging for the HORECA sector where the food and drink is filled and consumed on the premises**, including at tables, stools and standing areas both inside and immediately outside the premises.
7. **All single use packaging for the HORECA sector (for eating in or takeaway)** used for condiments, preserves, sauces, milk, sugar, and seasoning.
8. **Single use hotel 'miniatures'** for bathroom hygiene / toiletry products, including but not limited to liquid hair shampoo, hair conditioner, shower gels, hand and body lotions, etc. and miniature bar soap and other hygiene products.
9. **EPS packaging layers used in retail** pizza or other retail food packaging.
10. **Packaging with double walls, false bottoms** and other means to create the impression that the product volume is greater than it is.

Regarding Items 1 and 2, the main barrier to the wider uptake of returnable/reusable transit packaging (RTPs) is the feasibility and cost of tracking and reverse logistics, with losses of RTPs (theft and misplacing) being a significant issue as well as the transport impacts of returning bulky transit packaging. These issues can be dealt with effectively using 'pooling' to avoid the need for back-haul (as already done with pallets and pallet systems for example), collapsible systems to simplify return where that is necessary, and RFID chips and digital systems to aid tracking and charging for lost units. RTPs, however, can be logistically challenging to use where a) distributing items outside of continental Europe and b) where multiple companies, including third party hauliers working for multiple producers and retailers, are involved.

This measure, banning some single use transit packaging, is therefore limited to Item 1 RTP use within companies, and groups of companies, within the EU, while Item 2 is limited to large packaging systems used for deliveries within Member State boundaries. Imported and exported packaging are exempt.

I**tem three would not include items that are necessary for distribution handling reasons**, e.g., to facilitate palletisation. Shelf-ready collation packaging, which is used both for distribution and retail shelf display, would also be exempt. In terms of how this measure might affect retail check-out times, it should be noted that increasingly grocery stores are moving to smart checkout systems where the item is scanned by the shopper as it goes into the basket or trolley.

It is also worth noting that for many stakeholders, the issue with Item 3 and Item 4 is not over-packaging, but rather their potential for littering and their recyclability. Various alternatives to plastic multi-pack collation packaging have already been developed, mainly involving cardboard solutions or glue-dots (e.g., to hold cans together). It may only be necessary to ban the plastic collation items that can have a serious impact on wildlife if discarded as litter, e.g., beer can collars/rings that can ensnare animals and birds.

Items 4 and 5 are considered unnecessary single-use items since they can be easily replaced by a reusable item that the consumer would bring to a retailer. These are already available, for example as reusable netting bags.

Items 6, 7 and 8 are regarded as unnecessary since they can be readily replaced by reusable containers that are refilled, from bulk dispensers, by the HORECA business. Note that Item 6 does not include single use packaging filled at a separate location, e.g. by a brewery that fills single use bottles for sale in HORECA.

Item 9 is included since corrugated cardboard and more recyclable plastics are now widely used as a replacement for EPS in retail packaging (e.g., under pizzas to provide additional cushioning and support within a box).

Finally, if Item 10 would not be considered appropriate to be dealt with as unnecessary packaging, it could be dealt with by a tightening of consumer protection law or through the use of void space limits (addressed by Measure 5).

In addition, it is worth adding that the Commission is considering action on the packaging of fresh fruit and vegetables. Several countries have already taken action or are considering taking action (e.g. FR, ES, IT, BE); in addition, several large supermarket chains have announced similar measures. The sector is calling for the European harmonization of the approach. In France, the anti-waste law for a circular economy prohibited the retail sale of fresh fruit and vegetables in plastic packaging from 2022, except when they are packaged in batches of more than 1.5 kg and for "fruit and vegetables presenting a risk of deterioration when sold in bulk". The French measure concerns only retail. Operators can continue using plastic pallets upstream, or even plastic packaging, but this packaging must be removed when the product is displayed to the final consumer. The objective of Measure 7 as regards fruit and vegetables packaging, is also to encourage the sector to rationalize its supply chain and develop another form of communication with the consumer. The measures is aimed to increase consumer acceptance and reduce their confusion. Consumers are confused as they see consumption of fruit and vegetables as virtuous eating habit and then they are faced by the multitude of packaging; in addition, they can find all fresh fruit and vegetables sold in bulk in open markets, while in the supermarkets, they find the same

products wrapped in plastic packaging and sometimes next to similar products sold in bulk.

9.5.2. Effectiveness

The modelled impacts of this measure show an **overall reduction of 4.4% in packaging waste** in 2030 compared to the 2030 baseline, or 4.093 million tonnes in absolute numbers. As shown in Table 27 below, the biggest changes per material would be for wood, followed by paper/board, plastic and finally aluminium.

Table 27. Summary of packaging waste generation changes for Measure 7

	2030 – measure (thousand tonnes)	**Change vs 2030 baseline (%)**
Glass	14,875	0.0%
Steel	2,681	0.3%
Aluminium	970	-2.9%
Paper / board	35,824	-5.1%
Plastic	20,174	-3.8%
Wood	13,584	-9.0%
Other	204	0.0%
Total	**88,311**	**-4.4%**

9.5.3. Ease of implementation

In line with the approach taken with the SUP Directive, this measure would require the PPWD to include an article setting restrictions on placing on the market. The determination, review and update of the list of items to be restricted would require different efforts.

9.5.4. Administrative burden

The burden would be on Member State market surveillance authorities to ensure that banned packaging is not being used. The most complex enforcement issue here would in relation to the use of **transit packaging which requires consideration of the types of use, and travel parameters**, rather than the use of a type of packaging. In addition, the list of banned items needs to be amended via delegated acts.

Furthermore, additional burden is related to the fact the list would need to be reviewed and updated if necessary after the implementation.

9.5.5. Economic impacts

This measure would result in avoided packaging placed on the market, with the following impacts:

- Savings of 1,243 € million in EPR fees due to reduced waste management costs;
- Loss of producer turnover of 15,380 € million;
- Material cost savings of 1,676 € million; and
- Costs of 979 € million in reuse schemes.

This measure could have a negative impact on SMEs; however, as described in previous sections, the removal from the market would be gradual, allowing enough time for businesses to adapt.

9.5.6. Environmental impacts

Measure 7 would result in the environmental benefits in the table below due to the avoided packaging.

Table 28. Summary of environmental impacts for Measure 7

Summary of Environmental Impacts, change in 2030 relative to baseline	
Change in GHGs, thousand tonnes CO_2e	-2,177
Change in water use, thousand m^3	-91
Change in GHG/AQ externalities, € million	-516

9.5.7. Social impacts

Similar to measures 2c, this measure would result in a loss of 133 thousand jobs from manufacturing (mostly), recycling and waste treatment, and at the same time a creation of 623 thousand jobs in the reuse sector. Thus, the **net results would be the creation of around 490 thousand jobs**.

9.5.8. Stakeholder views

This measure was not presented in the webinar in June 2021 so most feedback reflected below was gathered during the two previous workshops.

There were **polarised opinions on this approach with NGOs generally in strong support, industry strongly against.**

One stakeholder noted that bans on certain packaging would contribute to the image of an over-regulating EU that dictates to citizens what is "unnecessary". Introducing the notion of “avoidable” packaging and defining a list of packaging which is to be phased out will set an extreme precedent in EU legislation that would hinder market freedom and consumer choice, create discrimination and limit business innovation (misaligned with the Innovation Principle, a requirement of the Union’s Better Regulation Agenda).

There was a general desire that these measures make use of **LCA data to ensure that the changes driven by these measures had a positive impact on GHG emissions** and do not result in increased product waste.

Regarding the phasing out of single-serve food packaging**, there is a concern about hygiene with regards to reusable alternatives**.

9.6 Measures that were discarded in an early stage

The measures that are included in this Impact Assessment are the result of an extensive screening process. Based on a preliminary assessment some measures were discarded in early stage because they were considered to not meet one of the core criteria related to effectiveness, efficiency, fairness, policy coherence etc. Related to the intervention area on waste prevention there were two discarded measures, presented below.

9.6.1. Measure 2a: Unit weight reduction target

Material specific unit weight reduction targets are given to Member States per type of materials: 7%-unit weight reduction target for plastic and glass items, 5% for paper-based packaging, and 2% for steel, aluminium and wood packaging. The targets are reflect the further reduction of weight that can be achieved in each packaging unit through weight optimisation (as per measure 3, 'best-in-class') and limiting voids (as per measure 5, 'void space limit').

This approach should be achievable through at-source reduction (reuse/refill would be treated separately). It would minimise material switching and market distortion and allow simple monitoring using existing weight data by material as already reported. The detail of how the target is disseminated to sectors could be through negotiation between the Member State authorities and the lead organisation, to establish a figure that is deemed reasonable for the sector.

9.6.2. Measure 4: Pack-to-Product weight ratios

Measure 4 defines limiting pack-to-product ratios by weight, excluding or otherwise penalising, those that exceed these thresholds. This approach would be either an alternative to Measure 3 (best-in-class weight limits), or a complement, where the whole sub-category of products is considered excessive (e.g. hospitality single serve items) and a 'best-in-class' benchmarking approach within that sub-category would not be very effective.

Products are generally sold by weight and packaging weights are (relatively) well-known and reported in regard to compliance with packaging legislation and weight-based EPR fees as applied in most EU countries. Defining suitable ratios is complex, however, as this would need to be done by packaging material, as material choice has a very significant

effect on this ratio, and by product type since product weights vary greatly and hence this affects the product to packaging weight ratio.

This approach is far more complex than the 'best-in-class' approach (Measure 3), as it requires far more data on product weights as well as pack weights, and hence would involve a high administrative burden for producers, PROs and the Commission, given the need to define a potentially very large range of threshold ratios by product/material combinations, and potentially in setting exemptions for certain very lightweight products. **There is also a potential cross-over** here with reuse options (e.g. in this case refilling a shampoo dispenser in a hotel room rather than providing small single-use bottles) and with items that could be considered entirely avoidable as a category (see Measure 7).

9.6.3. Measure 6: Eco-modulation to incentivise light-weighting

Measure 6 would introduce modulate fees under EPR, complementing recyclability criteria for example. **This is, however, seen as a complicating factor for administering eco-modulation, and while some PROs already have complex eco-modulation schemes with multiple criteria** (notably CITEO with multiple bonus and malus factors), it is considered that this is generally not desirable since having multiple criteria within a Member State, and differing criteria from one Member State to another, sends a confusing message to producers selling across the EU. One criteria, where a producer scores a bonus or a malus, may not be present in another country, and hence the producer is not as incentivised as might be the case if all EU countries focused on the same criteria, and ideally just one criterion. In addition, while charges under EPR in the EU are already weight-based, however the cost of packaging is often a very small fraction of the product cost. Consequently, while it is cheaper to use lighter material (both from a material cost perspective and to reduce EPR fees), this is only likely to be a significant incentive for very large producers where the product value (and profit margin) is low relative to the packaging costs.

9.6.4. Measure 9: Mandatory MS level 'overarching cross-sectoral' reduction targets

Total waste generation per capita continues to increase over time, driven by trends such as higher levels of economic development and growth in disposable income, as well as the proliferation of single-use packaging and products, for the same reasons described for Measure 8, this has led to the consumption of more material goods.

Currently, no waste generation reduction target is mandated by EU. The WFD provides for examination of preparation for reuse data by the end of 2024, with a view to understanding the feasibility of setting quantitative waste reduction targets.

This measure will introduce waste reduction targets to drive a reduction in total waste production, and specifically packaging waste, thus leading to a decrease in material and resource use, as well as limiting leakage of packaging into the environment and damaging ecosystems.

The denomination “overarching” is specified in terms of waste reduction – this could be achieved via– avoidance, reuse and light weighting. To promote reuse over light weighting, a target quantifying the proportion of waste reduction to be met by reuse is specified. The target will be cross-sectoral because it does not establish any specific sector but should be achieved within the packaging industry. A cross-sectoral target has the advantage that is it simpler to communicate than a panel of targets for different product/packaging groups and different waste prevention pathways. On the contrary, setting targets by each material stream would mean that there are fewer market distortions away from denser materials like glass and metal, this does not allow the optimal material for specific reuse systems and formats in terms of environmental performance to be ascertained and emerge.

Mandatory packaging waste reduction targets are set as a general target for all products/packaging as a group, measured in kg per person per year.

9.6.5. Measure 9a. Target as % of reduction of SU items.

One of the drawbacks of targets expressed in terms of waste reduction is that they can be met by a variety of actions – i.e. avoidance and light weighting as well as reuse. By measuring in numbers of items, confounding actions are limited to avoidance, rather than light weighting (which tends to be most predominant). The total market scope in terms of sectors and product/packaging types means there is the risk that meeting the target will be driven by the easiest to achieve and will stall when the necessary preparatory activity has not been carried out in other sectors.

Transition to reuse would be dominated by areas in which it is already well established (like B2B tertiary packaging), whereas as the necessary development of new systems across a wider range of sectors would not have been stimulated. Sector by sector targets in contrast set the stage for widespread change across a broad variety of products and increase the number of types of reuse systems developed, increasing innovation and best practice that can be shared between different sectors. It also maximises consumer exposure, engagement and behaviour change.

9.6.6. Measure 9b: Mandatory MS 'overarching cross-sectoral' % reduction targets – General target (kg per person per year) – less ambitious - 5% reduction to be met by reuse.

Measure 9b consists of a target with a higher level of ambition as regards absolute waste reduction and timeframe, and the expected level of adoption of reusables to achieve the

required reduction in waste generation is therefore higher, sooner. The additional consequence of this is that meeting the target will be more challenging for obligated actors. If implemented alone, as a cross-sectoral target, change will be driven by sectors where reuse is already well established. Those facing greater research, development and investment needs to optimise and deploy reusable packaging are unlikely to have the impetus to act in a way that anticipates the scale of change needed to meet the targets. Progress towards the targets then risk stalling when the necessary groundwork has not been done. See Annex 9.2 on reuse for further details on this measure.

9.6.7. Measure 9c Mandatory MS 'overarching cross-sectoral' % reduction targets – General target (kg per person per year) – more ambitious - 10% reduction to be met by reuse.

Measure 9c is similar to measure 9b but with a more ambitious waste reduction target compared to measure 9b and a 10% waste reduction to be met by reuse. See Annex 9.2 on reuse for further details on this measure.

INTERVENTION AREA PREVENTION AND REUSE: MEASURES ON REUSE AND REFILL

9.7.1 INTRODUCTION

As products, materials and consumption patterns have evolved, there has been a significant rise in the use of one-way packaging, especially single-use plastic. In absence of regulation and policies to protect re-use and refillable markets in almost all territories, the market share has been under considerable pressure over the past 20 years. There has been a steep decline in reusable packaging over the past 20 years.

There are many reasons behind this drastic scenario, but most of them involve the economic factor of costs. For instance, many companies and retailers have switched to single-use packaging due to the cheaper prices and ‘simpler’ setup and operation compared to reuse systems (which require a higher initial investment, labour, space and take-back management). A shift to single-use packaging have also allowed manufacturers to externalise their waste costs. The cost-competitiveness of single-use packaging can be explained by the externalisation of costs to society and environment, since Extended Producer Responsibility Schemes (EPR) fees cover only a fraction of collection and treatment whereas the producers working with refillable packaging must factor in the full costs of take-back and refill.

Key issues identified are the following:

- Consumers lock-ins e.g., a trend towards increasing consumer convenience, including increasing on-the-go consumption and e-commerce.

- Lack of standardization, harmonization and infrastructure causes unfair competition between single use versus reusable packaging:
- There is currently no explicit target on packaging prevention and minimisation. The reference in Annex II of the PPWD to packaging waste minimisation in the Essential Requirements is vaguely worded and difficult to implement. Annex II of the PPWD states that "*Packaging shall be so manufactured that the packaging volume and weight be limited to the minimum adequate amount to maintain the necessary level of safety, hygiene and acceptance for the packed product and for the consumer."* European Standard EN 13428:2000, which provides presumption of conformity with the above requirement, leaves too much flexibility through the performance criteria.

Measures discarded and not analysed in depth:

- Measure 8a: Voluntary re-use targets
- Measure 8d: Voluntary targets must be set
- Measure 8e: Mandate re-use of some tertiary packaging (as standalone measure)
- Measure 8f: Target for re-use of some E-commerce packaging (as standalone measure)
- Measure 8g: Mandating re-use of tertiary packaging within businesses or groups of businesses that constitute closed loops (as standalone measure)
- Measure 8h: Targets for re-use within supply chains or within a specific sector such as the retail sector (whether voluntary or mandatory) (as a standalone measure)
- Measure 9: Mandatory MS level overarching cross-sectoral waste reduction target
- Measure 10d: Informal guidance issued by informal forums
- Measure 11a: Business advisory body for reusable products and packaging: Advisory bodies mandated formally at EU or national level
- Measure 11b: Forum: informal EU or national level groups
- Measure 13: Create a single market for reusable packaging
- Measure 14. Updates to the essential requirements and EPR considerations for re-use
- Measure 14a. Updating the essential requirements to better align with the waste hierarchy
- Measure 14b. EPR fee modulation for reusable packaging
- Measure 14c. Reusable packaging exempt from licensing obligations/EPR fees
- Measure 15. Re-use reporting in selected product/packaging groups
- Measure 16. Incentives for reusable models
- Measure 16a. Taxes on single use items (all materials),
- Measure 16b. Levies and charges for single use packaging items at point of sale,
- Measure 16c. Subsidies or tax breaks for reusable items such as reduced VAT on refillable/reusable items.
- Measure 16d. Competition/lottery entry with prizes to reward consumer use and adoption of re-use schemes could drive up number of reuses, with a variety of ways these can be implemented.
- Measure 17. Provision of funding for research and development
- Measure 18. Information campaigns on re-use
- Measure 18a. Promotion of specific reusable items to consumers
- Measure 18b. Promotion of reusable packaging items in general
- Measure 18c. General campaigns on environmental costs of single-use packaging and how to reduce packaging consumption
- Measure 20. Reusable tableware mandated in HORECA sector

Measures analysed in depth in the Annex and included in the options table

- Measure 8b: Mandatory reuse and refilling targets for selected packaging groups for 2030/2040 in selected sectors
- Measure 8c: Mandatory high level targets to increase the reuse of packaging by 2030/2040 in selected sectors
- Measure 10: Standardisation of reusable packaging and effective reuse systems
- Measure 10a. Revision of CEN standard for defining reusable packaging
- Measure 10b. Definitions and mandatory requirements for reusable packaging formats set in EU legislation and standard for some formats
- Measure 10c. Definition and mandatory standards for re-use systems, in terms of incentives, infrastructure, logistics, required reporting etc., set in legislation and standard
- Measure 12-u: Harmonised labelling for reusable packaging (See section on labelling Annex 9.8)
- Measure 19: Providing clarity on the definition of re-use activity versus a "preparing for re-use" activity

MEASURES INCLUDED IN THE OPTIONS TABLE

The Waste Framework Directive (WFD)[386] states that Member States must take measures to "encourage" reuse and setting up of re-use systems for products and packaging. According to the Packaging and Packaging Waste Directive (PPWD)[387], Member States shall take measures to "encourage the increase" in the share of reusable packaging placed on the market and of setting up re-use systems. This may include, in environmentally sound manner and in conformity with the Treaty without compromising the hygiene and safety of consumers, the setting of qualitative or quantitative targets and the setting up of a minimum percentage of reusable packaging placed on the market every year for each packaging stream.

This measure proposes mandatory re-use and refill targets, same for all Member States. The targets aim to drive an increase in the overall market shares of re-use and refillables in selected sectors, thus **reduce the consumption of single-use packaging, preventing packaging waste and achieve an overall decrease in material and resource use**. The targets will also encourage a level playing field between the single-use and re-use/refill markets.

Preventing packaging waste includes all the measures taken before any packaging or packaging material has become waste, that reduce the quantity of packaging waste, including through re-use of packaging and refill, the extension of the life span of packaging, re-design of products, bulk sales, elimination of excessive packaging.

The targets refer to both re-use and refill, recognizing that they are two separate and different operations that will require different actions from the obliged actors. The following terms are used to delineate different modes of re-use and refill within the proposed targets:

- ‘re-use’ means any operation by which packaging that are not waste are used again for the same purpose for which they were conceived;

[386] WFD, Article 11(2) and (3) (c), (d) and (e); 11a (1)(c): Preparation for reuse is allowed to contribute to recycling targets for all waste

[387] PPWD, Article 5(2): reuse as % PoM (placed on the market) is allowed to contribute up to 5% to recycling targets for packaging (overall and material specific targets) Article 5(2) of the PPWD states “A Member State may decide to attain an adjusted level of the targets referred to in points (f) to (i) of Article 6(1) for a given year by taking into account the average share, in the preceding three years, of reusable sales packaging placed on the market for the first time and reused as part of a system to reuse packaging. No more than five percentage points of such share shall be taken into account for the calculation of the respective adjusted target level.”

- ‘reusable packaging’ or packaging component or unit shall mean packaging which has been conceived, designed and placed on the market to accomplish within its lifecycle a minimum number of trips or rotations in a system for re-use.
    - ‘rotation’ cycle undergone by reusable packaging from filling/loading to filling/loading. A rotation will always contain a trip.
    - ‘trip’ transfer of packaging, from filling/loading to emptying/unloading. A trip may be part of a rotation.

  ‘systems for re-use’ arrangements (organizational, technical and/or financial) which ensures the possibility of re-use:

    - closed loop system where reusable packaging is circulated by a company or a co-operating group of companies or companies who participate in the re-use system.
    - open loop system where reusable packaging circulates amongst unspecified companies; the ownership of the packaging changes at one or more points in the reuse process.

- ‘refill' operation by which packaging, that has been conceived and designed to accomplish within its life cycle a number of trips or rotations, is refilled or used for the same purpose for which it was conceived, with or without the support of auxiliary products present on the market enabling the packaging to be refilled. The end user is both the consumer and the refiller. There is no redistribution system in place for commercial refilling. The end user retains ownership of the refillable item and are responsible for cleaning.
    - Reconditioning, ‘operations necessary to restore a reusable packaging to a functional state for reuse purposes’
    - Auxiliary product, ‘products used to support the refilling/loading of reusable packaging’

By setting product and packaging-specific targets, the development of re-use and refill is promoted in a variety of sectors rather than being focused on increasing re-use and refill only in already well-established sectors. Binding targets, as opposed to voluntary targets, provide a policy framework, which incentivises re-use and refill, thereby creating favorable conditions for investments in the relevant technology and infrastructure for deployment of reusable packaging, re-use systems and refill.

The targets are proposed as % product sales or trips of re-use or refill. The targets aim to reflect both: the proportion of reusable items sold and their durability, i.e., the number or uses/rotations/trips a multiple use packaging does during its life cycle plus the sales of refill. Trips are included as an option for the units for tertiary packaging particularly, where sales would not be an appropriate unit. Where there is neither a transaction involved nor any way of registering the refill/reuse, the reduction in the number of single-use items can be used as a proxy rather than weight to estimate the target. The reporting units proposed differ from the one currently in force in PPWD, which requires Member States to record

the tonnage of all packaging placed on the market, the tonnage of reusable packaging placed on the market for the first time and number of rotations. However, measuring reuse by number of items in percentage of product sales/trips rather than weight provides a more accurate picture of waste reduction, as reusable alternatives may be of a different material and heavier than the single-use options they replace. The multiple use packaging will be reused multiple times, and therefore lead to a decrease in material use over time.

Re-use will not have the best environmental performance in some context compared to single use e.g. when the distance to a washing facility is too long, however the environmental and economic benefits improve when the number of rotations increase. The reuse and refill targets are therefore designed in a way that support and stimulate the innovation and growth within reusable packaging and systems without banning the single-use options completely.

The targets are material neutral as the best type of material and container for reusable packaging have yet to be established with respect to system performance and environmental benefits and varies for each application.

A scoping exercise was carried out to select the product/packaging groups with a high potential for re-use or refill. The potential for re-use or refill of different product/packaging groups was investigated based on the following 6 criteria.

Criterion 1 - Excessive use of single-use packaging	Is there any excessive use/consumption of single-use packaging or any re-use system already in place and accepted that could replace the single-use option?
Criterion 2 - Necessity	Is the packaging necessary or avoidable?
Criterion 3 – Recyclability and recycled content	Are the single-use packaging options currently recycled or do they contain high recycled content?
Criterion 4 – Product specific characteristics	Does the multiple-use option meet the functional requirements of containment/tidiness, health/hygiene, and safety? Does the multiple-use option decrease the generation of waste?
Criterion 5 – Type of	How many reusable models are available or in place for a given

reuse	product/packaging (e.g., business-to-business, refill at home, etc.)?
Criterion 6 – Uptake potential	Is the reuse system easy to implement and apply (based on costs, space and convenience for retailers, convenience for consumers durability of formats like paper/cardboard, and better environmental performance compared to recycling)?

This produced **a ranking for general feasibility and potential for positive impact of re-use** and refill across a broad range of **categories of products shortlisted across the following sectors** Food and Beverage (divided into Retail and HoReCa) and Commercial and Industrial (C&I) packaging, for which separate targets have been proposed[388]. Table 29 presents the re-use and refill targets for the selected packaging types and product categories for measure 8b and measure 8c.

The proposed measures (M8b and M8c) consist in setting up **binding targets for re-use and refill targets - same targets for operators in each Member State** - and corresponding sanctions for failing to meet such targets. In Measure 8b **low level targets** are considered. Measure 8c instead, proposes **high level targets** for the same sectors, packaging groups and products. The scope of the measure has been restricted due to the selection of the shortlisted packaging types in the Table 29 compared to the complete list in the initial Appendix I of the Eunomia report. The quantitative share of the shortlisted packaging types is estimated to be in the order of 70% of the complete list, so the impacts presented below are corrected by that factor, as these impacts are the results of the modelling of the complete list.

An interim target has been specified for 2030 and a longer-term target for 2040 (Table 29). The set of mandatory and strict targets, e.g. 100%, would have as a consequence that businesses that only produce single-use packaging for the market in question, they could not adapt to producing reusable packaging, it would be thus at risk of closure. 100% targets

[388] The scoping exercise was based on a general modelling of primary re-use. For example, reusing a reference beverage container 25 times allows to avoid the production, use and disposal of 25 reference single use beverage containers. The production of an average single use beverage container requires 28 g of plastic per use. In comparison, the average multiple use beverage container requires only 2.2 g plastic per use (55 g plastic divided by 25 rotations). Another example would be transport packaging. The production of an average single use crate/box requires 2,415 g plastic per use. In comparison the multiple use crate/box requires only 24.15 g plastic per use (2,415 g plastic divided by 100 rotations).

have not been specified in the reuse and refill measures within the measures, but for the categories such as white goods for which high level targets (90%) have been introduced, these do not refer to the producers that they can sell their products only in SUP. In addition, the targets have been set in close cooperation with the relevant stakeholders and are based on applied best practices in the EU.

The longer-term target for 2040 allows time for adaptation of existing supply chains to a greater proportion of reusable packaging and re-use systems. In absence of harmonisation, each Member State could be setting divergent targets and create obstacles to e.g., the fundamental principle of the free movement and could further confuse the European consumers[389].

Table 29. Targets as % sales or trips of reusable packaging for Measures 8b and 8c, expressed as (number of units sold in MU)/(number of units sold in MU + number of units sold in SU) for the selected packaging types, packaging groups and products; low level and high level targets are proposed for 2030 and 2040 respectively

Sector	**Packaging type**	**Packaging groups and products**	**Business model**	**Target for 2030 [2040] Measure 8b**	**Target for 2030 [2040] Measure 8c**
Food and beverage-HoReCa	Primary	Beverage (cold and hot) filled into a container at the point of sale for take-away, to be sold in packaging within a system for re-use or refill.	B2C	20% [80%]	30% [95%]
	Primary	Food for take-away, to be sold in packaging within a system for re-use or refill	B2C	10% [40%]	20% [75%]

[389] As it was mentioned in M8b, the quantitative share of the shortlisted packaging types is estimated to be in the order of 70% of the complete list, so the impacts in M8c should be corrected by that factor, as these impacts are the results of the modelling of the complete list

Food and beverage-Retail	Primary	Alcoholic beverages other than wine and spirits, and products based on wine, spirits or other fermented beverages mixed with non-alcoholic beverages, such as soda or juice, to be sold in packaging within a system for re-use or refill.	BB2C	10% [25%]	20% [75%]
	Primary	Wine, sparkling wine, spirits and other spirituous beverages, to be sold in packaging within a system for re-use or refill.	B2C	5% [15%]	10% [30%]
	Primary	Non-alcoholic beverages e.g., water, soft drinks, juices, to be sold in packaging within a system for re-use or refill.	B2C	10% [25%]	20% [75%]
Commercial and Industrial	Tertiary	Large household appliances e.g., washing machines or fridges, to be sold in reusable packaging	B2B	90% [90%]	90% [90%]
	Tertiary	Goods sold using pallets, crates, foldable boxes, pails and drums for the conveyance or packaging of the goods, to be sold in reusable packaging	B2B	30% [90%]	50% [90%]
	Tertiary	Non-food goods sold via e-commerce using packaging for transport and delivery, to be sold in reusable packaging	B2B	10% [50%]	20% [80%]

	Tertiary	Pallet wrappings and straps for stabilization and protection of goods during transport, to be sold in reusable packaging	B2B	10% [30%]	20% [75%]
	Secondary	Grouped packaging boxes, e.g., pack of 6 bottles of water or pack of 4 bottles/cans of beers used outside of sales packaging to group a certain number of goods to create a stock-keeping packaging unit is classified as reusable packaging within a system for re-use.	B2C	8% [25%]	15% [50%]
	Tertiary	Grouped packaging boxes used for wholesale (excluding cardboard) e.g., pack of larger quantities of packaging units used, outside of sales packaging to group a certain number of goods to create a stock-keeping packaging unit is classified as reusable packaging within a system for re-use.	B2B		
The targets refer to the actor in the chain who makes available the products on the market. As an example, a coffee shop has the obligation to sell 20% of the coffee in reusable or refillable cups					

Member States have the responsibility for monitoring if operators reach the re-use and refill targets. The legal responsibility for reaching the target though is put on the economic operators, e.g. importer, manufacturer, food service provider, final distributor, they also have the responsibility to report on the progress for re-use and refill within their products. The economic operators are responsible for making decisions on whether products are sold using reusable or single-use packaging. The economic operators are mostly packaging

users rather than suppliers, in a departure from the general approach for packaging EPR in many countries. These would be HORECA businesses, brand owners and retailers, or tertiary packaging service users and potentially third-party logistics providers, as appropriate to the sector.

Economic operators selling packaging within the selected product groups shall be subject to random third party spot-check auditing by the relevant regional or national authorities. These investigations should:

- Check data sources and their reliability;
- Check for any anomalous or suspicious individual packaging weights; and
- Check calculations

Different approaches may be more or less feasible for different sectors. Economic operators selling packaging within the selected product groups may be, because of their specific situations, exempted from reaching the re-use targets.

Member States can put in place their own exemptions based on a number of factors. A non-exhaustive list of factors where the exemptions will be based is following: i. the volume of packaging placed by a given economic operator on the market during a calendar year, ii. Its geographical location, e.g. on a small island, iii. meeting by economic operators conditions for receiving de minimis state aid, iv. number of employees employed by an economic operator, and v. sales area of given economic operator, including also all storage and dispatch area. The above mentioned thresholds will be specified along with the stakeholders.

To better understand how the re-use and refill targets will be used in practice, a practical example follows. The example shows the required data and information by the obligated operators, as well the impact of the targets to the packaging reduction:

Economic operators making available through a targeted packaging shall collect data on the volume of products (in units or weight/volume) sold through either a system for re-use or refill by:

a. extracting their sales data (or transaction data) on the information of % of reusable packaging and refill sold in year 2030 and 2040.
b. extracting the total products (in units or weight/volume) placed on the market both MU and SU.

Economic operators making available through a targeted packaging group will then

calculate their % sales (or trips) of re-use or refill as the ratio of the measured amount a. and b., measured in units and multiplied by 100 to be expressed in %. Economic operators selling packaging within the selected product groups will then submit a finalized report on their % sales of re-use/refill to the Member States on December 31, 2030, and December 31, 2040.

Example: A coffee shop (target = 30%), for example, which sells 100,000 cups of coffee per year is obliged to sell and report a minimum of 30,000 coffee served in MU coffee cups, whether this coffee is not consumed in the shop (take away). In case of an assumed average number of rotations per year of a MU coffee cup of 15, and the average weight of the single use cup and multiple use cup are 21g and 51 g respectively, the coffee shop would, at a MU rate of the 30%, reduce packaging by 24.76%. The detailed calculation rules and reporting schemes will be established in an implementing act.

In the following sections, the analysis of the impacts for each measure (8b and 8c) is following.

9.7.2 Measure 8b: Mandatory reuse and refilling targets for selected packaging groups for 2030/2040 in selected sectors

9.7.2.1 Effectiveness

The effectiveness of this measure is higher than the 8a with voluntary targets, which was analysed in depth. The changes in packaging waste generation per type of material are indicated in the table below. Considering that in the reference year 2018, the quantity of packaging waste generated in EU in 2018 is estimated to be 77.8mt, it is expected a reduction of about 3.154mt of packaging waste in 2030 and 9.96mt in 2040.

Table 30. Changes in Packaging Waste Generation [million tonnes] by Material, Measure 8b

Material	Change in 2030 (10^6t)	Change in 2030 (%)	Change in 2040 (10^6t)	Change in 2040 (%)
Glass	-0.2268	-2.20%	-0.7966	-7.20%

Steel	0.0161	0.20%	0.00238	1.30%
Aluminium	-0.0119	-1.70%	-0.049	-6.50%
Paper / board	-2.7055	-10.20%	-7.9338	26.10%
Plastic	-0.2191	-1.50%	-1.1851	-6.50%
Wood	0	0	0	0
Other	0	0	0	0
Total	**-3.1472**	**-4.9%**	**-9.9621**	**-13.3%**

The table below shows the overall outcome of the lower-level mandatory re-use and refill targets per type of packaging material in terms of percentage of product sales/trips of reusable packaging. The table indicates the 2018 situation along with the modelled baseline in 2030 and 2040, where a decreasing share of reused packaging was modelled for 2030 and 2040 compared to 2018 (from 3.5% down to 2.4% and 2.2% respectively), and the impact of the measure in 2030 and 2040, which achieves an increase of reusable packaging. By 2030 and 2040, the share of reused packaging was modelled to be 5.9% and 10.3%, respectively. This represents for the total packaging a change of +3.5% in 2030 compared to the baseline scenario and +8.2% in 2040, in product sales/trips.

Table 31. Percentage of product sales/trips in reusable packaging (in number of items), Measure 8b

Material	**2018**	**2030**	**2040**

		Baseline	Measure	Change	Baseline	Measure	Change
Glass	41.7%	30.9%	33.5%	+2.5%	26.7%	36.0%	+9.2%
Steel	0.1%	0.0%	16.9%	+16.9%	0.0%	28.8%	+28.8%
Aluminium	0.7%	0.5%	0.5%	-	0.4%	0.4%	-
Paper / board	0.0%	0.0%	0.0%	-	0.0%	0.0%	-
Plastic	1.8%	1.8%	6.4%	+4.6%	1.8%	12.2%	+10.4%
Wood	69.0%	69.0%	69.0%	-	69.0%	69.0%	-
Other	0.0%	0.0%	0.0%	-	0.0%	0.0%	-
Total	**3.5%**	**2.4%**	**5.9%**	**+3.5%**	**2.2%**	**10.3%**	**+8.2%**

9.7.2.2. Ease of implementation

The ease of implementation will need to include the enforcement for reaching the targets by each Member State and economic operators. The European Commission will have the role of ensuring the enforcement of such targets, via sanctions and which will be proportionate and effective. It is thus expected that more stakeholders will contribute to the target. This can be seen as a reliable mechanism for implementation.

9.7.2.3. Administrative burden

Costs incurred for meeting legal obligations to provide information, for this measure are expected to derive from monitoring and reporting the progress with respect to the targets, which will lead to new regulatory burdens on both public authorities and business.

The economic operators will face the administrative burden of reporting their progress by having to collect and report data/information on sales/trips for their multiple use items with the Member States. This could require them to create an internal system that can gather and report on the sales data for MU. Some big economic operators in e.g. HORECA sector already gather this information for internal reporting on waste management and SDG's. The measures may require some *de minimis* threshold for obligation to allow for SME's to meet the reporting requirements. As obligated parties are likely to be determined by Member States, such thresholds if deemed necessary should also be determined by Member States, however this could be the subject of guidance issued by the Commission (e.g., as part of Measure 10).

It was not possible to distinguish the administrative burden between the baseline and this measure in terms of the costs for the different sectors which collect and collate information that can contribute to the reporting on the re-use and refill target to differing extents. Ultimately the information would be transferred to public authorities, or potentially this could be part of the role of advisory bodies, who would have to evaluate the information supplied.

EUR 373 million savings in waste management costs (lower EPR fees and avoided costs of one-way DRS), EUR 15.82 billion revenue losses for SU producers, EUR 1.62 billion savings in material costs, and capital & operating costs of EUR 1.48 billion for reuse schemes (including refillable DRS).

9.7.2.4. Economic impacts

The economic impacts quantified for Measure 8b are summarised in Table 32.

Table 32. Summary of Economic impacts for Measure 8b

Category	**Estimated economic impact (relative to baseline), €million**

	2030	2040
Waste management – EPR fees	-373	-1,340
Waste management – one-way DRS costs	-88	-310.80
Packaging Producers – SU Packaging Turnover loss	15,820	50,230
Packaging Users – Material savings	-1,620	-4,860
Capital and Operating costs of Reuse schemes (including refillable DRS)	1,480	4,000

Only products that could be sold in reusable packaging (and hence single-use packaging was not considered a necessity) were included in the scoping exercise. There should not be a threat to producers of products that for some reason must be sold in single-use packaging.

Less divergence of activities and progress to target between Member States and competing enterprises is expected compared with a voluntary regime. Those countries where a high volume of single-use packaging is manufactured, or products are sold in single-use packaging, will be more affected than those for which this is not the case. The mandatory approach will allow for a more harmonised approach which maintains a level playing field. It has to be noted though, that the Member States will apply exceptions based on the criteria mentioned in section 2 of this document. Therefore it is assumed that the implementation of similar exceptions will not affect considerably the level of the hamornisation, as the operational frame of the reuse and refill systems will be similar.

The measure applies equally to domestic and imported to the EU products. Current essential requirements and EPR requirements are all applied to importers of packaging and packaged products, and so there is a general precedent for this mode of implementation.

Cost saving potential in using reusable or refillable containers arises from the reduced needs on purchasing packaging in every filling process. This would mean that with higher number of rotations of each packaging, the cost for packaging per filling is getting lower.

There will be opportunities to offset some of the potentially increased capital costs for reusables (such as plant requirements for packfilling/bottling and reconditioning) by leveraging the existing investment cycle when plant for single-use packaging packfilling/bottling would come to the end of its life. This depends on the timescales for investment in capacity for single-use plastic packaging manufacture compared to the timeframe envisaged/required for transition to reusable packaging. The benefits of reusables are correlated with the high collection rates associated with the refundable deposit, and with high rotations (ideally, as close as possible to their maximum lifespan, of course).

SME retailers may find it more difficult to accommodate particular re-use and refill systems (because of space and resource limitations). In addition, SME producers of products have less ability to absorb investment costs internally or to drive economies of scale and are more likely to have to pass more of any increase in cost onto consumers in the product price. This risks putting them at a competitive disadvantage, at least initially when capital investments are taking place or re-use and refill systems are not yet widely operated at scale. For lower levels of percentage share of re-use, such as those expected to be arrived at under a voluntary system, these factors are expected to be less of an issue and these small businesses may simply not participate in the effort if they do not want to or cannot bear the costs. This will be also reflected in the exceptions, which as mentioned in section 2 consider the size of the business that have to put in place re-use and refill systems. It is worth bearing in mind that some reusable packaging formats and systems in some sectors presently do or will constitute a cost saving and so are not always more problematic for SMEs (e.g. customer led refill for HORECA businesses). To reduce the economic costs some SME's might join a closed loop system or pool system. Also keeping in mind that the market of re-use and refill systems is mainly operated by SME’s, a boost in the uptake of re-use and refill could therefore support SME’s within this sector.

The targets constitutes both positive and negative drivers of different aspects of consumer choice; they can be expected to increase the availability of reusable packaging options for consumers who want more sustainable packaging choices. However, there may in some cases be a smaller range of products available for consumers per unit area of retail space (for refill on the go, grocery). Prices may be affected by different packaging modes (with initial costs expected to be higher but to reduce over time for reusable packaging). For a refill system in particular there may be cost savings owing to reduced requirements to purchase single-use packaging on an ongoing basis, so higher initial outlay for purchase of reusable packaging is offset by longer term savings. For refill on the go systems there will be a small increase in cost related to reconditioning (washing) of reusable packaging; at the

same time, the non-monetized benefit of saved time on household waste management could offset this.

For instance, a number of studies have estimated the economic effects on producers and retailers from the incorporation of reuse in their operations or implementation of reuse systems, focussing particularly on the number of rotations. For instance, a study[390] on plastic-based re-use systems, estimated the relative economic costs of three different reuse and single use systems, looking at 3 different scenarios with 5, 50 and 125 rotations, respectively.

Costs per litre of packaged material for 125 rotations (a number which may not be representative for all applications), were up to 17 times lower for reusable compared to single-use transport crates for fruit and vegetables and up to 4 times lower for reusable compared to single-use trays for transporting plants. In all the above mentioned examples, the washing and licensing costs were also included.

Another factor where economic savings can be achieved are the reduced costs for producers and retailers due to lower waste management costs. In fact, producers and retailers can have positive financial effects by reducing the burden placed them by regulations that aim to price environmental costs into products, e.g. EPR schemes. Therefore, by reducing the amount of waste by scaling up re-use and refill systems, costs (incurred by HORECA producers and retailers) associated to waste management can be reduced.

9.7.2.5. Environmental impacts

Impacts through switches to reusable packaging result in significant GHG savings associated with the manufacturing, recycling, incineration, landfill and reuse-associated activities (logistics and reconditioning). Reduction targets could lead to further waste prevention, and thus a further decrease in manufacturing emissions for the waste prevention intervention area. In addition, the measure could reduce packaging pollution (litter), especially deriving from on-the-go items. The measure may also affect the flow and quality of waste sent to third countries for recycling, and therefore the resultant environmental impacts from its management.

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[390] Fraunhofer CCPE 2022 „KUNSTSTOFFBASIERTE MEHRWEGSYSTEME IN DER CIRCULAR ECONOMY“ https://www.umsicht.fraunhofer.de/content/dam/umsicht/de/dokumente/publikationen/2022/2022-04_Kunststoffbasierte-Mehrw egsysteme-in-der-Circular-Economy_Fraunhofer-UMSICHT.pdf (p. 162-163; 100-102)

Tables 33 and 34 below present a summary of the environmental impacts for Measure 8b associated with manufacturing, recycling, incineration, landfill, logistics and reconditioning for re-use.

The increase in reusable packaging is estimated to lead to a **net decrease in GHG emissions of 1,251kt CO_2e in 2030, and 5,530kt CO_2e in 2040, a net decrease of the associated externalities (that include both GHG emissions and air quality) and a net decrease in water consumption of 69,300m^3 in 2030 and 212,800m^3 in 2040**.

Table 33. Summary of Environmental Impacts for Measure 8b

Environmental impact	**Estimated impact (relative to baseline)**	
	2030	**2040**
Change in water use, thousand m^3	-69.3	-212.8
Change in GHG/AQ externalities, € million	-427	-1,727

Table 34. Summary of change in GHGs for Measure 8b

Change in GHGs, million tonnes CO_2e	**Estimated impact (relative to baseline)**	
	2030	**2040**
Manufacturing	-1.70	-4.94
Transport	-0.57	-1.51

Collection	-0.14	-0.43
Sorting	-0.01	-0.02
Recycling	-0.26	-0.29
Incineration	-0.23	-0.70
Landfill	-0.08	-0.22
Reuse (Transport and Washing)	1.74	2.98
Total	**-1.25**	**-5.53**

9.7.2.6. Social impacts

The literature indicates that re-use systems create some jobs to a certain extent, however, the effect on employment is strongest in refillable systems. Therefore, this measure will have a positive effect on employment as new service opportunities are created which result in more people (workforce) needed to support them. It is thus estimated a net creation of 468k jobs in 2030, arising from:

- Creation of 607k jobs in the re-use sector
- Loss of 139k jobs in manufacturing, recycling and waste treatment industries, due to the reduced generation of packaging

The types of jobs created for the re-use sector would be in logistics and reconditioning, as well as maintenance of infrastructure for take-back, dispensing and refill in retail. The literature reports that especially refillable systems create additional jobs due to the additional requirements placed on sorting and logistics. The majority of the job types affected might be classed as low skilled. There will be higher skilled jobs created in design of packaging and supply chains (which are not included in the above table). Jobs in

logistics involving management or vehicles would be classed as higher skilled. In reconditioning and maintenance, there would be higher skilled roles in management.

Jobs would be likely to increase for to packing/bottling imported products at the expense of those extra-EU. Although there are concerns that mandating re-use could result in a de facto ban for certain types of businesses that currently rely on single-use packaging, and could lead to closure of business and hence change in employment levels for this reason, these product/sector groups are either not included in the targets, or proposed targets are not set at 100% for these expressly to allow adaptation and still maintain a level of choice for the consumer while alternative modes of product delivery are in development.

9.7.2.7. Stakeholder views

Stakeholders were not supportive of an overall re-use and refill target, but they proposed targets differentiated by sector, packaging type and purchasing model (e.g. physical vs online retail). Industry stakeholders stated that the suitability of re-use, and any associated targets, should be assessed through rigorous and comparable life cycle assessments, regardless of the feasibility of doing this. One sector that was mentioned as deserving particular attention is the e-commerce sector as the fastest growing retail sector, responsible for large quantities of packaging and surveys are highlighted that indicate that consumers are increasingly keen for reusable packaging alternatives for their online purchases.

NGOs are very supportive of ambitious mandatory re-use and refill targets, as they see targets as the main mechanism by which to drive innovation, investment, and commitment from industry to move up the waste hierarchy towards re-use.

Producer Responsibility Organisations and trade associations voiced concerns that it is too early to set targets however and that such measures should only be considered further down the line, once the updated Essential Requirements and definitions around re-use create a clearer market in Europe and start driving more innovation in this field.

9.7.3 Measure 8c: Mandatory high level targets to increase the reuse of packaging by 2030/2040 in selected sectors

9.7.3.1 Effectiveness

Table 35 shows the impact on packaging waste generation of the higher-level mandatory sector by sector re-use and refill targets, for 2030 and 2040. For reference, the quantity of packaging waste generated in EU in 2018 is estimated to be 77.8mt.

Relative to the 2030 baseline, the measure achieves a reduction of 3.9mt of packaging waste, 7.8% less than would otherwise have been generated. By 2040, this becomes a reduction of 26.4% less than the counterfactual in 2040.

Table 35. Changes in Packaging Waste Generation [million tonnes] by Material, Measure 8c

Material	Change in 2030 (10^6t)	Change in 2030 (%)	Change in 2040 (10^6t)	Change in 2040 (%)
Glass	-0.445	-4%	-3,077	-28%
Steel	0.030	2%	0	0%
Aluminium	-0.024	-3%	-0.002	-26%
Paper / board	-3,936.800	-15%	-12,792.5	-42%
Plastic	-0.666	-5%	-3,635.1	-20%
Wood	0	0%	0	0%
Other	0	0%	0	0%
Total	**-3,937.90**	**-7.8%**	**-16,430.67**	**-26.4%**

Table 36 shows the overall outcome of the higher-level mandatory re-use and refill targets per type of packaging material in terms of percentage of product sales/trips of reusable packaging. Table 36 indicates the 2018 situation along with the modelled baseline in 2030

and 2040 where a decreasing share of reused packaging was modelled for 2030 and 2040 compared to 2018 (from 3.5% down to 2.4% and 2.2% respectively), and the impact of the measure in 2030 and 2040, which achieves an increase of reusable packaging. By 2030 and 2040, the share of reused packaging was modelled to be 8.6% and 19.2%, respectively. This represents for the total packaging, a change of +6.2% in 2030 compared to the baseline scenario and +17.0% in 2040.

Table 36. Percentage of product sales/trips in reusable packaging (in number of items), Measure 8c

Material	2018	2030			2040		
		Baseline	Measure	Change	Baseline	Measure	Change
Glass	41.7%	30.9%	35.9%	+4.9%	26.7%	57.6%	+30.9%
Steel	0.1%	0.0%	27.9%	+27.9%	0.0%	45.5%	+45.5%
Aluminium	0.7%	0.5%	0.5%	-	0.4%	0.6%	+0.2%
Paper / board	0.0%	0.0%	0.0%	-	0.0%	0.0%	-
Plastic	1.8%	1.8%	9.9%	+8.1%	1.8%	21.9%	+20.1%
Wood	69.0%	69.0%	69.0%	-	69.0%	69.0%	-
Other	0.0%	0.0%	0.0%	-	0.0%	0.0%	-
Total	**3.5%**	**2.4%**	**8.6%**	**+6.2%**	**2.2%**	**19.2%**	**+17.0%**

9.7.3.2. Ease of implementation

The ease of implementation will need to include the enforcement for reaching the targets by each Member State and economic operators. The European Commission will have the role of ensuring the enforcement of such targets. Considering that sanctions will be in place, it is expected that more stakeholders will contribute to the target. This can be seen as a reliable mechanism for implementation i.e., making implementation easier.

9.7.3.3. Administrative burden

Information about the administrative burden of this measure can be found in section Administrative burden of M8b. It is assumed that the level of targets will not affect the administrative burden.

9.7.3.4. Economic impacts

The overall economic impacts quantified for Measure 8c are summarised in the table below.

Table 37. Summary of Economic impacts for Measure 8c

Category	**Estimated economic impact (relative to baseline),** € billion	
	2030	**2040**
Waste management – EPR fees	-0.683	-2.7636
Waste management – DRS costs	-0.169	-1.2166
Packaging Producers – SU Packaging Turnover loss	-24.21	-86.8

Category	**Estimated economic impact (relative to baseline),** € billion	
	2030	**2040**
Packaging users – Material savings	-2.49	-8.67
Capital and Operating costs of Re-use schemes	2.22	7.66

Further analysis of the economic impacts are presented in Measure 8b.

9.7.3.5. Environmental impacts

Impacts through switches to reusable packaging result in significant GHG savings associated with the manufacturing, recycling, incineration, landfill and re-use-associated activities (logistics and reconditioning). Reduction targets could lead to further waste prevention, and thus a further decrease in manufacturing emissions for the waste prevention intervention area. In addition, the measure could reduce packaging pollution (litter), especially deriving from on-the-go items. The measure may also affect the flow and quality of waste sent to third countries for recycling, and therefore the resultant environmental impacts from its management.

The tables below show a summary of the environmental impacts for Measure 8c associated with manufacturing, recycling, incineration, and landfill and to changes in greenhouse gases. By 2030, the increase in reusable packaging is estimated to lead to a **net decrease in GHG emissions of 2,667kt-CO_2e in 2030 (15,756kt CO_2e in 2040), a net decrease of the associated externalities (that include both GHG emissions and air quality) of 704 million € in 2030 (3.12 billion € in 2040) and a net decrease in water consumption of 118,3km^3 in 2030 (451,5km^3 in 2040), as presented in** Table 38.

Table 38. Summary of Environmental Impacts for Measure 8c

Environmental impact	**Estimated impact (relative to baseline)**	
	2030	**2040**
Change in water use, thousand m^3	-118.3	-451.5
Change in GHG/AQ externalities, € billion	-0.704	-3.12

Table 39.-Summary of change in GHGs for Measure 8c

Change in GHGs, thousand tonnes CO_2e	**Estimated impact (relative to baseline)**	
	2030	**2040**
Manufacturing	-3,229.10	-14,389.90
Transport	-907.20	-3,544.10
Collection	-226.80	-885.50
Sorting	-15.40	-60.20
Recycling	-158.90	-477

Change in GHGs, thousand tonnes CO_2e	**Estimated impact (relative to baseline)**	
	2030	**2040**
Incineration	-490.70	-2,267.30
Landfill	-121.80	-353.50
Re-use (Transport and Washing)	2,482.20	6221
Total	**-2,668**	**-15,756**

9.7.3.6. Social impacts

The literature indicates that all reuse systems create some jobs to a certain extent, however, the effect on employment is strongest in refillable systems. Therefore, this measure will have a positive effect on employment as new service opportunities are created which result in more people needed to support them. It is thus estimated a **net creation of 628600 jobs in 2030**, arising from:

- Creation of 840000 jobs in the re-use sector
- Loss of 211400 jobs in manufacturing, recycling and waste treatment industries, due to the reduced generation of packaging.

Further information is available in Social Impacts section of Measure 8b.

9.7.3.7. Stakeholder views

Most of the industry stakeholders highlighted that the implementation of the higher targets would be more challenging when compared to the lower targets. Other stakeholders, such as NGOs and national governments, indicated instead their support to such measures. Some stakeholders stressed the need to consider differences between Member states when setting the level of target.

The full analysis of the positions of the stakeholders is analysed in Measure 8b, as the nature of the targets remain the same, and only the level of the targets change.

9.7.4 Measure 10: Standardisation of reusable packaging and effective re-use systems

There is a lack of standardisation of packaging formats and systems which is seen as a barrier to upscaling certain re-use systems, especially regarding products with longer supply chains.

Existing CEN and ISO standards cover some types of tertiary packaging, or limited attributes of reusable packaging. The harmonised EU standard EN 13429:2004 can be relied upon by producers to show compliance with the PPWD but lacks sufficient clarity on various aspects of re-use systems for packaging. While Member States have mostly transposed the PPWD definition of reusable packaging under Article 3(2a) of PPWD ("packaging which has been conceived, designed and placed on the market to accomplish within its lifecycle multiple trips or rotations by being refilled or reused for the same purpose for which it was conceived"), this is no safeguard against poorly performing packaging with low or no rotations being classed as reusable.

This measure consists of adding clarity to the EU legal definition of reusable packaging and reusable packaging systems and different levels of **standardization with the aim to optimise re-use of packaging** to improve its function, environmental performance and accelerate its scale-up in the market. Given the limited implementation of reusable packaging systems for many product groups and packaging types, there is considerable scope for their development and optimisation, particularly in terms of environmental performance, consumer behaviour and product protection (the key characteristic being an optimized number of rotations).

Three variants are considered:

1. **Measure 10a:** the Commission publishes guidance on implementation of re-use systems that refers to a CEN standard.
2. **Measure 10b:** the Commission formulates a definition and requirements for reusable packaging formats at the EU level, which are mandatory and specified in legislation.
3. **Measure 10c:** the Commission formulates a definition and standard for re-use systems, in terms of incentives, infrastructure, logistics, required reporting etc., which are mandatory and specified in legislation.

9.7.4 Assessment of measure 10a: the Commission publishes guidance on implementation of re-use systems that refers to a CEN standard

9.7.4.1. Description of the measure

Under this measure, the Commission would request CEN – the European standardisation body - to **update the current standard EN 13429:2004** with regards to the definition of reusable packaging, reusable packaging format and design, re-use systems requirements, return infrastructure, supply chain and logistics as well as public engagement and consumer incentives. As under the current system, compliance with the standard would create a presumption of compliance with the PPWD's essential requirement for reusable packaging, but economic operators could prove compliance also by other means.

However, as the adoption of the standard cannot be mandated (the mandate must be accepted by CEN), the Commission could opt to develop **voluntary guidance**, in case no agreement can be found on the terms of the revised standard.

The CEN standard (or Commission guidance document) would provide a reference point for industry to enable improved performance of re-use systems and facilitate their adoption. It would stimulate innovation in reusable packaging formats and systems over time, so that **best practice can be fed back into the standards** and **variances in systems across the EU can be more easily considered**.

In time, elements which have been established as optimal features for all or some re-use formats and systems could be brought into the revised packaging legislation, which is not envisaged under this measure.

9.7.4.2. Effectiveness

The CEN standard would provide a reference point for industry, providing a basis for how re-use formats and systems should be designed and thus encouraging the development and roll-out of systems that would not necessarily be otherwise implemented due to lack of knowledge and understanding.

The scope of the standards would be much broader than definitions and requirements suitable for inclusion in the revised PPWD, which correlates with its effectiveness.

However, as by definition, the standard (or even more so, a Commission guidance) would not be mandatory. Consequently, its **effectiveness in driving adoption of re-use packaging systems, alone, would be limited.** Therefore, it is considered a supporting measure for Measure 8 and 2. As such, it is not possible to attribute any share of the

outcomes assessed under “Effectiveness” to this measure. It is, however, expected to increase the likelihood of attainment of targets in general.

9.7.4.3. Ease of implementation

The Measure, being a standard, **entails a considerable flexibility with respect to the development over time**, and allows more input from industry, which will increase acceptance and consensus and facilitate implementation.

The scope of the measure is expected to be broad, in terms of numbers and types of formats, applications and systems, and this may increase the complexities associated with its development.

9.7.4.4. Administrative burden

The measure being a standard, the efforts for its development would not be front-loaded. The major burden would be for stakeholders and national authorities participating in the development of the standard.

No enforcement or sanctions would apply to ensure compliance as such, which makes it simpler to implement. However, as harmonised standards are the main means of showing compliance with the essential requirements, its revised (broader and more precise) content is expected to lead to more enforcement activities to ensure compliance with the essential requirements and, hence, greater administrative burden for both public authorities and the economic operators.

9.7.4.5. Economic impacts

As a supporting measure for measures 2 and 8, it is not possible to attribute any share of the outcomes assessed under “Economic impacts” to this measure. It is however expected to increase the likelihood of attainment of targets in general.

Standardisation will drive cost efficiencies, and this would reduce the manufacturing costs of multi-use items, as well as capital and operating costs of re-use schemes. Standardisation may in turn reduce costs for the consumer. There will be an increase in costs for research and development in standardisation of reusable packaging and infrastructure, supply chain design and development.

Standardisation will make reusable packaging systems more easily deployed for some systems and stakeholders owing to increased familiarity and reduced cost, especially SMEs in retail/HORECA sectors. However, for some SMEs that provide reusable packaging as a service, who have invested in a stock of reusable packaging already, standardisation may entail investment and adaptation costs, but it is expected that there will be sufficient time to adapt as revision of the standard will take some time.

Standardisation is likely to contribute to the amenability of longer supply chains to deployment of reusable packaging systems and hence support the single market.

If importers of packaging and packaged products are included in obligations on re-use, packaging standardisation could increase the barrier to market. However, it could also facilitate the adaptation as importers will have an established system ready to integrate into. This in turn could make it easier for exports to be included in requirements on reusable packaging.

9.7.4.6. Social impacts

It is not possible to attribute any share of the outcomes assessed under "Social impacts" to this measure. It is however expected to increase the likelihood of attainment of targets in general.

An additional consideration with respect to standardisation of packaging formats follows on from impacts on manufacturers of specific packaging types that could result from the constraining effect standardisation has on access to market. The distribution of job losses and creation by packaging type and material could be influenced, depending on the exact nature of the standards.

9.7.4.7. Environmental impacts

It is not possible to attribute any particular share of the outcomes assessed under "Environmental impacts" to this measure. The additional consideration with respect to standardization is that it should contribute to optimisation of performance with regard to environmental impacts, and therefore should provide additional benefit. This is dependent on the exact nature of the standards.

9.7.4.8. Stakeholder views

Stakeholders across the board mention the importance of clearer guidance and a framework around re-use, whether it be to guarantee conditions in which reusable packaging is compliant with the internal market, or whether it be to bring unbiased guidance on issues often discussed as limiting factors for re-use (e.g., food waste prevention, hygiene, transport emissions).

There is **broad support for standardisation from across the spectrum of stakeholders.** However, standardisation should **consider the existing standards** (e.g., on safety and hygiene), allow for regional variability depending on consumer preferences and take into consideration reusable formats already in use, so as not to disadvantage them.

Overall, of all variants of Measure 10, **there was the greatest support for Measure 10a** as this standard would still allow businesses to innovate. Moreover, some stakeholders were concerned there is not enough data or practical experience yet to determine robust standards for packaging re-use formats (10b) or systems (10c).

One industry stakeholder representative stressed the need for LCAs (Life Cycle Assessment) to be applied in the process of creating harmonised standards. One PRO objected to EU-wide standardisation considering that elaboration of standards should be the remit of national EPR organisations. Many suggestions were made about what should and should not be included in the criteria, and opinions diverged on how comprehensive the standard should be. While some stakeholders **do not want too prescriptive** standard (or any standard at all) to allow for necessary innovation, brand specificity and competition in the market, **others advocate for a detailed standard** that aims to standardize and simplify packaging and harmonize systems between operators of all sizes. Two criteria that stood out as being of importance to many stakeholders were **the recyclability of reusable packaging and the minimum number of rotations required**. Several stakeholders stressed the importance of consulting with a wide range of stakeholders, leaving enough time to develop a strong set of standards and considering the costs and time required for industry to adapt to these standards. It was also highlighted that for standards to be meaningful, a **form of digital tracking** will be required so performance can be monitored, and businesses can demonstrate compliance.

9.8 Assessment of measure 10b: Definitions and mandatory requirements for reusable packaging formats set in EU legislation and standardisation of some reusable packaging formats

9.8.1. Description of the measure

This measure consists in improving the **definitions of reusable packaging** based on the approach of specifying **the minimum number of rotations.** Any definition of 'reusable packaging' should be unambiguous and should include a level of detail, potentially quantitative, to provide clarity on what qualifies as reusable and avoid mislabelling and misreporting.

Requirements should include the **number of rotations for different packaging groups or specific types of packaging**. Some characteristics of reusable packaging formats could be defined for some product/packaging groups where the re-use systems are widespread in the market, or where research was undertaken to establish optimal parameters. These would need to be determined through additional research to be harmonised at the European level in the form of EU standards, which would need to be updated on a periodic basis.

It is considered difficult at this time to comprehensively specify optimal packaging formats, materials or minimum rotations in the legislation, without data on systems operating at scale, with monitoring of outcomes, or modelling of optimal systems. These parameters may be different for select product/packaging groups (bottles, tertiary). With respect to minimum rotations, it is useful to bear in mind two different rationales which may be followed for specifying a particular threshold.

The first is to consider that **the minimum must be enough to exclude the most egregious examples of 'pseudo-reuse'** (for example, where single-use packaging is provided in combination with bulk dispensing facilities in retail outlets, or where refill packs only provide two refills). The second is to consider **the minimum number of re-uses must be enough to achieve a particular environmental outcome,** in other words, a benefit relative to a single use packaging item (i.e., at a minimum, the break-even point for emissions, or some desirable outcome such as a halving of the emissions incurred).

Given that, as stated above, **settling on one threshold or a set of optimal minimum rotations with respect to environmental impact is difficult at this time**, the first purpose for specifying minimum rotations is considered here – i.e., to exclude pseudo-reuse.

To fulfil this purpose, it would be sufficient to find a low number that would be unlikely to be achieved without purposeful activity to achieve good functioning of the format and a re-use system together. **The existing definition** uses the word "**multiple"**, which strictly speaking means "more than one" – i.e. two or more.

Taking the precedent of work to support re-use labelling in the UK (which proposed 10 rotations as a minimum suggestion), the California 1991 Rigid Plastic Packaging Container law (which had a threshold of 5 rotations) as well as existing EU data on rotations (e.g., not high-performing bottle return systems achieving 5-10 rotations on average), a nominal number such as 5 is considered appropriate. This would lead to the revised definition of *reusable packaging:*

> "*Packaging which has been conceived, designed and placed on the market to accomplish and which achieves on average within its lifecycle a**t least five trips or rotations** by being refilled or reused for the same purpose for which it was conceived*"

The implementation would be monitored, similarly to an approach outlined in Measure 8, by auditing a number of users. Where the packaging is used for product/packaging categories falling under targets specified under Measure 8, the reporting obligation could be leveraged to enforce this requirement.

In addition to the refined legal definition of reusable packaging, the Commission would request **CEN to develop standards** for specific r**eusable packaging formats.** It is not expected that this would initially include many formats. The efforts would rather focus on product/packaging groups where the re-use systems are widespread in the market, or where research was undertaken to establish optimal parameters, for example, for the packaging/product groups for which re-use targets will be set in the legislation (Measure 8). **Once the formats are developed, compliance with the formats will be made mandatory.**

9.8.2. Effectiveness

This Measure – if limited to the refinement of the legal definition – is expected to contribute to **improving the accuracy of current reporting** on re-use, and would improve the **performance of existing** re-use systems, but would **not be a strong driver** of a transition to re-use in the market. It is considered a **supporting measure** for Measures 8 and 2. As such, it is not possible to attribute any share of the outcomes assessed under "Effectiveness" to this measure.

Moreover, because of the early stage of implementation or low market share of most re-use systems, and that optimal packaging formats are not yet established for most packaging/product groups, there is a **risk that it will not be possible to arrive at appropriate standards for most groups.** Committing prematurely to standards will lead to unintended/counterproductive consequences. As a result, the expected scope of such definitions and standards is likely to be very narrow and apply only to very well-established markets.

9.8.3. Ease of implementation

As industry and other stakeholders would be involved int the development of the standards, this will increase their acceptance.

The implementation of the measure may be challenging for industry to comply with, if the standardised formats are made mandatory. In this case, sufficient time for transition will need to be granted.

9.8.4. Administrative burden

The administrative burden is higher than under Measure 10a. If only the legal definition, which includes a number of rotations, is included, there will be more burden in monitoring, enforcing and reporting on non-compliance. This burden will be increased in case specific packaging formats are developed and need to be complied with.

9.8.5. Economic impacts

As a supporting measure for measures 2 and 8, it is not possible to attribute any share of the outcomes assessed under "Economic impacts" to this measure. It is however expected to increase the likelihood of attainment of targets in general.

9.8.6. Social impacts

It is not possible to attribute any share of the outcomes assessed under "Social impacts" to this measure. It is however expected to increase the likelihood of attainment of targets in general.

An additional consideration with respect to standardisation of packaging formats follows on from impacts on manufacturers of specific packaging types that could result from the constraining effect standardisation has on access to market. The distribution of job losses and creation by packaging type and material could be influenced, depending on the exact nature of the standards.

9.8.7. Environmental impacts

It is not possible to attribute any particular share of the outcomes assessed under "Environmental impacts" to this measure.

9.8.8. Stakeholder views

The standardisation of the formats is the most contentious proposition among options under Measure 10, especially for stakeholders from the food and beverage industry who fear it might reduce the variety of packaging needed to meet quality and performance requirements for their goods. There is agreement that such standards should be carefully considered, on a case-by-case basis depending on the sector and the type of re-use. Impacts on SMEs have been also highlighted as being potentially important. Opposite positions were also voiced, that standardised formats are expected to be highly efficient in scaling up re-use systems, including for SMEs.

NGOs are very keen on standardisation of reusable packaging formats at an EU level, as they understand this to be the most effective way of creating a scalable model for major product groups (e.g. beverages, transport packaging). One NGO highlights the need for standardisation to avoid the risk of competition between different re-use systems which would lead to negative environmental impacts and contribute to consumer confusion.

9.9 Measure 10c: Definition and mandatory standards for re-use systems, in terms of incentives, infrastructure, logistics, required reporting set in legislation and standard

9.9.1. Description of the measure

An alternative approach altogether is to couple the existing definition of reusable packaging with a requirement that a re-use system be in place for the achievement of re-use. This could be done in addition or separately from Measure Mb, which provides for a definition with a minimum rotation requirement.

This measure consists in **establishing requirements for re-use systems**, ('minimum requirements') as a way of defining reusable packaging; it would lead to improved performance of existing re-use systems.

This approach follows the precedent in German law. However, it is important that this approach avoids being overly prescriptive such that customer led refill is not excluded from the definition of re-use in general as a result. This can be done by not specifying that the system is for return or that it needs to involve infrastructure for return; but in more general terms, referencing instead, a re-use system. For example, reusable packaging could be defined as:

"... packaging which has been conceived, designed and placed on the market to accomplish within its lifecycle multiple rotations by being refilled or reused for the same

purpose for which it was conceived and ***which is made possible by the existence of re-use systems for them***"

This approach would be followed both in the development of standards for specific requirements for certain re-use systems or packaging/product groups.

Because of the range of possible re-use systems (i.e., consumer led (refill) vs industry led (return), B2C vs B2B, home vs on-the-go, and further subdivisions of these main groups), **it is not possible to define a single set of definitions or requirements for all these systems in the legislation**.

- It would be more harmonised and facilitative to the implementation of re-use schemes, if it was clear what precise requirements and obligations are associated with specific schemes in order to be considered as reusable schemes or reusable packaging.

The following requirements must be simultaneously satisfied:
Requirements for a closed loop/ pool system:

- Reusable packaging is owned by a company or a co-operating group of companies; This can either be in the hands of the pool operator or remain with the pool participants. For the joint usage of packaging type, the pool should define which packaging types and rules it will use;
- The packaging is circulated by a company or a co-operating group of companies, where at least two players shall participate in the process set-up;
- The system should have a clearly defined governance structure in charge of governing;
- The governance shall ensure that the targets and objectives of the system are delivered;
- The system should have reverse logistics facilitating re-use in place facilitating the move of the reusable packaging from the user back to the seller or manufacturer.
- Design of the packaging is fixed in accordance with a mutually acceptable specification;
- The packaging is used in accordance with mutually acceptable procedures;
- Collection, reconditioning and redistribution systems are in place. Packaging materials no longer to be reused and therefore removed from the system shall be recoverable in conformity with the requirements of one or more of EN 13430, EN 13431 or EN 13432;
- The company is, or the group of companies are, obliged to take the reusable packaging back if it has been used in accordance with the specification;
- The filler/packer/retailer provides information on how to treat and where to leave the packaging for the purpose of re-use;

- An incentive should be assigned to a reusable packaging when necessary to achieve a container return rate of 90% or higher. The incentive shall be something of value that is given to users when they return a used reusable container to a reuse collection point;
- There shall be a control system in place, ensuring that re-use is enabled. The pool system should operate using reporting systems for fillings, feeds, and rejects as well as collecting and reporting data on the % sales of re-use within the system;
- There shall be equal access and fair conditions for all market participants;
- Packaging shall be allowed to circulate freely among all pool participants (producers/packers) and relevant stakeholders at all times.

o **Requirements for an open loop system:**

- the reusable packaging is owned by each user at the time the packaging is in his possession;
- design of the packaging is fixed in accordance with a generally accepted specification;
- the packaging is used in accordance with a specification agreed by the participants in the system;
- after reusable packaging is used by the emptier/user, they decide whether to discard the packaging or to pass it to a third party for re-use;
- redistribution systems are in use for that packaging and are generally available;
- the filler/packer/retailer provides information on how to treat and where to leave the packaging for the purpose of re-use;
- packaging materials no longer to be reused and therefore removed from the system shall be recoverable in conformity with the requirements of one or more of EN 13430, EN 13431 or EN 13432;
- reconditioning can be undertaken by the emptier/user or is available on the market as part of the system;
- There shall be a control system in place, ensuring that re-use is enabled. The open loop system should operate using reporting systems for fillings, feeds, and rejects as well as collecting and reporting data on the % sales of re-use within the system.

More specific requirements would be stipulated in **the harmonised standards**, which would be developed for specific packaging/product groups or for specific re-use systems.

9.9.2. Effectiveness

This measure alone would contribute to the reliability of current reporting on re-use and the performance of *existing* re-use systems, but it would not be a strong driver of a transition to re-use in the market where it is not currently implemented. It is hence considered a supporting measure for Measures 8. As such, it is not possible to attribute any

particular share of the outcomes assessed under “Effectiveness” to this measure. It is however expected to increase the likelihood of attainment of targets in general.

9.9.3. Ease of implementation

As industry and other stakeholders would be involved int the development of the mandatory standards for re-use systems, this will increase their acceptance. To ease the implementation of the measure, sufficient time for transition will need to be granted.

9.9.4. Administrative burden

This measure is likely to influence the type of information that may be required under reporting obligations for Measures 8 and 2. In addition, enforcement requirements induced will incur some administrative burden for reporting of non-compliance, or to demonstrate compliance.

9.9.5. Economic impacts

As a supporting measure for measures 2 and 8, it is not possible to attribute any share of the outcomes assessed under “Economic impacts” to this measure. It is however expected to increase the likelihood of attainment of targets in general.

9.9.6. Social impacts

As a supporting measure for Measures 8 and 2, **it is not possible to attribute any particular share of the outcomes assessed under “Social impacts” to this measure**. It is however expected to increase the likelihood of attainment of targets in general.

In addition, the considerations around effects on packaging formats made for Measure 10b do not apply here as they are not in the envisaged scope of the standardisation for Measure 10c.

9.9.7. Environmental impacts

It is not possible to attribute any particular share of the outcomes assessed under “Environmental impacts” to this measure.

9.9.8. Stakeholder views

Industry representatives from the reusable transport packaging industry were **highly in favour of standardisation of re-use systems in the tertiary packaging sector**, as this would provide businesses with legal certainty and confidence in investing in these systems. The issue of how legal ownership of reusable packaging could be asserted was explicitly cited, as this has been a problem for some packaging formats such as pallets.

In general, there were conflicting views on whether standardising re-use systems would simplify the logistics around packaging, or whether it would increase the burden on businesses to adapt to ill-fitting systems. Although there is a one common viewpoint that in innovation phase, standardisation can be premature, for some well-established formats it was held that further specifications would be obstructive and cause established systems to work less well. In addition, some stakeholders pointed out that clear criteria for performance can aid innovation and optimisation by providing suitable outcomes to aim for, and in this sense, standardisation helps guide innovation.

9.10 Measure 19: Harmonisation of when reusable packaging (including returnable transport packaging) is classified as waste

9.10.1. Description of measure

There is a lack of common understanding among Member States related to the harmonisation of when reusable packaging (including returnable transport packaging) is classified as waste. This is related to differing interpretations of Article 3 of the Waste Framework Directive (2008/98/EC; WFD) This measure aims at providing clarity and consistency across all Member States on the definition of re-use activity versus a "preparing for re-use" activity. It also aims to provide legal certainty to allow for the development of a market for re-use across all packaging streams.

The absence of legal consistency in the distinction **between "re-use" and "preparing for re-use"** have led, in some cases, to packaging destined for re-use to be treated as waste because it was considered the need to go through the "preparing for re-use" stage, which is classified as a waste activity in the WFD. Furthermore, lack of clarity has been found on **whether cleaning and reconditioning should directly confer the status of waste on a product** (e.g., refillable bottles which are cleaned after each use are not considered as waste until the end of their useful life).

The Commission shall therefore ensure that reusable packaging is only classified as waste once it has reached the end of its useful life and is discarded. During a rotation, after reusable packaging is used and subsequently collected, it shall be reconditioning before it can be refilled and used again. Reconditioning is not considered to be preparing for reuse.

Unless the packaging becomes waste, as set out in Article 3(1) of Directive 2008/98/EC, then it is not preparation for reuse. Reusable packaging should not be classified as waste, even if it is cleaned and reconditioned by a third party and is not returned to the same user (i.e., a pool system or open loop system).

The undue classification of a product as waste when it is a reusable product, can lead to disincentives from reusing it since the administrative burden and costs on handling and collection licenses. Therefore, it can be simply discard rather than repeatedly incurring costs for being reused. The burden of dealing with a waste item is particularly cumbersome when cross-border transport is involved because of additional steps to notify border authorities of the waste product being transported.

9.10.2. Effectiveness

As a supporting measure for Measures 8 and 2, it is not possible to attribute any particular share of the outcomes assessed under "Effectiveness" to this measure. It is however expected to increase the likelihood of attainment of targets in general, by improving the uptake and performance of re-use systems.

9.10.3. Ease of implementation

Challenges might be faced on the transposition of this legislation since currently there are different interpretations at Member States level. After this first step, this measure is expected to be easily implemented at local level.

9.10.4. Administrative burden

The administrative burden on actors in the re-use supply chain will be reduced, since there will not be the need to apply for waste licenses each time the product is reused. The reduction in costs is likely to be felt most by producers/fillers of RTP (as the product group most likely to be affected by this measure), and to a smaller extent by the authorities which monitor cross-border shipments.

9.10.5. Economic impacts

As a supporting measure for Measures 8 and 2, it is not possible to attribute any particular share of the outcomes assessed under "Economic impacts" to this measure. It is however expected to increase the likelihood of the attainment of targets in general.

This measure is likely to produce a reduction in costs for producers/fillers who have to apply for waste licences for their products.

9.10.6. Social impacts

As a supporting measure for Measures 8 and 2, it is not possible to attribute any particular share of the outcomes assessed under "Social impacts" to this measure. It is however expected to increase the likelihood of attainment of targets in general.

As it will improve the uptake of re-use through providing greater clarity, it will likely lead to an increase in employment in the re-use sector, for example in the reconditioning sector for RTPs.

9.10.7. Environmental impacts

As a supporting measure for Measures 8 and 2, it is not possible to attribute any particular share of the outcomes assessed under "Environmental impacts" to this measure.

However, prolonging the life of products should entail the more efficient use of resources and the avoidance of landfilling of these materials, so will have a beneficial impact on the environment.

Moreover, by making re-use a clearer and easier process to use, this measure will help optimise re-use systems which will have a positive impact on the environment by closing material loops and creating more efficient supply chains.

9.10.8. Stakeholder views

Several packaging trade associations supported the idea that reusable packaging should only be considered as waste at its end of life and not each time it is placed on the market after a new rotation, noting that *"the current definition of packaging waste fails to make this distinction"*. This is also recognised by a recycling trade association, who commented *"reusability does not represent the end-of-life management of packaging, recycling does, especially for waste packaging*." Stakeholders from a sector of the industrial/tertiary packaging industry welcomed an approach extending the clarification around the definition of waste to all reusable packaging, agreeing that it would meet their specific need.

Measures that were discarded

The measures that are included in this Impact Assessment are the result of an extensive screening process. Based on a preliminary assessment some measures were discarded in early stage because they were considered to not meet one of the core criteria related to effectiveness, efficiency, fairness, policy coherence,

Measure 8a: Voluntary re-use targets (as % product sales/trips in reusable packaging, in number of items), EU level

This measure consists in **voluntary re-use targets at EU level – i.e. all Member States would have the same target**. These targets would be set up by the Commission and they would encourage Member states to deploy more reusable packaging. There will be no sanctions if the targets are not met.

 The ease of implementation would be challenging for several issues, in particular:

- **Setting up appropriate reporting on % sales/trips** in reusable packaging that it is a novel practice.
- **Identifying the best economic actors to assign the responsibility for meeting targets** and how, such that responsibility and competence are aligned, to produce a workable chain of management for the measure.
- **Ensuring widespread participation** while these targets are voluntary and, therefore, stakeholders cannot be obligated and might not want to bear the costs that competitors do not have.
- **For sectors where return-on-the-go or return-from-home systems** are most likely to be the predominant re-use system, this measure is likely to be seen challenging to meet for those product manufacturers who have not been taking their products to market in reusable packaging and/or systems for handling the packaging and returning it to use might not function at scale yet or they might not be widespread across Member States.
- **For retailers that currently have no exposure to take-back systems**, the retailers might need to review the supply chains (for instance increasing the number and distribution of pack-filling/bottling plants, and shipping in bulk) and the need for reconditioning plants/equipment. These may require investment. For refill on the go in retail premises, reconfiguration of the store for dispensing purposes for bulk sales, will also involve significant effort.

On the other side, sectors like those related to consumer-led systems (ex. refill on the go for HORECA sector) and where re-use is established at scale and in a full range of supply chains, meeting any voluntary target could be easily implemented and done with minimal investment.

The ease of monitoring and reporting will depend on the sectors, those that already collect the data required to report on re-use will be needed to collate data on trips in reusable packaging and aggregate data.

Sectors related to return on the go might be able to report on pack filling/bottling in reusables through existing information flows (e.g., beverages – either refilling statistics recorded by the bottler or collection statistics recorded by the collection operator), that can be combined with data on the whole market for that product group, in a similar way.

Other sectors or product/packaging groups may need to develop data and capacities *ex novo*.

Measure 8d. Voluntary targets

This measure stipulates that voluntary target must be set but does not stipulate what level. It has been dismissed at an early stage since it is considered that **it would lead to different targets being set at different Member States and this would fragment the single market**. It is also believed that because of the different range of ambition and nature of the targets, it would lead to less favourable environmental outcomes.

Measure 8e. Mandate re-use of some tertiary packaging

As a standalone measure, given how well-developed re-use systems are in some areas of returnable transport packaging, 100% targets are proposed for selected groups of tertiary packaging such as B2C packaging for large white goods: crates, pallets, kegs and drums.

Measure 8f. Measure Target for re-use of some E-commerce packaging

As a standalone measure, given the fast growth in this sector and development of re-use schemes, targets are proposed specifically for certain types of E-commerce packaging, specifically non-food (as online food delivery product groups are dealt with under the general targets package for groceries) and non-large white goods (as white goods are dealt with in the general targets packaging under secondary/tertiary packaging, above).

Measure 8g. Mandating re-use of tertiary packaging within businesses or groups of businesses that constitute closed loops

As a standalone measure, re-use within closed systems can be achieved easily and hence should be made mandatory. There is a wide range of single use packaging used unnecessarily in these situations for palletising goods or bagging up items for transport between sites and depots.

Measure 8h. Targets for re-use within supply chains or within a specific sector such as the retail sector (whether voluntary or mandatory)

The question of who to obligate under re-use and refill targets is left to the Member State to determine the best solution and it could vary for different product groups. This may mean that responsibility for meeting targets is given to different actors or groups of actors in specific cases. Obligation of supply chains for particular products or retailers of specific products is not precluded.

The question of whether higher targets for particular supply chains could be warranted in that they might constitute closed systems is separate and is dealt with by the preceding measure.

Measure 9 Mandatory MS level overarching cross-sectoral waste reduction target.

The target is termed "overarching" in that it is specified in terms of waste reduction – this could be achieved via any or all the three waste prevention pathways – avoidance, re-use and light weighting. To promote re-use over light weighting, which is the predominant waste prevention method under current conditions, a target quantifying the proportion of waste reduction to be met by re-use is specified. It is termed cross-sectoral because it does not set specific targets for specific sectors but should be achieved within the packaging industry. Requiring targets to be met by each material stream would mean that there are fewer market distortions away from denser materials like glass and metal, this does not allow the optimal material for specific re-use systems and formats in terms of environmental performance to be ascertained and emerge.

Measure 10d. Guidance on best practise for reusable packaging (issued by informal national or EU level groups)

As a contrast to official guidance, an alternative measure considered was the formation of more informal groups to provide forums for e.g. conducting the gathering of supporting information on reusables and sharing of best practice nationally or at EU level.

Measure 11: Business advisory body for reusable products and packaging

This measure consists in the implementation of an advisory body for reusable packaging systems, operating at EU or Member State level. The advisory body could be mandated to further the development and optimisation of re-use systems, and their adoption by industry and consumers. Their role could include:

- Monitoring or collating evidence on re-use levels ("Observatory" role)
- Primary research and evaluation of the cost and performance of different reusable packaging systems
- Supporting the creation of standards for reusable packaging systems
- Offering advice and guidance to producers on the implementation of reusable packaging systems
- Provide strategic direction to support meeting of the re-use and refill targets (e.g. defining pathways and milestones, whether operational or outcomes based)
- Engage industry and consumer stakeholder groups

This measure could either apply at an EU level or could require Member States to initiate national observatories. If set at an EU level, the advisory body's role would be to consider Member State differences in consumption, manufacturing and consumer habits, while ensuring harmonisation of approaches to the extent possible. It would be advisable for there to be a high-level involvement of Producer Responsibility Organisations, to achieve effective buy-in from producers. The financing of the body or bodies could be met through Extended Producer Responsibility fees.

Measure 11b. Forum: informal EU or national level groups

An alternative measure considered was the formation of more informal groups / forums for e.g. conducting the gathering of supporting information on reusables and sharing of best practice nationally or at EU level.

Measure 13. Create a single market for reusable packaging

Standardisation of packaging format has been identified by some stakeholders as necessary to allow:

- Economies of scale
- Smooth functioning of the internal market; and
- Improved rates of adoption by consumers,
- Improve the feasibility of particular re-use systems.

However, it is too early to know what the optimal packaging format and re-use system is for product groups. Therefore, the creation of a single market for reusable packaging by creating standardised, single re-use systems for product/packaging or product/packaging groups is not seen as currently feasible. This has therefore not been shortlisted.

Measure 14a. Updating the essential requirements to better align with the waste hierarchy

Revisions to the Essential Requirements have been addressed in the study "Effectiveness of the Essential Requirements for Packaging and Packaging Waste and proposals for reinforcement". In summary:

- Reusable packaging should not be exempt from end-of-life waste management fees as they still incur these. In absolute terms however there are less fees to pay because this is only charged the first time the packaging is placed on the market.
- Reusable packaging should be subject to the same recyclability related modulated fees. This will also be ameliorated by the measure under consideration that 'all reusable packaging should be recyclable' (Measure 21).
- The obligated party should be the 'leaseholder' of the packaging rather than the producer so as to incentivise care of the packaging and high number of rotations so that EPR fees are reduced.

- It was determined that the Essential Requirements, by their very nature a set of conditions

- according to which packaging may or may not be placed on the market, cannot drive re-use

- because when packaging is placed on the market, it is not possible to know whether the

- product sold in it could feasibly be sold in an item of reusable packaging, as this is for many

- items, dependent on the existing systems. And where the systems do not exist, the use of

- reusable packaging can simply be deemed not possible.

In addition, it is unable to drive re-use in preference to recycling – i.e. to achieve alignment with the waste hierarchy. It is expressly for these reasons that this separate project on waste prevention has been commissioned.

Measure 14b. EPR fee modulation for reusable packaging

Some Member States have independently implemented exemption of reusable packaging from EPR fees. However, the proposal that fees should be modulated according to the number of re-uses an item of packaging could have, were not recommended in the previous project (Effectiveness of the Essential Requirements for Packaging and Packaging Waste and proposals for reinforcement) as they were not considered workable. Feasible versus actual use for any specific packaging item placed on the market was considered too difficult to demonstrate comparatively across all the different re-use systems.

Measure 14c. Reusable packaging exempt from licensing obligations/EPR fees

This measure was discarded as it is inconsistent to exempt packaging, as it still needs to be disposed of at end of life. As stated above, the benefit comes from the fee for reusable packaging only being applied once, the first time it is placed on the market.

Measure 15. Re-use reporting in selected product/packaging groups

At present, **reporting of re-use is very minimal**. Simply obliging reporting would be a way to make re-use or lack of it more evident and to hold stakeholders to account if they are failing to provide consumers with the choice of using reusable packaging and improve the uptake of this mode of service/product provision. It would also pave the way for voluntary or mandatory targets in the future. It was considered that this alone would not be a strong driver however for the development and deployment of re-use systems and would be required for the implementation of the proposed re-use and refill targets anyway. Therefore, it was not assessed as a separate measure.

Measure 16. Incentives for reusable models

There are several options for incentivising re-use financially. These include:

- **Measure 16a**. **Taxes on single use items (all materials)**
- **Measure 16b. Levies and charges for single use packaging items at point of sale**
- **Measure 16c. Subsidies or tax breaks for reusable items such as reduced VAT on refillable/reusable items**

EPR fee modulation is discussed in measure 14b above and is not considered here.

Financial incentivisation is an effective way of encouraging adoption and use of re-use systems however the price signal is not enough to overcome the barrier presented by investment in development and initial set up costs for all systems. These incentives are best

deployed as a way of contributing to the meeting of re-use and refill targets and therefore it is not necessary to specifically mandate them if there are re-use and refill targets. In addition, taxation as an instrument is considered out of the scope of the PPWD.

However, these incentives could all be referenced in the revised PPWD as suggested ways to meet the targets set.

Measure 17. Provision of funding for research and development

This measure could support the activities of a business advisory body involved in the development of reusable packaging systems and formats and guidance on optimal implementation, for example by supporting the development of methods for collection of data on re-use and conducting data gathering. However alone it was not considered to be adequate to motivate the piloting and scaling up of the required infrastructure and associated systems and drive the scale of change necessary in terms of adoption.

Many stakeholders (producers and some Member States in particular) have asked that life cycle analysis (LCA) should guide every decision around switching to re-use systems on a case-by-case basis, and that funding and completion of exhaustive analysis be a prerequisite for deploying reusable packaging systems. It is noted that to require this is however to presume in favour of the performance of single-use plastic packaging by default, which is inconsistent and unfair playing field. To mitigate the fact that the data for optimised re-use systems will not be available until they are implemented at scale, and that LCAs have intrinsic limitations with regard to a) the parameters assessed (e.g. litter is not taken into account) and b) the arbitrary nature of decisions around defining analysis scenarios (for example, in terms of the number of reuses being current averages, best practice or potential future optimal scenarios), the measures provided are designed to be material neutral, not favouring any by material weight or emissions footprint, so that the optimal packaging material for each case can be determined over time. The general principle that a re-use system will outperform single-use packaging environmentally if the number of rotations is high enough is sound. Re-use is only rarely mandated for specific product/item type categories for the precise reason that it will take time to understand where re-use is most favourably implemented at present, and how this might itself change over time as systems develop.

In addition, funding is more within the scope of other EU programmes, and not most suitably addressed within the reviewed PPWD.

Measure 18. Information campaigns on re-use

The considered measures included:

- **Measure 18a. Promotion of specific reusable items to consumers (such as reusable beverage cups)**

- **Measure 18b. Promotion of reusable packaging items in general, as required by WFD[391]**
- **Measure 18c. General campaigns on environmental costs of single-use packaging and how to reduce packaging consumption**

Awareness and education alone are not sufficient to drive re-use, especially when several modes of re-use (all except refill on the go for the HORECA sector) require the development and scaling up of supply chains and infrastructure to accommodate this change in supply of services and products. They are of course necessary in support of the achievement of re-use targets, but this can be left to the obligated parties to leverage in the most cost-effective way.

Measure 20. Reusable tableware mandated in HORECA sector

Reusable tableware items would be mandated in the HORECA sector for eat-in purchases. Not all tableware items (such as utensils) are packaging, and measures regarding them have therefore been discarded. Although this measure has been promised under the Circular Economy Action Plan through the activities of the Ecodesign Sustainable Products Initiative, and within the Commission are committed to carry out analytical work to scope legislation for substitution of single-use packaging in the HORECA sector for re-use.

[391] Article 9(d) of the WFD states that "Member States shall take measures to prevent waste generation. Those measures shall, at least: (d) encourage the re-use of products and the setting up of systems promoting repair and re-use activities, including in particular for electrical and electronic equipment, textiles and furniture, as well as packaging and construction materials and products".

INTERVENTION AREA ON RECYCLABILITY AND COMPOSTABLE: RECYCLABILITY

9.11 Introduction

Recyclability of packaging is directly related to the problem of the increased use of packaging design features that inhibit recycling. Key issues identified are related to:

- The current Essential Requirements, which, among others, regulate material recovery of packaging in the form of recycling, do not provide the right incentives for the packaging industry to maximise their contribution to the circular economy. For example, their current wording allows to design packaging for energy recovery as a route to comply with the packaging legislation, contradicting the objectives of the new Circular Economy Action Plan[392] and of the waste hierarchy as established in the Waste Framework Directive (WFD)[393]. More details can be found in the Problem Definition Chapter.

- Currently, there is no clear definition of recyclable packaging, nor are any there harmonised EPR fee modulation criteria related to packaging recyclability. Some Member States have or have been working on their own concepts of packaging recyclability and assessment procedures, with the consequence that the same packaging may be considered as recyclable and be allowed on the market in some and not in other Member States. To ensure the smooth functioning of the internal market, it is necessary to develop clear and common definitions and methodology for packaging recyclability assessment.

- It is necessary to improve the recyclability of packaging to reduce its impact on the environment and to foster circular and low carbon economy.

<u>Measures discarded and not analysed in depth</u>

- Measure 22: Defining Recyclable Packaging
    - Measure 22d. Industry led voluntary design for recycling (DfR) approach
- Measure 24: Defining high quality recycling
- Measure 25: Reducing packaging material complexity
- Measure 26: Updates to recycling targets
    - Measure 26a: Updates to existing recycling targets (2030)
    - Measure 26b: Proposal for increased recycling targets in 2035

[392] https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN
[393] Directive 2008/98/EC on waste (*OJ L 312, 22.11.2008, p. 3–30)*

Measures analysed in depth and included in the options table:

- Measure 21: Updates to the Essential Requirements
    - Measure 21a: All packaging shall be reusable or recyclable by 2030- clarification of Essential Requirements and recyclability definition
    - Measure 21b: All reusable packaging must be recyclable as of 2030
- Measure 22: Defining Recyclable Packaging
    - Measure 22a: Qualitative definition of recyclable packaging
    - Measure 22b: Definition of recyclable packaging based on design for recycling (DfR) criteria complemented by the recyclability assessment procedure and a negative list of non-recyclable packaging characteristics
    - Measure 22c: Quantitative definition of recyclable packaging
- Measure 23: Harmonisation of EPR Fee Modulation Criteria

Measures analysed in depth and included in the options table

Measure 21- Updates to the Essential Requirements

The current trajectory for changes in waste management to divert material to higher levels of the waste hierarchy has been driven by existing legislation focusing primarily on the end-of-life management of packaging, in particular recycling targets. The 2018 revision of the Packaging and Packaging Waste Directive (PPWD) included measures that are likely to have some impact on the design of packaging, such as the obligation to modulate EPR fees but the latter does not affect all packaging equally, as the impact will depend on the magnitude of the fee relative to the overall value of the product and is affected by the lack of harmonisation of the EPR modulation criteria and the underlying concepts (e.g. recyclability).

Without further incentives for design improvements to make packaging recyclable, meeting the 2030 recycling targets in Article 6 of the PPWD is likely to be challenging, particularly for plastic packaging due to the new recycling calculation methodology. The quantitative modelling of impact that has been undertaken for this measure therefore assumes in the baseline that the revised packaging recycling targets set in Article 6 of the PPWD for the year 2030 will not be met, despite some improvements in the design of packaging placed on the market relative to 2018 (see Baseline Methodology). Such design improvements in the baseline scenario are likely to be the case for those packaging types where the design changes required to boost the collection and recycling of packaging are minor or where alternative formats and materials that are more recyclable are easily available, and therefore represent the most cost-effective changes required to meet the targets.

However, particularly problematic packaging types for recycling are unlikely to be impacted in the baseline, as design changes within these formats are costly and require significant investment in R&D or recycling technology. In this respect, as mentioned above, EPR fees will not always provide a sufficient incentive to improve recyclability of packaging.

Industry action via the Circular Plastics Alliance (CPA)[394], committed to a number of actions including the development, update and revisions of design for recycling guidelines for a range of plastic products and packaging types through development of CEN standards in order to facilitate the uptake of recycled material. However, the CPA initiative is

[394] https://ec.europa.eu/growth/industry/strategy/industrial-alliances/circular-plastics-alliance_en

voluntary, and is therefore unlikely to either be applied consistently across the EU market, or with the same level of ambition and scrutiny. Therefore, a further incentive is needed to ensure that the more problematic packaging types are also being designed to be recyclable or taken off the market.

This measure is designed to bring the Essential Requirements in line with the current EU policy and objectives, in particular the waste hierarchy and the EU circular policy. The measure will create a level playing field in which all packaging types are equally encouraged to improve the recyclability of their packaging whilst preserving the smooth functioning of the internal market in an enforceable manner. As a result, it will reduce the environmental impact of packaging waste management, by driving design for recyclability of packaging to stimulate a circular economy.

The following measures are proposed to reinforce the Essential Requirements for packaging in Annex II of the PPWD. It is to be noted that **two measures (21a and 21b) are complementary** and are therefore not proposed as variants of each other.

Assessment of measure 21a: All packaging shall be reusable or recyclable by 2030

9.11.1 Description of the measure

This measure implements the political mandate to ensure that all packaging (irrespective of the material) should be reusable and/or recyclable. It removes the option for energy recovery as a route to comply with the Essential Requirements. Incineration with energy recovery increases system-level GHG emissions from plastic in Europe[395] and removes the possibility of using plastic packaging as secondary raw material, thus increasing the pressure on natural resources. This pressure is compounded by the growing amounts of packaging waste, which are set to continue, and a short life-span of packaging. In 2020, of the 22.0 Mt of packaging and household goods plastic demand, 20.6 Mt entered the waste system within one year. This means that ~95% of economic value was lost to the economy after one short use cycle[396]. In the future, the Essential Requirements and with them the packaging design will be focused on the top three tiers of the waste hierarchy: prevention, reuse, and recycling.

Legally, the measure would consist of **minor changes** to the wording of the current essential requirements.

Paragraph 3(b) (relating to packaging recoverable in the form of energy recovery) **would be omitted**. In this way, packaging which is designed to be incinerated would not be

[395] https://plasticseurope.org/wp-content/uploads/2022/04/SYSTEMIQ-ReShapingPlastics-April2022.pdf
[396] https://plasticseurope.org/wp-content/uploads/2022/04/SYSTEMIQ-ReShapingPlastics-April2022.pdf

allowed on the EU market. This would improve the environmental impact of packaging waste management and reflects the current view of the waste hierarchy.

In addition, paragraph 3(a) – relating to packaging that is recoverable in the form of material recycling – **would be amended**, in part to reflect the new definition of recyclable (see Measure 22 below) but also remove the reference to only "a **certain percentage by weight of the materials**" being suitable for recycling. Under the reinforced Essential Requirements, all packaging – not only an unspecified percentage of some packaging – would need to be recyclable.

The Circular Economy Action Plan 2020 (CEAP 2020) highlights the objective for all packaging on the EU market to be reusable or recyclable by 2030 "**in an economically viable way**". The purpose of including the term "in economically viable way" is related to the fact that all packaging could be considered 'recyclable' if enough time and money were available to spend on the process.

However, referring to this term might be inappropriate because the wording is open to different interpretations. It may be interpreted as "packaging placed on the EU market must be recyclable, if such recycling is economically viable" or that "packaging shall be recyclable if it is economically viable to make it recyclable". This would potentially create a loophole to the requirement for all packaging to be recyclable by 2030. Even if a process to recycle the packaging did exist in theory, in reality, only a very small proportion would be actually recycled. The producers of these types of packaging could therefore be exempt from having to design their packaging to be recyclable, since recycling is not deemed "economically viable".

Alternatively, the term "economically viable" could be interpreted to imply that "packaging should be recyclable and such recycling must be economically viable in 2030", i.e., that only packaging for which there are established, cost-effective routes for collection, sorting and recycling would be deemed recyclable.

Whichever of the above interpretations is applied, the interpretation may differ among Member States since sorting and recycling systems vary widely across Member States and gaining consensus on what can be considered economically viable at the level of the EU may mean that packaging which is currently "recyclable" in one or two advanced recycling Member States may no longer be deemed recyclable at the EU level.

Therefore, if the term "economically viable" was to be included in the legal text, the Commission would need to define what is meant by it to ensure that it is interpreted in a coherent manner. This would imply that packaging that is technically recyclable but does not actually get collected, sorted, or recycled on a wide scale, would be considered unrecyclable and therefore no longer allowed on the market. If defined along these lines,

the inclusion of the requirement would provide grounds for severe market restrictions in the future. Therefore, **it is proposed that in the Essential Requirements, the wording should be limited to requiring that packaging should be reusable or recyclable in 2030**. In addition, the underlying principle behind this requirement will be incorporated in a less ambiguous way by referring to the need for packaging to be recyclable **"at scale"** in "**industrial processes**" as part of the definition of the term recyclable packaging as discussed in measure 22a, to ensure that the objective of the CEAP is fully reflected even if the term "economically viable" is not used. In practice, to remain feasible and implementable, this will involve demonstrating the potential for packaging to be recycled in existing and widely used ("at scale") facilities.

9.11.2. Effectiveness

Measure 21a will effectively achieve the objective of internal consistency within EU waste legislation by prioritising recycling over recovery in accordance with the waste hierarchy. The measure is also expected to be effective in creating a level playing field for all packaging types by removing the option for certain packaging to be recoverable via incineration, which is only a viable route for packaging with a significant calorific value such as plastics.

However, to improve the enforceability of the Essential Requirements and prevent fragmentation of the internal market, this measure should be accompanied by a harmonised definition of recyclable packaging and related assessment criteria.

9.11.3. Ease of implementation

For the Commission, the burden of implementation of Measure 21a would be low. However, the implementation at the Member State level, if not supported by further measures harmonising the definition of recyclable packaging, will be more challenging and could potentially result in different interpretations in different Member States. Member States might also assess that the wording of the essential requirement is too vague to enforce, resulting in an absence of enforcement altogether.

For industry, similarly, the cost of implementation associated with this measure in isolation are likely to be high since they will be faced with different requirements in different Member States, though this depends on the extent to which Member States implement and enforce the requirement in the absence of any clear operationalisation. Measures 22 a, b and c present diverse ways of operationalising this measure and should be implemented alongside this one.

9.11.4. Administrative burden

Enforcing this measure in isolation will place some administrative burden on the Commission and Member States. However, the administrative burden of enforcement against this requirement would not likely be significant since the term "recyclable" would not be operationalised. Similarly, there is likely to be some administrative burden placed on the producers of packaging, though the extent of this is unclear and would depend on the way in which producers and Member States interpret the term "recyclable".

9.11.5. Economic impacts

The proposed measure implies that in 2030 producers of packaging will no longer be able to place on market products that are not recyclable. The Commission currently estimates that 35% of plastic packaging falls in the category if non-recyclable packaging, some of which will be addressed in the baseline by 2030. However, given that the requirement for a percentage of packaging (as opposed to the whole item) to be recyclable will be removed, as well as the option for design for recovery (rather than recycling) of packaging, some additional impact relative to the baseline can be anticipated.

Producers of packaging types that do not meet the new requirements will incur costs to change their packaging design, or brands may need to switch to other, more recyclable packaging types (though these will not necessarily be more expensive). Accordingly, **the net costs of packaging production are expected to increase** (estimated additional cost in the model of **~174m€ in the year 2030**) relative to the baseline. However, it is noted that these are expected to reflect the maximum cost scenario, and impacts in this context are unlikely to be significant, since the costs in the baseline scenario are much higher (~350€ billion) and the term "recyclable" is sufficiently open to interpretation to allow, for example, evidence of a technically feasible recycling process to be construed as evidence of a packaging type being recyclable.

In addition, the removal of the option for plastic packaging to meet the requirements through design for energy recovery should result in some additional costs to the recycling sector (~86m€) due to additional tonnages being diverted to this stream, offset to some degree by the loss of material from incinerators and landfill (~23m€). **The net economic impacts** in this regard were estimated in the model to be worth around **63m€ in additional costs** in the year 2030. Once again, these figures represent the maximum impact anticipated.

In terms of investment in recycling capacity and infrastructure, no additional impact relative to the baseline is anticipated. Only a small proportion of packaging placed on the

market is likely to be impacted by the measure, with the corresponding quantities diverted to recycling being insignificant to justify large investments in infrastructure.

9.11.6. Environmental impacts

The measure is likely to result in a reduction in the quantity of packaging waste material sent to incineration, diverting this to the recycling stream, with resulting reduction of environmental burdens, e.g., related to GHG emissions, air and water quality. Similarly, some changes in material choices and packaging design are anticipated to have a positive environmental impact, though not to a significant extent as per the argumentation above. Overall, some positive net impacts were estimated in the CBA (Cost-Benefit analysis) model in this regard, as summarised in Table 40 below. It is noted that these environmental impacts are uncertain and unlikely to be significant without further direct measures to define the term "recyclable" and create a clear incentive for packaging to be designed along these lines.

Table 40. Summary of Environmental Impacts for Measure 21a

Summary of Environmental Impacts	
Change in GHGs, thousand tonnes CO_2e	-812
Change in water use, thousand m^3	-29
Change in GHG + AQ externalities, m€	-179

9.11.7. Social impacts

The social impacts of the measure are unclear – this is because **there are likely to be additional employment opportunities associated with the need for new packaging formats, designs and technologies (in the production stage)** to meet the requirements, as well as additional quantities of packaging waste diverted to the recycling sector at the end of life. However, **these might be offset by some job losses among those packaging categories which are no longer allowed to be placed on the market** if they are assessed

to be unrecyclable, as well as job losses in the residual treatment sector (including collection). The maximum net impacts estimated in the model in this respect were of the magnitude **of a gain of ~3,800 additional FTEs in 2030 relative to the baseline**.

Additional social impacts observed as shifts in consumer behaviour (e.g., as they adjust to changes in packaging types and increased requirements for sorting of packaging) can be expected, though these cannot be attributed to this measure above and beyond the baseline scenario with certainty.

9.11.8. Stakeholder views

In the workshops undertaken for the Essential Requirements Scoping Report **participants repeatedly called for the need for improvements to the Essential Requirements including a harmonised approach to enforcement across Member States**[397]. There was broad support across all stakeholder groups for aligning the requirements with the waste hierarchy, focussing on making packaging more recyclable and removing confusing and vague references to recyclability in the harmonised standards.

In the online public consultation, the statement with the most support from the participants was "I want all packaging to be recyclable". In total 86% of participants either agreed or strongly agreed with this.[398]

Assessment of measure 21b: All reusable packaging must be recyclable as of 2030

9.12.1. Description of the measure

The measure would propose that all reusable packaging must also be recyclable.

The CEAP 2020 requires that all packaging should be 'reusable or recyclable' by 2030 – suggesting packaging must be either one or the other and that, if a piece of packaging was reusable, it might not have to be recyclable. However, there is a risk that non-recyclable packaging is placed on the market, claiming to be reusable, even though the number of times the packaging is actually reused is very low. This may be because the item is, for example, not very durable; a term also not defined in the legislation. This risks the creation of unfair advantages for pseudo-reusable packaging which would not have to meet the

[397] European Commission, 2020, Effectiveness of the Essential Requirements for packaging and packaging waste and proposals for reinforcement available at:
https://op.europa.eu/en/publication-detail/-/publication/05a3dace-8378-11ea-bf12-01aa75ed71a1
[398] Appendix I - Online Public Consultation Report

requirements to be recyclable. To maintain a level playing field, it is proposed that all reusable packaging should be also recyclable. Recyclability requirements are designed to ensure that the negative environmental impacts of all packaging, including reusable packaging, at the end of life are minimised. The approach taken here departs from the underlying Impact Assessment Support Study (Eunomia 2021), which recommended that limited possibilities of exemptions from recyclability requirements are provided between 2030 and 2035 and removed thereafter.

Therefore, **paragraph 2 in the Essential Requirements would need to be amended** to **require that reusable packaging meets also the requirements of paragraph 3 – relating to the recyclable nature of packaging** as specified in measure 21a.

However, the market for reusable packaging is relatively immature. In order to develop widespread reusable systems, innovation is required not just in the construction of the packaging item, but also in the system supporting reuse, including collection points, preparation for reuse, which may include sanitisation, and redistribution. In addition, assessing recyclability of reusable packaging is a more complex process as this packaging is in use for a much longer time period, perhaps several years, and the waste collection, sorting and recycling markets and infrastructure can change in this time.

It is thus proposed that **reusable packaging would be required to be recyclable only as of 2030**. To qualify for such an exemption until 2030, packaging must be shown to meet the minimum requirements for reusability (see measures 10b and c in the reuse intervention area).

After 2030, it is proposed that producers of reusable packaging should not only be required to demonstrate that their packaging meets the minimum criteria for being classed as a reusable (see Measure 10 in the reuse intervention area) but must also demonstrate that their packaging is recyclable according to the recyclability requirements.

Links to other measures

- The implementation of this measure is dependent on the more direct measures operationalising the requirements related to definition of recyclability and supporting measures related to monitoring and enforcement.
- The measure also links to those discussed as part of the reuse intervention area.

9.12.2 Effectiveness

Given that the proportion of reusable packaging products on the market is relatively low at present, and even more so for those that are not already made of recyclable materials, the measure is **likely to be effective**, though impacts on recycling rates of this measure will be low relative to the baseline.

The effectiveness of the measure will be closely linked to the development of the minimum criteria for reusability and recyclability. The measure will **stimulate innovation to improve recyclability in the reusable packaging market** and provide the reusable packaging **industry with a long-term view, ensuring that innovation** is directed accordingly.

It should be noted that the impacts of this measure have been assessed in isolation, though the measure must necessarily be implemented alongside measure 21a. Therefore, these impacts can be interpreted as additional to those set out for measure 21a, though still in isolation of any operationalising measures for the recyclability requirements in measure 22. Additionally, these impacts are likely to become more significant over time, as the share of reusable packaging on the market increases because of the measures considered under the reuse intervention area. Therefore, this measure, like Measure 21a, will not be implemented in isolation. However, in assessing this measure in isolation, a **maximum change of 1.7% in the recycling rates** has been estimated in the CBA model relative to the 2040 baseline. 2040 was chosen as the measure will only take full effect after 2030.

9.12.3. Ease of implementation

The implementation of this measure will depend on the minimum criteria for classification as "reusable", while further work will be needed to outline the approach to assessing the recyclability of reusable packaging (alongside the approach taken forward in measure 22).

From the perspective on the packaging industry, implementation will involve focussing innovation in reusables to materials that are already recyclable or investing in appropriate recycling schemes to improve recyclability.

9.12.4 Administrative burden

The Commission will need to develop **the criteria for assessing the recyclability of a reusable packaging per type, as well as the approach to such assessment.** In addition, administrative burden is foreseen on the Member States to verify compliance, and on

producers to proceed to the recyclability assessment and comply with any reusable packaging requirements to be developed under reuse intervention area.

The administrative responsibility for this measure should be met within the same regulatory structures that will administer measures 21a, 22a and 22b.

9.12.5 Economic impacts

It is noted that, as with Measure 21a, in the absence of a definition for the term "recyclable", the impacts of this measure are uncertain. By 2030, producers will be required to either redesign their packaging, use alternative formats or materials or invest in recycling infrastructure to enable their packaging to also be classed as recyclable. The net increase in **production costs associated with these changes relative to the 2040 baseline was estimated to be worth ~ EUR 107m** in the CBA model.

Such changes will result in some increase in packaging waste diverted from incineration and landfill to recycling relative to the baseline, with increased recycling costs offset by reduced costs of incineration and landfill. It is estimated that this will increase waste management cost by EUR 39 million **relative to the 2040 baseline.**

Impacts on investment in recycling infrastructure are expected to be similar to measure 21a.

9.12.6 Environmental impacts

Based on the impacts on the production and end of life management of reusable packaging described above, the modelled environmental impacts (relative to the baseline scenario in the year 2040) are summarised in the table below.

Table 41. Summary of Environmental impacts for Measure 21b

Summary of Environmental Impacts	
Change in GHGs, thousand tonnes CO_2e	-550

Summary of Environmental Impacts	
Change in water use, thousand m^3	-18
Change in GHG + AQ externalities, m€	- 163

9.12.7. Social impacts

Based on the changes in production and end of life management of reusable packaging discussed above, **some net positive impact on employment levels** can be expected relative to the baseline, estimated to be equivalent to ~2400 additional FTEs in 2040. This estimate is subject to considerable uncertainty for the reasons highlighted previously.

Additionally, this measure will ensure that **consumers can have increased confidence** in the environmental benefits of purchasing reusable packaging items; in that the material used in these items can also be recycled at the end of life.

9.12.8. Stakeholder views

Following the webinar in June 2021, a range of stakeholders submitted feedback on this measure. One stakeholder from the paper industry argued that exemptions for reusables should be allowed and should follow a product specific approach. Most stakeholders, including producers, PROs and NGOs, expressed concern that allowing exemptions will lead to packaging items being classed as reusables to avoid the requirement to be recyclable. This has been considered by requiring stringent criteria for classifying as reusable packaging (Measure 10) and by setting increasingly stringent criteria for exemptions from recyclability for reusable packaging items.

Other stakeholders argued that the reusable packaging market needs longer time to innovate and adjust, and this has been accommodated in this measure.

In the online public consultation (OPC)[399], small operators expressed some concerns regarding the economic costs that may be associated with this measure. No strong stakeholder views were expressed by larger operators either in support of or against this measure.

9.12.9. Summary and conclusion

Measures 21a and 21b are intended to be mutually supportive rather than presenting distinct options. If measure 21b is not adopted, the effectiveness of measure 21a is likely to be compromised, and in the absence of 21a, measure 21b is meaningless. However, the impacts of both are heavily reliant on measures 22 and 23 and are unlikely to be significant without further intervention to clearly define and operationalise the requirements in terms of packaging that can be considered "recyclable".

Measure 22: Defining recyclable packaging

The **term recyclable is not clearly defined in the legislation**. The Essential Requirements for packaging recoverable by material recycling are currently enforced via harmonised standard EN 13430, and compliance with this standard provides producers with a presumption of compliance with the requirements[400]. The current requirements are vague, open to interpretation and therefore not enforceable.

It is **necessary that the definition of 'recyclability' includes not only whether the packaging material is technically recyclable, but also considers the likelihood of the item being collected, sorted and processed in existing systems into a material** that can be used in place of virgin material. At each of these stages in the recycling process, changes in design and technology can increase or decrease the value of the material to industry at the next stage. For this reason, the upcoming definition of the term 'recyclable' should underpin regulatory requirements on packaging producers to look at those elements of packaging design that can influence the item at every step of end-of-life management.

The objective of this measure is to set out a clear definition of 'recyclable' that supports the operationalising of the updates to the Essential Requirements in Measures 21a and b. In this way, it will create a level playing field across packaging types and producers and enable smooth functioning of the internal market.

[399] See Appendix I – OPC report
[400] EN 13430:2004 Packaging - Requirements for packaging recoverable by material recycling

Three approaches are presented below (and a fourth discarded variant is described in the last section):

1. **Measure 22a: a qualitative definition of what recyclable packaging is**, to enable enhanced enforceability compared to the current wording in the Essential Requirements and associated harmonised standards. The definition could be included within the Essential Requirements themselves or in Article on definitions in the legislative proposal.
2. **Measure 22b: a definition that uses mandatory design for recycling (DfR) criteria** to determine whether packaging is recyclable (and, due to the Essential Requirements, can therefore be placed on the EU market) or not. This would build on the qualitative definition in Measure 22a by developing the DfR criteria and approach to assessment and certification of packaging. Furthermore, a list of negative packaging features would be developed to reverse the burden of proof. Packaging with characteristics that hinder the recyclability would be obliged to prove recyclability via third-party certification.
3. **Measure 22c: A quantitative definition** of recyclable packaging based on actual recycling rates within a packaging category or packaging level basis. For example, the definition would be 'packaging is considered recyclable where it is recycled over a certain threshold across the EU'.

Assessment of measure 22a: Qualitative definition of recyclable packaging

9.13.1. Description of the measure

The objective of this measure is to introduce a **clear qualitative definition** of recyclable packaging, which meets the objectives of the revision and can be easily understood by a wide audience.

There are two options to implement this measure:

- As a stand-alone definition in the essential requirements (i.e., without linking to either measures 22b or 22c for further operationalisation), which would be mandatory, as opposed to the current voluntary approach to assessing recyclability through reference to the harmonised standard EN 13430.
- As a definition in the main body of the legislative proposal and referenced in the Essential Requirements.

Building on input from stakeholders, packaging is recyclable if it can be effectively and efficiently separated from the waste stream, collected, sorted and aggregated into defined streams for recycling processes, and recycled at scale through established industrial processes, so that it is turned into secondary raw material of sufficient quality that it can find end markets to substitute for the use of the primary raw material.

There are three key elements of this description which remain open to interpretation but will require significant effort in building industry consensus to define more precisely:

- the term “recycled at scale”
- the classification of “innovative packaging”[401]
- Unit of packaging[402]

In addition, it is proposed that "*whenever possible, packaging should be designed to be mono-material and not contain barrier layers or additives*." This could be linked to the core functions of packaging, which will be similar or the same as under Measure 1 on definition of over-packaging, and will not include marketing or consumer acceptance.

It has to be mentioned as well that the Commission has been developing technical screening criteria for various manufacturing process, including non-hazardous waste sorting and recycling processes under the EU taxonomy framework. The platform on sustainable finance in particular has recently put forward draft definitions for recyclable packaging and collection, sorting and recycling at scale. As this initiative is very relevant for this measure and the PPWD in general, it is suggested to align the two initiatives.

In addition, the new PPW legislation would include a provision stating directly, that **any packaging being a food contact material, needs also to meet the more stringent criteria established under the Food Contact Material legislation[403].**

Recycled at scale

[401] Innovative packaging shall mean packaging that is manufactured using new materials, design or production processes. Modifications of packaging for the sole purpose of improved presentation of products and marketing shall not be considered as such as innovative packaging.

[402] Unit of packaging shall mean a unit as a whole, including any integrated or separate components, which together serve a packaging function such as the containment, protection, handling, delivery, storage, transport and presentation of goods to the final user. Grouped and transport packaging that are discarded prior to the point of sale to the final user or consumer shall be considered independent units of packaging. The measure was developed considering that each unit of packaging shall be recyclable in 2030.

[403] Regulation (EC) No 1935/2004 of the European Parliament and of the Council of 27 October 2004 on materials and articles intended to come into contact with food and repealing Directives 80/590/EEC and 89/109/EEC, https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32004R1935; Commission Regulation (EU) No 10/2011 on plastic materials and articles intended to come into contact with food, https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32011R0010; Commission Regulation (EC) No 282/2008 of 27 March 2008 on recycled plastic materials and articles intended to come into contact with foods and amending Regulation (EC) No 2023/2006, https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32008R0282
Legislative work is also ongoing on the adoption of an act that will establish new specific requirements for recycled plastic and repeal current Commission Regulation (EC) No 282/2008.

In order to be considered recyclable "at scale" packaging must not only be accepted in an existing recycling stream but also have a pathway to recycling across the EU. This means that the necessary infrastructure and processes for the collection, sorting and recycling of the packaging waste type generated in the EU must be available and accessible in sufficient quantities.

Considering that targets for the recycling of packaging waste by material are already in place for 2030, it follows that packaging should be placed on the market in a Member State only if it is recyclable at a scale, so that it facilitates the achievement of those targets in that year (and thereafter). As a minimum, sufficient recycling capacity to meet the relevant material targets should be available for each packaging type placed on the market in the EU. Where packaging waste is exported for recycling to deal with insufficient recycling capacity in the EU, this must also be considered as part of the recycling capacity for that packaging type, so long as such exports are compliant with all relevant legislative requirements (Article 6(a)(8) of the PPWD, which references Regulation (EC) No 1013/2006 [Waste Shipment Regulation]).

However, to ensure that the packaging is put into these recycling processes, it must first have been collected, sorted and transported. The at scale assessment refers to whether the unit of packaging can be collected, sorted and recycled at scale in Member States representing 75% of the EU market share by volumes of that packaging placed on the market or the Member State where the packaging has the highest market share in the EU.

Due to the need to ensure that this relates to the PPWD's 2030 recycling targets and given that not all packaging waste that is collected and sorted is subsequently recycled, the capacity and levels of availability and accessibility to these collection and sorting processes must be suitably higher. However, this requires significant effort in building industry consensus to define more precisely the thresholds where the at scale assessment will be applied and thus it is suggested to conclude at a later stage.

The following **conditions** should therefore be fulfilled for packaging to be considered **recyclable at scale.**

- **Collected at scale**

For packaging to be collected at scale, **the whole population** of a Member State should have **access and the ability to sort** the packaging **in an effective collection system.** There would be **exceptions** for sparsely populated areas[404], mountainous areas and islands[405] qualifying for a derogation under the Waste Framework Directive. As most waste

[404] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Sparsely_populated_regions.png
[405]https://ec.europa.eu/regional_policy/sources/policy/themes/sparsely-populated-areas/map_mountains_islands_spas.pdf

collection systems do not operate regionally or EU-wide, this must be assessed at the **Member State level.**

- **Sorted at scale**

For packaging to be sorted at scale, it should be possible to **direct it into defined and recognised waste streams**. Additionally, there must be **sufficient existing sorting capacity** (including technologies and processes) in the EU to enable this. This assessment will take place at regional or EU level where it can be demonstrated that packaging waste of the relevant type in a Member State has a realistic route to sorting capacity to allow market efficiencies to determine the best geographical location.

- **Reprocessed/ recycled at scale**

The packaging must be acceptable for recycling in an existing recycling stream and there must be a sufficient reprocessing capacity in the EU. As a minimum, this must be a percentage of the volumes of the packaging type placed on the market, which is equal to the material specific recycling targets as specified in the PPWD. The criterion can be determined at EU-wide but needs to be realistically accessible for the relevant collected and sorted material generated by a Member State and such reprocessing capacity should not be double counted between certification schemes.

Further, for packaging to be considered recyclable at the EU level, these conditions should be fulfilled in a major part of the EU market. To determine this threshold, an approach using a simple Member State majority by count (recyclable at scale if conditions fulfilled in >18 EU Member States) was considered. However, it is expected to be challenging to implement this approach as it requires data on packaging placed on the market for EU as a whole and Member States' markets, at a high level of granularity. EPR systems are expected to have access to the relevant data.

If needed, the Commission should develop and publish guidelines to assist Member States in the interpretation and practical implementation of these requirements, specifically regarding the adequacy of collection, sorting and recycling systems that should be considered. This work will build on the results of the current review of the Waste Framework Directive and could include, for example:

Consideration of the key elements that constitute **"effective" collection**:

- A minimum standard of provision of collection points per population density, where areas would be zoned into high, medium and low density and could build on existing derogations within the Waste Framework Directive for sparsely populated

areas, mountainous areas and islands. Within urban areas, further zoning is possible where areas of multiple occupancy housing require different collection systems from suburban areas.

- The collection system must be known to the majority of consumers, meaning that the route for collection must be clearly communicable. For example, where industry seeks to set up a product specific collection service such as a deposit return system (DRS) or take back scheme, relevant consumers need to have a high degree of awareness about this. One example of this is the system being trialled for the take back of coffee pods in the UK and in some EU Member States. Consumers are made aware that they can have items collected by mail, at the kerbside, or at various drop off points if they register through an online "recycle checker" tool and can register to order (free) recycling bags to access the system.
- The collection system needs to be convenient and accessible, which should be defined in relation to an agreed benchmark. For example, this could be the provision of a bring point within a certain radius that matches the average distance travelled to the nearest supermarket. In this way, returning items is considered as convenient as buying food. In the example of coffee pod return the convenience is like posting a letter. Some effort on the part of consumers is expected but there should be no additional cost to consumers.
- The waste collection scheme ensures high capture rates (amount of separately collected waste) of high quality (low level of impurities present in the separately collected waste fractions).

Further inspiration and improved metrics could be taken from approaches in some Member States. For example, CITEO currently proposes that in France effective collection schemes are those where the population:

- is covered by kerbside collections, or
- has access to at least one collection point per 200 inhabitants in rural municipalities, or
- has access to one collection point per 500 inhabitants in urban areas, or
- has access to a return point in the case of dedicated collection per 1000 inhabitants.

Consideration of the key conditions to ensure packaging **sortability:**

- For glass, plastics, paper/ card and liquid packaging board, effective separation using sensor-based sorting may be considered suitable.
- For metals, use of the standard eddy current and magnetic separation processes should be assured to deem such materials “sortable”.
- Consideration should also be given to technologies and processes that enable sorting of recyclable material from the residual waste stream, and whether the collection of such material can be considered part of the provision of effective collections at scale

Consideration of any key conditions that must be met for recycling streams

- Recycling streams will need to ensure traceability and quality of outputs.

Innovative packaging

From 2030 onwards, innovative packaging is exempted from meeting the above recyclability requirements for a maximum of five years. The classification of "innovative packaging" is important to ensure that a loophole is not created whereby minor design changes to existing unrecyclable packaging are made in order to claim "innovative" status and thereby avoid meeting recyclability requirements for five years.

So, to be classified as "innovative", it is proposed that producers must demonstrate evidence of the following criteria:

- The use of novel packaging materials /packaging design/ format shall result in a significant improvement in the core function of the packaging (i.e. containment, protection, handling and delivery, in line with Article 3 of the PPWD) either in an existing application or in new applications.
- Innovation solely for the purposes of improved presentation of products or commercial benefit is excluded, though these may be co-benefits of improvements listed above.
- Additionally, to qualify for this derogation, there must be an assessment of the current recyclability of the innovative packaging against the requirements of the qualitative definition and evidence of plans to ensure that the packaging will become recyclable within 5 years.

Unit of packaging

Initially, it was considered necessary specifying a percentage of a packaging unt that must be compatible with the recyclability definition. This would require defining the term '**unit of packaging'.** In this regard, EN13427 defines a packaging component as "a part of packaging that can be separated by hand or by using simple physical means". Following this the functional unit of packaging in described in clause 4.3:

> *The smallest part of a packaging considered in this standard is a component. Usually, a number of components will be brought together to form a functional unit of packaging, and these may in turn be brought together in a complete packaging system which could comprise primary, secondary and tertiary packaging (as defined in article 3 of Directive 94/62/EC).*[406]

[406] CEN 13437:2004 Packaging - Requirements for the use of European Standards in the field of packaging and packaging waste.

As this description falls short of a workable definition as the term functional is not elaborated upon, the approach of unit of purchase by the consumer or a stock keeping unit (SKU) was considered. However, some packaging requires complete and permanent disassembly into separate components for the product to be consumed, and such separated packaging components, which are discarded separately, may be assessed at the level of each separate component.

From the perspective of packaging manufacturers, the 95% threshold is likely to be challenging to meet, particularly for lightweight or smaller applications where the proportion of inks, adhesives etc. is relatively greater by mass. In order to address this concern, it was considered that, when the unit of packaging has components of different combinations of materials or polymers, it can still meet the 95% criterion, if these are easily separable by hand or by simple physical means within a sorting plant, such as density separation of polymers after grinding, and for these separated mono-material components a recycling pathway currently exists.

Finally, some stakeholders expressed concern that for these types of packaging (composite packaging), there may be a risk of producers adding material to meet the 95% threshold. Further, stakeholders noted that reducing this threshold to 90% would still not be sufficient for certain packaging types (e.g., some flexible composite packaging would need a threshold closer to 80% while some beverage cartons would need a threshold closer to 70%).

Setting the threshold and then having to lower it could lead to negative impacts on recyclers by reducing the recycling yield even before losses due to non-target material/ product contamination are considered.

Consequently, it is not appropriate to define the threshold for the recyclability of the unit of packaging under this measure. It will, however, be required that ***all*** *packaging elements must be compatible with the relevant collection, sorting and recycling processes without hindering the recyclability of the main components of the unit of packaging.* This means that no element of packaging should impact on the quality of the recyclate or increase the processing costs **significantly**. This approach allows for the unit of packaging to be defined as a stock keeping unit, with the possibility to take into account the ease of consumer separation of different packaging components in view of its consumption and disposal.

Ultimately, the use of a design for recycling approach to defining recyclability (see measure 22b below) is likely to be more suitable to defining such thresholds on a more granular level.

Recyclability of compostable packaging

Finally, it is noted that the wording in the above definition pertaining to secondary raw material "of sufficient quality that end markets exist in which it is valued as a substitute for virgin material" may be interpreted to exclude composting, which is explicitly included within the definition of recycling in the Waste Framework Directive. Accordingly, additional clarifying text should be considered:

"*Compostable packaging is considered to be recyclable where it is processed to produce compost, digestate or other output - and that output is subsequently used on land, in line with Article 6a of the PPWD."*

9.13.2. Effectiveness

The qualitative definition proposed provides a clear steer to industry to transition towards packaging that can easily be recycled.

The measure is likely to be most effective if implemented in the form of principles to underpin measure 22b (which establishes clear design criteria to enable the recycling of specific packaging categories), which would also reduce the scope for inconsistency in implementation across Member States.

In terms of impacts on recycling levels, given the assumptions underpinning the baseline, recycling rates for some packaging types[16] may be expected to increase by 3-5pp, though the impact on overall packaging recycling levels relative to the baseline in 2030 is estimated to be insignificant (<1pp).

9.13.3. Ease of implementation

The success of application relies on the nature of the enforcement mechanisms put in place. The implementation challenges for each section of the qualitative definition need to be considered separately. Challenges relate to the implementation of the definition of ***innovative packaging,*** *which* would require a system to be set up with a **body overseeing the rules and process of applying for an exemption**.

Implementation of the part of the definition which requires a*ll packaging elements to be compatible with the relevant collection, sorting and recycling processes without hindering the recyclability of the main components of the unit of packaging*, relies on clear guidance as to which materials are considered incompatible with the recycling process of the main materials. Technical Report CR 13688 provides non-exhaustive list of examples of the materials and substances which cause problems in the recycling operations of the main packaging materials and could serve as an initial list, which may need to be further updated and refined. This legally defined list of disruptive components would need to be updated regularly to take innovation in packaging and/or in recycling systems into account.

9.13.4. Administrative burden

Administrative burden for the Commission is related to the drawing up of legislation coordination of inputs from stakeholders. Particularly burdensome will be drawing up of the list of negative packaging characteristics and its regular updating.

At the Member State level, additional administrative burden is expected, since current the Essential Requirements were not seriously implemented in most Member States. However, if differing interpretations of the definition across Member States arose, the administrative burden for producers could increase significantly.

Table 42. Implementation methods for measure 22a

Implementation method	**Description**	**Costs**
Remove references to Standard EN 13430	With the definition of recyclable packaging being specified in the Essential Requirements, the use of Standard EN 13430 'Requirements for packaging recoverable by material recycling' is no longer required.	Easiest implementation method
Update Standard EN 13430	There are features of the standard that could still help packaging designers think about design for recyclability so the standard might be updated to remove unnecessary elements (e.g., proving compliance with 'a certain proportion' of the packaging needing to be recycled) and update the design guidance more broadly	Effort to update the Standard
Update CR TR 13688	This is independent from the decision on Standard EN 13430	This would require resource from CEN and related stakeholders. In this case, the impact of the measure and associated administrative burden may be higher, though this would likely be a one-off

		cost. In addition, CEN is currently already revising the technical report 13688.

9.13.5. Economic impacts

The measure relies heavily on the nature of enforcement mechanisms that each Member State would put in place, therefore the **impacts estimated are uncertain**.

Packaging producers (including converters, fillers and brands): Investment will be required to identify packaging designs that improves recyclability whilst maintaining function of a particular packaging product. **Changing design may require adaptations to infrastructure, such as filling processes**. However, it is expected that the simplest design of packaging, in order to be considered fully recyclable, will lower the costs to producers in long term.

Where changes to design are not seen as viable or innovative, producers may invest in developments of the recycling chain**.** This could involve advocating for increased collection coverage within Member States, incentivising sorting plants to incorporate new technology, and funding innovation into new recycling technologies.

To some extent, costs will have already been incurred in the baseline to meet the revised recycling targets. It has been estimated that as a maximum, the additional costs of packaging production **associated with the measure are around ~260m€ relative to the baseline in 2030**.

Recycling Industry (sorting and reprocessing infrastructure): This measure is expected to boost investor confidence in sorting and recycling infrastructure although it is not clear to what extent these impacts will be perceived. There is the risk that elements of the definition may be interpreted differently by Member States and therefore become difficult to enforce. Overall, it is estimated that as a result of additional packaging waste being diverted to recycling, **increased costs of ~91m€ can be expected relative to the baseline in 2030** (net of reductions due to reduced incineration/ residual treatment).

9.13.6. Environmental impacts

The environmental impacts of the measure are **expected to be positive**, and similar in magnitude and scope to those described in measure 21a (as shown in the table below). If implemented in combination, the impacts described below should not be considered of as additional to those described in measure 21.

Table 43. Summary of Environmental Impacts for Measure 22a

Summary of Environmental Impacts	
Change in GHGs, thousand tonnes CO_2e	~-1,230
Change in water use, thousand m^3	~-44
Change in GHG +AQ externalities, m€	~-270

9.13.7. Social impacts

The social impacts of agreeing a definition of 'recyclable' are likely to be similar to those discussed in measure 21 updated to the Essential Requirements (i.e., a maximum **increase in employment of ~5,700 FTEs relative the baseline in 2030**). Having a common definition of 'recyclable' could increase consumer confidence in this term, if measures to harmonise labelling of recyclability (measure 27) are also adopted.

9.13.8. Stakeholder views

Stakeholders highlighted the need for clarity and harmonisation of the definition. In the open public consultation, many participants proposed definitions they considered particularly suitable. Some organisations highlighted that these definitions must be technology neutral to avoid unintentionally favouring or excluding certain processes (chemical recycling and composting in particular).[407]

The following points were raised with regards to the specific elements of the definition:

<u>At scale</u>

Stakeholders widely disagreed with the use of a simple Member State majority by count metric to determine recyclability at scale. While most stakeholders agreed that an EU population-based metric highlighted is more relevant, several noted that an approach based

[407] Annex 2 - Online Public Consultation Report

on the market-share of packaging would allow the best distribution of responsibilities and obligations among all Member States in terms of the collection and recycling of packaging placed on their markets.

In terms of the individual at scale criteria for collection, sorting and recycling, stakeholders agreed with the approach that considers each of these three elements separately, and with the consideration of the requirements for collection at scale at the Member State rather than EU level. Several made suggestions related to the adequacy of collection and recycling systems that should be considered. For example, it was proposed that specific reference be made to separate collections and suggested the inclusion of specific criteria related to the quality of recycling, or the adoption of industry standards/ guidelines to improve the recyclability of specific materials.

Innovative packaging

Stakeholders tended to **agree with the proposed criteria**, making suggestions for additions rather than removals. For example, the addition of "communicating key information to consumers" to the core functions of packaging has been proposed. However, given that the communication of key information is mandatory under several pieces of product legislation, and must therefore be considered for any type of packaging used for such products, it is not recommended that innovation that results in improved communication of information should qualify for an exemption from being recyclable. In addition, there is no reference to "communicating key information" in the PPWD, what constitutes key information and how such information should be communicated. There is a risk that packaging changes that result in a simple change to the presentation of information will be classed as innovative and therefore able to remain unrecyclable for up to 5 years.

Several stakeholders are also in favour of including sustainability criteria (e.g., innovation that results in increased recyclability or lower carbon footprint of packaging). In the first case, seeking an exemption from recyclability requirements on the grounds of improved recyclability would not make sense. In the second, there is no commonly accepted methodology for estimating the overall carbon footprint of packaging, nor for the selection of a counterfactual to which the innovative packaging should be compared. This would therefore be unnecessarily burdensome to implement and comply with.

95% of the unit of packaging

Most stakeholders were opposed to the use of a threshold due to the differences in specific packaging materials, formats and recycling systems. Several specified that the allowance for components that can be manually separated to be recyclable in individual

recycling streams would be important to achieve the threshold. Others noted that the threshold would simply not be achievable for many packaging formats. The use of a design for recycling (DfR) based approach whereby the recyclability of packaging and its components could be defined in a more targeted way was preferred (measure 22b).

Assessment of Measure 22b: Definition of recyclable packaging based on design for recycling (DfR) criteria complemented by the recyclability assessment procedure and a negative list of non-recyclable packaging characteristics

9.14.1. Description of the measure

This measure is complementary to the qualitative definition of recyclable packaging and is based on the mandatory use of **design for recycling (DfR) criteria and recyclability assessments to determine whether packaging is recyclable.** The qualitative definition above would be used as a set of guiding principles to support the development of mandatory DfR assessment methodology in line with the EU's recyclability objectives along the following lines:

"A packaging item will be deemed to be recyclable only if it meets the established design for recycling criteria for the category to which it belongs, as determined by an assessment of its suitability for recycling at scale in the EU and its recycling performance in practice."

"By xxx the Commission shall adopt an implementing act laying down the methodology for the assessment, verification and reporting procedure for the DfR assessment.

In determining the DfR criteria and assessment methodology to be developed, the Commission will consider the following key principles for assessing the recyclability of packaging:

- Packaging is recyclable if it can be effectively and efficiently separated from the waste stream, collected, sorted and aggregated into defined streams for recycling processes, and recycled at scale through established industrial processes, so that it is turned into secondary raw material of sufficient quality that it can find end markets to substitute for the use of the primary raw material.
- **Innovative packaging** placed on the market that requires new infrastructure to be developed shall **be recycled at scale within a maximum period of five years**.
- **All packaging elements must be compatible** with the relevant collection, sorting and recycling processes without hindering the recyclability of the main components of the unit of packaging.

The following key elements of this methodology shall be laid out in the legislative text:

Scope of Assessment

Brands/ fillers are responsible for ensuring that packaging placed on the EU market has been certified as recyclable.

The object of the assessment is a **packaging unit** (inclusive of all components such as labels/ sleeves, caps, lids and closures, decorative elements, etc.).

Some kinds of packaging require complete and permanent disassembly into **separate components** in order for the product to be consumed such that the separated packaging components are discarded separately. For the purposes of assessing recyclability, these types of packaging may be assessed at the level of each separate component, with the weighted results for each component added up to determine the overall result.

The product contained in the packaging shall only be included for assessment to the extent that **product residues** impact the collection, sorting or recycling of the packaging unit, for example due to high levels of material contamination.

Equivalent packaging (i.e., packaging that is the same in material/ components and design but different in size, decoration and/or product) need only undergo a sortability assessment (to ensure that the difference size/ decoration/ product does not hinder the sorting process).

Packaging categories

Packaging will be assessed within one of an established sets of categories (a preliminary list of 29 categories is listed in Table 44 below):

Table 44. List of packaging categories

Category No	Packaging material	Packaging type	Format (illustrative)	Colour
1	Glass	Glass	Bottles, jars, flacons, cosmetics pots, tubs etc. ––made of glass (soda lime silica)	
2	Glass	Composite materials, of which the majority is glass	Bottles, jars, flacons, cosmetics pots, tubs	

3	Paper/cardboard	Paper/cardboard packaging	Boxes, trays, grouped packaging	
4	Paper/cardboard	Composite materials of which the majority is paper/cardboard	Including beverage cartons, plates and cups, i.e., metallised or plastic laminated paper/ card, liquid paperboard, paper/cardboard with plastic liners/ windows	
5	Metal	Steel	rigid packaging formats (aerosols, cans, paint tins, boxes, etc.) made of steel, including tinplate)	
6	Metal	Composite materials, of which the majority is steel	drums, tubes, cans, boxes, trays, etc.	
7	Metal	Aluminium	Rigid formats (food and beverage cans, bottles, aerosols)	
8	Metal	Aluminium	Semi rigid or flexible formats (containers and trays, tubes, foil)	
9	Metal	Composite materials of which the majority is Aluminium	drums, tubes, cans, boxes, trays, etc.	
10	Plastic	PET - rigid	bottles and flasks	Transparent clear/ light blue
11	Plastic	PET - rigid	Bottles and Flasks	Transparent other colours
12	Plastic	PET - rigid	Rigid packaging other than bottles and flasks (Includes pots, tubs and trays)	Transparent
13	Plastic	PET - flexible	Films	
14	Plastic	HDPE - rigid	Containers and Tubes	natural /clear
15	Plastic	HDPE - rigid	Containers and	coloured

			Tubes	
16	Plastic	PE - flexible	Films	natural /clear
17	Plastic	PE - flexible	Films	coloured
18	Plastic	PP - rigid	Containers and Tubes	natural /clear
19	Plastic	PP - rigid	Containers and Tubes	coloured
20	Plastic	PP - flexible	Films	natural /clear
21	Plastic	PP - flexible	Films	coloured
22	Plastic	HDPE and PP - rigid	crates and pallets	
23	Plastic	PS - rigid	Rigid packaging (except EPS and XPS)	
24	Plastic	EPS - rigid	fish boxes/ white goods	
25	Plastic	XPS - rigid		
26	Plastic	Other rigid plastics including. PVC, PC - rigid	Rigid	
27	Plastic	Other flexible plastics including Multilayer plastic films and multi material materials - flexible	Pouches	
28	Wood, cork	Wooden packaging, including cork	Pallets, boxes	
29	Textile	Natural and synthetic textile fibres	Bags	
30	Ceramics or porcelain stoneware	Clay, stone	Pots, containers, bottles	

Design for Recycling (DfR) Assessment Methodology

The **DfR assessment methodology** will assess the **technical feasibility of recycling** a given item of packaging by checking the compatibility of its individual components/ design elements in **widely used sorting and recycling systems** at the EU level. **A set of criteria for each packaging category** will be developed, which will allow the rating of packaging **on a scale from A (most recyclable) to F (not recyclable)**. **The criteria listed below** represent those that are widely used in voluntary DfR guidelines at present and are therefore proposed for inclusion, however other criteria might be included:

Additives, labels/sleeves, closure systems and small parts, adhesives, colours, material composition, barriers/coatings, inks/printing, product residues/ease of emptying, ease of dismantling.

When linking the resulting rating to an assessment of recyclability (and therefore what can be placed on the market from 2030), the Recyclass methodology[408] has been used as an example of the framework of results that can be expected from such an assessment below. The outcome of the packaging that have undergone the DfR have been grouped in grades and would follow the structure below:

- Recyclable (allowed to be placed on the market, EPR fees lower, less stringent admin burden):
    - grade A: The package does not pose any recyclability issues and it can potentially feed a closed-loop scheme to be used in the same application.
    - grade B: The package has some minor recyclability issues but could even potentially feed a closed loop scheme (under specific conditions).
- Limited recyclability (allowed to be placed on the market, EPR fees higher, more stringent admin burden)
    - grade C: The package has some recyclability issues that affect the quality of recyclate.
- Not recyclable (not allowed to be placed on the market)
    - grade D: The package has some significant design issues that highly affect its recyclability.
    - grade E: The package has major design issues that put in jeopardy its recyclability.
    - grade F: The package is not recyclable either because of fundamental design issues or a lack of specific waste stream widely present in the EU.

Packaging that corresponds to recyclability performance grades A and B, is deemed recyclable.

Packaging that corresponds to recyclability performance grades C and D have to be passed through the recyclability assessment at scale (collected, sorted and recycled at scale). This is to determine whether it is recyclable in practice and at scale in the EU.

Packaging that corresponds to the recyclability performance grades E and F shall not be considered recyclable

408 https://recyclass.eu/recyclability/methodology/

The implementation of harmonised fee modulation criteria for EPR schemes based on the DfR criteria established as a part of this measure would be particularly useful in incentivising improvements to packaging design for recycling by providing a financial incentive to progressively move towards better performing packaging types, and away from those that may be ruled off the market in future years.

Recyclability at scale methodology

The **recyclability at scale methodology** will test the compatibility and performance of packaging and its components **in a specific collection, sorting and recycling stream** (i.e., at the Member State or regional level), and it is relevant for the packaging that got grades C and D in the DfR assessment. Therefore, it must:

- test whether the packaging is recyclable at scale and in practice (i.e., as defined through the use of the criteria specified in measure 22a) and
- test the performance of packaging in existing recycling processes (i.e., without significant losses) such that it is turned into secondary material of a sufficient quality to find end market to substitute primary materials. It must therefore prioritise collection/ sorting/ recycling of packaging waste for use in higher quality applications over downcycling.

Finally, an **alert system** could be developed to enable the sharing of information across Member States such that compliance with the 'at scale' criteria (which are set at the EU level) can be assessed and the market monitored more efficiently.

The approach described in this measure (DfR and recyclability at scale) above encourages consideration of the technical compatibility of packaging design features and components with existing recycling systems, in addition to an assessment of the extent to which recycling is achieved in practice.

As envisaged under Measure 22a, an **illustrative (non-comprehensive) negative list of packaging features** will be drawn up to minimise the burden of developing criteria for these types which are widely accepted to be the worst performers or incompatible with standard recycling processes (i.e. requiring specialist recycling facilities). Packaging design features on the negative list would be ruled off the market unless the packaging producer proves packaging effective recyclability via the third-party certification approach. This will allow for quick environmental gains without being too prescriptive as even some "non-recyclable" packaging features might become recyclable through development of new technologies. However, the burden to prove this will be on the packaging producers.

This is a first proposal of a list of features "to be considered" for inclusion in a negative list in an Annex or an Implementing Act. There is currently no evidence that these packaging design features/ materials will not become recyclable by 2030 as considerable efforts are

being made by industry to enable this. Therefore, regular updating of the list will be required. Updates after 2030 are also envisioned to ensure that the relevant developments in packaging design and recycling technologies are accounted for.

PLASTICS

1. Plastic packaging with non-NIR-detectable colours
2. Plastic packaging with sleeves covering >50% of the surface
3. Plastic packaging with additives changing the material density >1g/cm³
4. Multilayer plastic packaging containing layers of aluminium, PET-G, PLA, PVC and PS
5. PVC/PVDC packaging (and labels/sleeves) – potential exemption for pharmaceutical packaging
6. XPS packaging
7. PA barrier layers
8. Non-EuPIA inks and inks that bleed
9. PET packaging with non-water soluble / water releasable adhesives at <65°C
10. Polyolefin packaging with non-water soluble/water releasable adhesives at <40°C.

PAPER/ CARD

1. Paper-based packaging with plastic components that cannot be separated in standard processes
2. Silicone/ wax coatings
3. Insoluble adhesives + hotmelt adhesives with softening point < 68°
4. Mineral oil colours, inks that are on the EuPIA exclusion list
5. Two-sided plastic barrier/ coating/laminates
6. Inks/ decorative elements using PP/PET metallised laminates, PET-metallised film

GLASS

1. Non-packaging glass and infusible materials (i.e. material that does not melt at the same temperature as glass packaging) such as heat-resistant glass (e.g. borosilicate glass), lead crystal, cryolite glass
2. Opaque/ dark colours (black, dark blue)
3. Full surface sleeves and permanently attached/ labels with ultra-adhesive glues
4. Ceramic/ porcelain components e.g., in closures

METALS (ALU/STEEL)

1. PVC labels
2. Aerosol cans with hydrocarbon-based propellants
3. Lead materials

The **DfR rating would be self-assessed by brands and verified by certifiers.** In order to establish a robust, transparent and harmonised set of DfR criteria to be applied in this way across the EU, a secondary legislation will be developed (implementing or delegated act) which will specify the methodology detailing the criteria to be used and the performance levels associated with different ratings of recyclability.

To identify the performance thresholds that should be used to assign a rating within each of these criteria, it is noted that a significant amount of work has already been done (in the form of existing industry-led/ voluntary DfR guidelines that are largely harmonised in approach) and should therefore be drawn upon where appropriate. For some packaging types, these guidelines will need to be updated and expanded, while for others, entirely new criteria/ thresholds will have to be developed and agreed.

Table 45 below provides a summary of a high-level assessment of the current DfR guidelines, and groups them according to the expected level of effort required to harmonise in line with the requirements of this measure:

Table 45. List of packaging categories and status of the DfR guidelines

Implementation effort	Definition	Number of packaging groups
Low	At least one (in most cases, more than one) existing DfR guideline which reflects most, if not all, of the minimum DfR criteria listed above and it would require minimal work for applicability for all EU	16
Medium	At least one DfR guideline but only partially reflecting the DfR criteria and some work would be required	4
High	Either there are no current DfR guidelines, or the existing ones would require significant work	9

To enable the Commission to establish the above-mentioned harmonised set of DfR criteria and ratings, the following three approaches were considered, with pros and cons of each highlighted in Table 46 below:

- Approach 1 - EU technical committee to assist the Commission to adopt existing or develop new DfR criteria by packaging type.
- Approach 2 - Commission to reference existing DfR criteria/ industry-developed criteria that can meet certain minimum requirements, including (but not limited to):
    - Must be aligned with the Commission's methodology, DfR criteria and the recyclability requirements (at scale, rating system, etc.)
    - Must have EU-wide applicability (not based on the collection/ sorting/ recycling system of any member state and not based on one technology)
    - Must have balanced representation of the views of the entire value chain (producers, brands, PROs, sorters, recyclers etc.)
    - Must be updated regularly
    - Must prioritise collection/ sorting/ recycling for use in higher quality applications over downcycling
    - Transparency in the technical methods/ tests used to support the development of the guidelines
- Approach 3 - Development of DfR criteria though CEN standardisation

Table 47. Comparison of three approaches for the development of harmonised DfR guidelines

	Approach 1	**Approach 2**	**Approach 3**
Time	<1 year for existing/ largely harmonised guidelines ~2-3 years for new categories/ with limited harmonisation (e.g. composites, flexibles) Potential to be more time consuming if establishment of TC / expert groups is not straightforward	<1 year largely harmonised guidelines ~3-4 years (uncertain) for packaging types that lack existing guidelines/ cannot meet minimum criteria	~3 years minimum
Cost	High – Technical Committee to be established/	Medium – Technical Committee/ consultant still needed to make assessments (particularly for new /	Medium – Plastic working group already

	maintained	potentially conflicting guidelines)	in place, ongoing for CPA
Risks	Risk of bias/ unbalanced views if TC not established and maintained as representative of industry as a whole	More than one guideline with potentially conflicting criteria/ ratings could meet DfR criteria – internal market risk Risk of inconsistent methodologies for DfR rating applied in existing guidelines - uneven playing field for different packaging types Risk of suboptimal recyclability outcome if guidelines meet DfR criteria but are not developed with maximum technical consensus Risk of regulatory void if no guidelines referenced for a given packaging type in a given period	Time-consuming to establish WGs, develop standards/ update them
Opportunities	High level of dynamism / ability to make regular updates to criteria	More flexibility to industry / member states to develop criteria themselves	Recognised/ trusted process, which to some extent is already ongoing

In the end, a **hybrid approach** has been selected where:

- Approach 1 (technical committees) will be used to formalise the preliminary assessment of DfR criteria. Once established, technical committee (or potentially the Commission's Joint Research Centre (JRC)) will review the extent to which the existing industry led DfR guidelines and criteria have been developed and are harmonised across the EU. The technical committee would update those DfR guidelines classified with implementation effort 'Low' to minimise the time and

cost required to issue the criteria. The technical committee can therefore review and advise how to harmonise the existing DfR guidelines in an agile way. The Commission would then adopt an implementing act.

- Approach 3 (CEN standardisation) could be used for DfR guidelines classified with implementation effort 'Medium' or 'High' and published in the form of harmonised standards.
- It is also noted that there is a small overlap with the ongoing CEN standardisation work within the remit of the CPA's activities, which is developing DfR criteria for the following packaging products: polyolefins flexibles, PS cups, trays and dairy packaging, polyolefins rigids, PET beverage bottles, PET trays and EPS packaging. The scope of this work should be updated to avoid duplication of effort and ensure compatibility with the Commission's approach and packaging categories identified here.

Once the DfR rating criteria have been published, an evaluation tool would be developed to enable self-assessment by brands. At this stage, packaging that achieves the highest DfR rating should be allowed to be placed on the market without further assessment. For example, using an approach that rates packaging within a grading system from A-F (, packaging that achieves an A grade should not need any further assessment, it will be considered as recyclable and will be properly certified. This could be expected, for example, for packaging types that are widely collected, sorted and recycled at scale across the EU and do not include any incompatible components, such as clear PET bottles, aluminium cans, glass bottles without disruptive sleeves, closures, etc.). Packaging that obtains the worst grades (i.e., E, F) should not be allowed to be placed on the market. These packaging types would therefore not have to undergo the recyclability assessment in stage 2 in order to reach this decision and would have the opportunity to change the design of the packaging and/or its components that are not widely compatible with sorting and/or recycling before proceeding.

For packaging that is rated lower than an A grade (e.g. C or D), brands will need to undertake the recyclability assessment at scale.

For this purpose, Member States would need to accredit capable **third-party certification bodies.** In order to do so, **Member State competent authorities** must be identified that apply a harmonised set of criteria to accredit certification bodies and monitor their performance. It is assumed that a standardised process for accreditation of such bodies is already being used by the Commission and will therefore be adopted here. In addition, the following accreditation criteria for certification bodies are initially proposed for inclusion:

Governance. Certification bodies must be able to demonstrate

- Financial stability / insurance
- Legal entity – if part of a legal entity, it must ensure that validity/ independence of its certifications are not compromised
- Free of conflict / independent/ impartial

- Relevant certified management systems in place
- Relevant certified technical expertise / demonstrated past experience / references

Technical criteria. Certification bodies must be able to demonstrate

- Knowledge of material-specific packaging waste management systems in the Member State (collection, sorting and recycling systems, infrastructure and capacity) and the technical challenges associated with recycling the given packaging material/ type in these systems
- Strong connections and a reliable network of experts across the packaging waste management sector in the member state (engagement with key stakeholders at all points of the supply chain)
- Knowledge of packaging materials, design and construction, the physical and functional properties of packaging, its components and features
- Strong connections and a reliable network of experts in the packaging production supply chain (EPR schemes, producers, brands, converters, etc.)

Operational criteria. Certification bodies must be able to demonstrate

- Quality management systems in place to implement the recyclability assessment methodology
- Including evidence of appeal/ conflict resolution processes (e.g., certification or non-certification challenged) to withdraw certification if needed
- Responsibility for the competence / performance of auditors (including evidence of relevant qualifications, training undertaken, communication of updates to methodology etc. etc.)
- Good data gathering/ record keeping
- Mutual recognition of the assessments of other certification bodies

Once accredited, **certification bodies will be responsible** to carry out recyclability assessments for a given Member State. Certification bodies may be accredited to assess recyclability within more than one Member State and for training auditors to monitor. Certification bodies will also be responsible for certifying whether packaging qualifies for the suggested exemptions or not (see below).

Packaging that is positively assessed using this approach (either a verified A rating in DfR stage, or a positive recyclability assessment in at scale stage) will be certified as recyclable and may be placed on the EU market. Recertification would be allowed after a maximum of 3 years to ensure that changes in collection, sorting and recycling systems are being taken into account and that packaging on the market remains recyclable within these systems (although the period of the validity of the certifications will be decided once all the details of this assessment are settled). Further, given that the DfR assessment outcome will be linked to the eco-modulation of EPR fees, recertification gives producers the possibility to lower their EPR fees. Recertification will be required after 10 years.

Member State competent authorities together with producer responsibility organisations and market surveillance authorities will need to monitor compliance. **Spot checks and audits should be carried** out periodically to ensure that packaging products have been assessed accurately.

An alert system could be put in place so that each Member State competent authority can inform others when a particular packaging type has been evaluated, allowing enforcement of the at scale criteria across multiple member states and to alert other Member States when an instance of non-compliance is found (to trigger enforcement). The establishment and coordination of such a system may be arranged by the member state competent authorities.

Harmonised EPR fee modulation criteria on the basis of the DfR assessment should be enabled to provide a consistent market signal and a financial incentive (in addition to the regulatory one) to producers to improve their packaging design. This is also relevant given that updating the DfR criteria will be a time-consuming process relative to the pace of innovation in the packaging market.

Based on the above, therefore, the Commission, possibly with the support of the standardisation body (CEN), will develop the following key features:

1. Negative list of packaging features to be ruled off the market,
2. Harmonised DfR criteria and self-assessment tool for all packaging categories,
3. Harmonised methodology for recyclability at scale assessment, Accreditation criteria for certifiers related to the governance, technical capacity and operational considerations and a defined process to accredit the certifiers

A **clear timeline** must additionally be provided to give producers enough time to implement changes while also adhering to the 2030 deadline for packaging to be recyclable. Years **2027 or 2028** seem reasonable in terms of allowing for implementation and publication of the criteria and methodology, as well as for producers to adopt the new requirements, and enable a review in time for 2030 if need be. In terms of a list of packaging features to be ruled off the market in the form of a negative list, the list should be published before 2025 to enable implementation by then.

The following additional elements should be considered in the implementation and enforcement of the measure:

- DfR criteria should be reviewed at least every 5 years to ensure that they adapt to innovation – to either include further items that are not recyclable or remove other items that may now meet the definition of recyclable packaging as recycling system innovation occurs.
- A risk-based approach could be used to set monitoring/ enforcement requirements described above e.g., as already mentioned above, packaging that is “recyclable”

should not have stringent reporting/ monitoring procedures as compared to packaging that is allowed to be placed on the market but may still pose some recyclability issues.

Exemptions

1. An exemption from undertaking the DfR assessment can be granted if it can be demonstrated (and verified by third party certifiers) that a given type of packaging achieves a recycling rate of 70% in 2030 (the average recycling target set for packaging waste in 2030). It is noted that to qualify for this exemption in the year 2030, the necessary evidence and certification would have had to be obtained by producers by the end of 2029. This could be demonstrated, for example, either through the use of packaging traceability technologies (such as digital watermarking) or through extensive waste sampling. The threshold for this exemption should be revisited if the recycling targets are increased (e.g., in 2035 or 2040).
2. As noted above, packaging that attains the highest rating in the first stage (DfR rating), need not undergo the second-stage recyclability assessment.
3. A further exemption is granted for a maximum period of 5 years for packaging classed as innovative (see definition in measure 22a). It is noted that third party certifiers will be responsible for exerting control over this process, so that it can be ensured that claims of improvements to packaging functioning are suitably justified, and that packaging once identified as being innovative cannot be re-classified as innovative for a further period of 5 years on the basis of marginal changes. Innovative packaging may not be considered recyclable unless it has been explicitly demonstrated to third party certifiers in a DfR assessment process.
4. **Exemptions may need to be provided for specific categories** to ensure that packaging types with specialised functionality are not prevented from being placed on the market without a suitable recyclable alternative in place (e.g., PVC packaging components are included in the negative list except for pharmaceutical packaging applications). Similar exemption might be needed to be set in the case where a packaging unit is not accepted for collection in established separate waste collection systems, e.g. ceramic containers.

9.14.2. Effectiveness

This measure is likely to be **highly effective** as it requires the packaging value chain to work together in identifying routes to not only recycling, but higher quality recycling. The more precise and robust nature of the method to defining "recyclable" packaging would allow detailed consideration of the characteristics of each type of packaging that actually make it recyclable or not. It is therefore anticipated that over time, this measure will result in a reduction in the complexity of packaging materials, including the number of materials and polymers used.

Recycling rates would likely increase above the baseline in some cases, though this relies on corresponding increases in collection and sorting. In addition, the development of clear,

harmonised criteria would remove the possibility of differing interpretations of recyclable packaging across Member States, and could lead to greater harmonisation in collection, sorting and recycling systems across Member States over time.

For packaging types that are more challenging to recycle, it has been estimated, a significant **increase of between 11-20pp in recycling rates relative to the baseline in 2030** may be expected (affecting plastic packaging in particular). In terms of **overall packaging recycling rates, this corresponds to an increase of ~2pp relative to the baseline.**

9.14.3. Ease of implementation

The proposed implementation of the measure has been described above. A key aspect is the hybrid approach for the development of the harmonised mandatory DfR criteria for each packaging type, with some of the work being done via technical committee and the rest via the CEN standardisation procedure. **The development of the mandatory criteria will be particularly challenging** for a small proportion of packaging types on which there is currently no consensus across industry regarding recyclability criteria. To assess the likely ease of implementation of this measure for these packaging types, case study interviews were used. Interviews sought to explore the degree of existing agreement on DfR criteria for these categories, and, consequently, the likely scope of the work still to be done.

Table 48: Ease of Implementation for Case Study Packaging Types

Case Study Packaging Type	Ease of Implementation
Beverage Cartons	Beverage cartons have sat as an anomaly within the broader category of 'paper and board' and there is a need for this product group to have its own DfR guidelines. As the use of laminated paper is growing (e.g., for snack food wrappers) it may be that the guidelines for beverage cartons become more widely applicable. There is strong industry agreement among the main stakeholders on some of the design changes that can support the increased recyclability of beverage cartons and the limits of this approach for this packaging type. Removal of the aluminium layer simplifies the process of separating the recyclable components but is seen as only possible in some product lines. Removing the plastic liner entirely would improve recyclability but is not

	possible or the product loses all functionality.
PET thermoform food trays	A lot of industry time has already been spent on defining the DfR guidelines for PET trays, and there is a high degree of alignment across different guidelines. Clear PET trays that are mono material, with no additional polymers used will deliver the most efficient recycling process and high-quality product. There are four plants in Europe that are running test lines for PET trays, and one of these claims to have overcome earlier problems in low yield. Challenges remain in the agreed approach to coloured PET trays which make up close to half the trays on the market. Some industry players see no reason why most coloured PET trays could not shift to clear versions.[409] However, a large recycler that we interviewed said that their preference is to do additional sorting of coloured from PET at the recycling plant, which gives them greater control over the process, so they see less of a need to insist on a design change in this regard.[410]
Plastic film	There is a need to align different industry DfR guidelines for film. Given the wide range of applications included in this category, industry may make the case for a range of different guidelines to be produced according to application.
Multi-layered flexible packaging	This sector relies strongly on innovation in the layering of multiple polymers in different formulations to improve the functionality and give increased value to end products. Existing design guidelines for flexible plastics focus largely on switching to mono-material formulations.[411]

A further challenge that can be anticipated is the accreditation of sufficient certifiers and auditors to verify and monitor packaging recyclability. Given the large number of varying packaging types currently on the market, there must be suitable capacity in place to undertake assessments without undue delay. This must be taken into account when defining the accreditation process and criteria to be used by Member States. As this

[409] Interview with Petcore on 3rd May 2021
[410] Interview with Faerch on 25th May 2021
[411] Interview with Gualapack on 12th May 2021

measure is only intended to be enforced from 2030, there is some time for the above challenges of implementation to be overcome, particularly as the criteria can be rolled out sequentially, or in a staged manner, and existing recyclability certification bodies can be upskilled and better resourced during this time.

The use of an alert system to enable Member State certification bodies to share knowledge on packaging approvals and potential instances of non-compliance would improve efficiency, not only for Member States but also for producers (see part of Annex 9 on Data & Reporting). This may be implemented by the Member State competent authorities as a required feature of their co-operations under the market surveillance regulation. The results of this cooperation would be reported to the Commission.

In the absence of this system of cooperation, the implementation risks being more challenging, particularly if certification bodies lack mutual recognition and make conflicting assessments.

Finally, it is recommended within this **measure that the criteria should be checked for the need for revision at least every 3-5 years after 2030** to ensure that they adapt to innovation. If a negative list of materials or design elements that hinder recyclability is formed, then it will be necessary to keep this up to date. This may mean adding new items to the negative list or removing some as sorting and recycling infrastructure develops. While the implementation of this aspect will not be as challenging as the establishment of the criteria in the first place, it will require further effort and the dynamism of the measure is somewhat compromised in this regard (i.e., it will be difficult to keep up with rapid changes in packaging design and recycling technologies). Linking the measure to the harmonised eco-modulation of EPR fees (measure 23) would be beneficial.

9.14.4 Administrative burden

Under this measure **the Commission's administrative burden is expected to be considerable**. This relates to the drafting of the legislative proposal comprising EU taxonomy of packaging categories for assessment, the overarching rules of the DfR assessment methodology, and the criteria and procedure for accreditation of certification bodies. The Commission will also need to publish a range of implementing acts and standards setting out EU wide methodology for Design for Recycling rating and recyclability assessment complemented by a negative list of packaging features to be ruled off the market with immediate effect, and Guidelines for the practical implementation of "at scale" requirement.

The Commission will need to regularly update and amend these legislative texts. All these activities will involve consultation of relevant stakeholders. Furthermore, the Commission will need to set up a technical advisory committee comprising an entire packaging value chain and manage its functioning. Decision-making rules and other procedural rules will need to be developed.

Two options developed below for the development of the DfR criteria have been estimated to lead to the following cost:

(1) Technical Committee + CEN hybrid approach (with TCs advising EC on implementing acts for 16 packaging groups with "low" effort and CEN standardisation for the remaining 13 high effort packaging groups €1 million each, with 80% of this (€800 000) being one off costs and 20% (€200 000) being recurring/ maintenance costs)

- One-off costs
    a. 16 packaging groups with 'Low' effort with an average cost of €5,000 per guideline, resulting in annualised (over 10 years) costs of €10,000.
    b. 13 packaging groups with 'Medium' or 'High' effort with an average cost of €800,000 per CEN standard per year, resulting in annualised (over 10 years) of €1.2M

  Recurrent costs
    c. €150,000 per year for the establishment and maintenance of technical committees.
    d. Costs associated with the management centres of the European standardisation bodies ~€200,000
    e. Updates to the DfR rating methodologies are based on the above one-off costs, assuming an average of one update per year, resulting in €220,000 per year.

(2) Pure standardisation approach (with Technical Committee to additionally verify) – assumed high effort DfR criteria groups will cost € 1 million each, low effort will cost €500 000 each, so average cost of €750 000 each, with 80% of this (600 000) being the one-off technical development/ expert cost and 20% (150 000) being recurring/ maintenance costs

  One-off costs
    f. 29 packaging groups with varying effort with an average cost of €600,000 per CEN standard per year, resulting in annualised (over 10 years) costs of ~€2M.
    g. Verification of standards for 29 packaging groups by TCs with an average cost of €10,000 per group, resulting in annualised (over 10 years) of €34,000.

  Recurrent costs
    h. €150,000 per year for the establishment and maintenance of technical committees.
    i. Costs associated with the management centres of the European standardisation bodies ~€150,000
    j. Updates to the DfR rating methodologies are based on the above one-off costs, assuming an average of one update per year, resulting in €220,000 per year.

To sum up, if the DfR criteria are established via a purely CEN standardisation led process and checked by a technical advisory committee (to be established), the estimated annual cost is at EUR 2,555.000 per year over 10 years; if a hybrid approach is adopted where DfR guidelines requiring low effort (approx. 13) are adopted by the Commission (based on assessment of the technical committee) and the more complex guidelines (approx. 16) are developed via CEN standardisation process, the estimated cost is EUR 1,780.000 per year over 10 years.

Member States will have a significant administrative burden related to the enforcement of this measure, due to the need to establish Member State competent authorities, monitoring and enforcing the recyclability requirements in their territories and monitoring the performance of certification bodies and auditors. This has been estimated as an average of 1.5 FTEs per Member State, resulting in recurring costs of €1.8 million. This can be partially reduced by using existing PRO data, existing Member State surveillance authorities and harmonising EPR reporting requirements. Member States will also need to accredit the third-party certification bodies, which has been estimated at an average cost of €17,000, by an average of one certified body per Member State[1], resulting in annualised costs (over 10 years) of €22,000.

Packaging producers will have administrative burden associated with undertaking the two-stage assessment. For example, according to the RecyClass methodology developed by the Plastic Recyclers Europe, 57% of plastic packaging could be repartitioned in classes A, B and C[412] with the remaining 44% having significant or major design issues that highly affect its recyclability or make it unrecyclable.

The administrative burden based on 10-years recertification assumption on the economic operators has been estimated as:

- Time spent in gathering data, completing the first stage (self-assessment) and demonstrating compliance: average of 15 hours per packaging item (SKU), once every 10 years, multiplied by 10M SKUs,[2] resulting in annual costs of ~€385M;
- Cost of the third-party recyclability assessment (second stage) estimated at €750 per SKU, once every 10 years, multiplied by 10M SKUs, resulting in annual costs of €750M.

10M SKUs was used to account for the fact that there will be a large proportion of packaging SKUs that will qualify as equivalent packaging (and therefore not have to

[412] RecyClass methodology: Class A: The package does not pose any recyclability issues and it can potentially feed a closed-loop scheme to be used in the same application. Class B: The package has some minor recyclability issues but could even potentially feed a closed loop scheme. Class C: The package has some recyclability issues that affect the quality of its final recyclate.

undergo the full assessment/ the full cost burden) – the total number of packaging SKUs may well be higher. The same figure was used for the recyclability assessment because there is no reliable estimate of the number of packaging SKUs that will achieve an A rating in the self-assessment stage, and even that those that do achieve an A grade would still have to get this verified through a certification body (albeit at a much lower cost than undertaking the second stage assessment). It is noted that the above unit costs have been estimated assuming that the unit costs associated with recyclability certification at present will reduce due to economies of scale associated with carrying out assessments at the EU level.

Producers seeking exemptions from the assessment (innovative packaging/ packaging that can demonstrate a 70% recycling rate in 2030) will incur costs associated with gathering the evidence necessary to apply for such exemptions and obtaining the necessary verification. They have therefore been included in the estimates above. However, the above estimate of the producers' administrative burden will be lower for producers who are exempt from the stage 2 assessment (if packaging that achieves a high rating in stage 1).

The above costs will be more significant if recyclability assessment data are not shared across Member States via an EU rapid alert system or harmonised reporting thereby requiring producers to undergo assessment as many as 27 times for a given type of packaging.

Additionally, consideration must be given to the fact that the above cost burden of carrying out such assessments is likely to be felt disproportionately by small and medium sized enterprises, relative to their overall revenues and the likely impact in terms of the proportion of packaging placed on the market by them. However, it is assumed that the number of packaging SKUs used by SMEs is much lower and they are potentially using many packaging equivalent SKUs, which would reduce the administrative burden. As described above, packaging that achieves the highest DfR rating should be allowed to be placed on the market without further assessment; thus, SMEs should be encouraged to make use of this approach to avoid incurring in costs of the second stage of the assessment. Additional communication to SMEs regarding the types of packaging that would fall within this category should therefore be undertaken by Member States together with PROs.

Finally, costs will be incurred in **adapting/developing IT infrastructure for data gathering** (e.g., online tool for self-assessment of DfR rating using the Commission's established methodology and criteria), which will be borne by the data collection entities (certification bodies, compliance schemes, PROs, etc.). This has been estimated at an average of €1M per Member State, resulting in annualised costs (over 20 years) of €180,000 for all the EU. It is noted that this cost burden would be significantly lower if a single evaluation tool was developed by the Commission, with certification bodies providing access to the tool and performing the data collection and verification functions.

9.14.5 Economic impacts

The scale of the impacts is expected to be more significant than 22a. Packaging producers will have administrative burden associated with undertaking the two-stage assessment, which is estimated at annual costs of €385 million for first stage (self-assessment) and annual costs of €750 million for the second stage (third-party assessment), if this takes placed every 10 years. The economic impact will lead to EUR 868 million of additional production costs and EUR 172 million of additional costs in waste management, relative to the baseline in 2030. However, these costs are likely to be relatively low compared to an unregulated scenario in which Member States potentially set divergent and possibly conflicting recyclability requirements and criteria for producers to meet, thus fragmenting the internal market. Harmonisation of the criteria and reporting of recyclability thus mitigates against these inefficiencies.

In addition, **given that design changes are an ongoing cost for producers**, and the timescale of implementation of this measure, **these costs may be lower**. The implementation of a negative list by 2025 would not be associated with any additional costs, but rather improve the distribution of the estimated costs over time. This is because instead of waiting for all the DfR criteria to be published and recyclability to be assessed (by 2030), producers would already have clarity in 2025 on which packaging features should no longer be used. This would bring forward their ability to start complying with some of the requirements during the transitionary period between 2025 and 2030. This is also due to the fact that producers will have a clear steer as to where their investment can be best targeted to improve recyclability and compliance with the regulations at the same time. The more detailed economic impacts on the case study packaging types are summarised in Table A10 below.

Producers will also face costs of 'managing change' associated with **changes to their product lines** in response to this measure. This is additional to the **R&D and investment costs** and can be significant depending on the scale of adaptation required.[413]

An additional economic cost due to the diversion of packaging waste from incineration/ residual stream to recycling is estimated in the first few years of implementation. In the longer term, these costs would be offset to some extent by increased efficiency gains (due to lower levels of non-recyclable contamination), recycled material revenues and a reduction in costs required for managing waste in the residual stream. The model shows that, by 2030, the resulting reduction in unit costs of recycling will not be offset by the increase in absolute tonnages recycled; overall, an **additional cost in recycling is therefore anticipated by 2030, equivalent to ~172m€,** which will be passed on to producers in the form of heightened EPR fees.

Additional economic impact of this measure can be found in a CPA analysis of the sorting and recycling infrastructure investment needed to reach the target of 10Mt of plastic recyclates by 2025. They compare two scenarios, one with the development of existing technology and the other with 'design for recycling'. They estimate that to process the additional quantity of recyclables in the 'design for recycling' scenario would cost an

[413] Interview with Danone 6th May

additional 1,600m€, which is made up of an extra 20% on all investment costs plus a 'change' cost of 100m€ to upgrade and modify equipment.[414]

Table 49: Economic Impacts on Case Study Packaging Types

Case Study Packaging Type	Economic Impacts
Beverage Cartons	The additional impact of measure 22b over the changes that could occur under measure 22a are likely to be smaller than for other packaging types. This is because there is **limited scope to make design changes for beverage cartons that will significantly increase their recyclability,** although research is underway. It is currently not possible to remove the plastic layer without losing the functionality of the product, and whilst removing the aluminium layer is acceptable for some applications, the carton will still need to follow the same recycling process with removal of the polyAlu from the fibreboard and recycling into a useable form. Given the limitations of design changes the beverage carton industry is active in investing in the infrastructure needed to process existing cartons. Given these limits, the industry is looking at other ways to increase the scale of recycling of beverage cartons. Looking beyond the challenge of increasing collection, there are two related economic hurdles that the beverage carton industry is facing. Firstly, stimulating the paper recycling industry to invest in specialist equipment that separates the 25% polyAlu material from the paper board. Secondly, there is a need to expand the infrastructure that can process the rejected polyAlu component once it has been aggregated. The beverage carton industry is already funding infrastructure investment and Tetra Pak, Elopak and SIG Combibloc GmBH have invested 8m€ in a new recycling plant in Cologne called 'Palurec' that has been operational since spring 2021. Scaling this up to meet the industry ambition of 90% collection rate and 70% recycling by 2030, then there will need to be additional infrastructure sufficient to process an estimated additional 120kt of polyAlu across Europe. Currently, industry report that in around 37kt of polyAlu is processed in Europe so this will involve a threefold increase in capacity. The recently constructed Palurec plant cost €8M and processes 18kt so this increase in infrastructure could require up to 48m€.

[414] Though this study looked at all uses of plastic the contribution of the packaging sector to the 'untapped potential' is between 73-81%. CPA May 2021 Final Draft copy of 'Roadmap to 10Mt Recycled Content by 2025'.

	The packaging producers are unlikely to meet these costs themselves, as they have already invested in demonstrating the potential of the technology. Hence, they are reliant on the recycling industry finding sufficient value in the material produced to fund this infrastructure development. This measure alone does not create an economic incentive for recyclers but together with any future requirements for mandatory recycled content in beverage cartons, this could stimulate demand for the outputs of this process to be used in a closed loop. **Industry is also calling for separate recycling targets for beverage cartons as distinct from paper and board**.[415] It is difficult to discern the extent to which this measure would create an additional incentive to invest in the beverage carton recycling chain beyond the existing forecast for development.
PET thermoform food trays	Implementing this measure and **mandating the use of DfR guidelines for trays is expected to create a shift from coloured and multi-polymer trays to clear, mono-material PET trays** with around 40% of the coloured trays likely to switch to clear. By 2030, this could mean that 70% of the PET trays in Europe being classified as recyclable.[416] A corresponding **investment would be needed in sorting and recycling infrastructure to process this material** of around 0.7MT. Using the CPA figures for average investment needed per tonne of material this could require an investment of between 1.1 to 1.5m€. Of the 30% of PET trays currently in use for applications where a recyclable option is not seen as viable, a shift to alternative packaging materials/ formats will be required in order to meet the 2030 requirement for all packaging to be recyclable. Depending on the collection approach taken by a Member State, there may be an additional investment need for sorting equipment that can differentiate between PET bottles and trays.
Plastic film	DfR requirements have a large potential to improve the recyclability of post-consumer films. Whilst some mechanical recycling is operational for PE films, the complexity in additional materials used, and the high contamination levels of household films is problematic and restricting growth in this sector. Industry views expressed in the interviews for this IA estimate that by 2030 at best 70% of household films could be in formulations that are acceptable to recyclers.

[415] Interview with ACE on 28th April 2021
[416] Interview with Petcore 3rd May 2021

	Packaging producers have successfully brought to market mono-material versions of the multi polymer layered pouches and state that for some applications there is no loss of functionality. The mono-material versions are typically made from PP for the added strength this offers and are still multi-layered using different formulations of PP for different properties in the layers. Currently, the novel materials for **a mono-material pouch will cost at least 10% more than the raw materials for a multi-polymer pouch presenting a cost barrier** to switching. [417]
Multi-layered flexible packaging	Another interviewee pointed out that the costs incurred with switching to a more recyclable format for flexible packaging can vary greatly depending on the current formulation of the material. One brand indicated that their crisp packets are already mostly PP with a PE layer so that the switch to mono-material is quite straightforward. For other producers reliant on multi-material constructions, including the use of aluminium, the costs of switching to mono-material constructions are likely to be a significant hurdle. It is thought that some industry sectors would choose to hold back from switching their product design on the expectation that chemical recycling techniques will be sufficiently cost effective in ten years to provide an alternative route for recycling.

9.14.6 Environmental impacts

The environmental impacts associated with the changes in production processes and end of life management of packaging described above are summarised in the table below. These are estimated relative to the baseline in 2030.

Table 50. Summary of Environmental impacts for Measure 22b

Summary of Environmental Impacts	
Change in GHGs, thousand tonnes CO_2e	-4,220

[417] Interview with Gualapack 12th May 2021

Change in water use, thousand m^3	-150
Change in GHG +AQ externalities, m€	-930

9.14.7 Social impacts

This measure would result in significant additional employment opportunities relative to the baseline. These will be offset to some extent by job losses at waste incinerators. Overall, it is estimated that **~19 thousand additional FTEs** will be generated because of the measure, relative to the 2030 baseline.

9.14.8. Stakeholder views

Stakeholders appreciated that this route supports high quality recycling and aligns actors across the value chain.[418] Despite the fact that the measure should support the design of cost-effective infrastructure and encourage innovation in this area, stakeholders noted the potential risks to product innovation if the assessment process is too prescriptive.[419] Novel packaging solutions should not be disadvantaged on the basis of small quantities as they could prove to be an optimised solution to a packaging need. [420]The stakeholder views on measure 22a with respect to the definition of "recycled at scale" and "innovative" packaging are also relevant here. In terms of the proposed approach, stakeholders across the board preferred the use of DfR criteria for specific packaging types to assess the recyclability of packaging against the qualitative definition in measure 22a, in place of the use of the 95% threshold proposed in that measure.

Several stakeholders (mostly representative of the fibre-based packaging industry) were opposed to either a 95% threshold, or a DfR based approach, expressing a preference for a measure that considers the overall sustainability of a package rather than focussing on recyclability alone. A key concern is that **DfR is not equivalent to 'eco-design' so the approach does not consider environmental performance** or sustainability. A similar concern was raised regarding potential trade-offs required between product functionality and DfR guidelines. For example, **switching to mono-material flexible packaging could reduce the shelf life** of products which could negatively affect the amount of product going to waste and profit margins.[421]

[418] P30 Appendix D European Commission, 2020, Effectiveness of the Essential Requirements for packaging and packaging waste and proposals for reinforcement available at: https://op.europa.eu/en/publication-detail/-/publication/05a3dace-8378-11ea-bf12-01aa75ed71a1
[419] Ibid.
[420] Interview with Plarabel 20th May 2021
[421] Interview with Gualapack 12th May 2021

However, given the objective of this measure (to ensure that packaging placed on the EU market in 2030 is recyclable), and the challenges associated with developing and implementing a holistic, sustainability-based approach at present, this is considered beyond the scope of the current analysis.

Most other stakeholders consulted were supportive of the DfR approach as the most pragmatic for achieving the desired outcomes, particularly approving of the use of a two-staged approach to assess actual, and not just theoretical, recyclability. For example, it was noted that the recyclability of a container should not rely only on the ability of the consumer to separate the materials, but also efficient separation of waste in a sorting station.[422] This is a consideration that could be accommodated within DfR guidelines. Additionally, it was noted that a risk of "downcycling" exists if technical recyclability alone is assessed (as opposed to recycling performance/ recyclability in existing processes).

Respondents to the online public questionnaire highlighted the **need for harmonised guidance on design for recycling** (DfR) practices. One stakeholder, for example, proposed a "dynamic and regularly updated positive/negative list" that could be developed alongside industry to give clarity. Many participants supported this proposal, and it has therefore been developed further.[423] However, when consulted on the specific packaging features included in the preliminary list, stakeholders in the fire-based packaging industry were opposed to the **use of a negative list** in any form, stating that it does not account for ongoing developments in recycling technologies. Several examples of the ability to recycle packaging with the listed features in specialised plants and using specific technologies at present were cited. However, unless these technologies and infrastructure become available "at scale" by 2030, these packaging features remain incompatible with most of the standard collection, sorting or recycling systems across the EU, and the relevant criteria have therefore been modified, but remain on the list. It is likely that a further review will therefore be needed before the implementation of the negative list in 2025.

Similar feedback was received from representatives of the plastics industry and NGOs, albeit these stakeholders were supportive of the concept of a negative list more generally, making suggestions for the improvement of the criteria instead (which have been considered). It is noted that little or no changes were proposed to the proposed list of criteria for glass and metal packaging.

In terms of the **implementation of the measure**, stakeholders highlighted the need for the DfR criteria to be developed by independent experts that are representative of the entire value chain, which must be considered in the establishment of the technical committees/ CEN standardisation request. Risks associated with a lack of certifying capacity to meet the demands of the entire packaging market were highlighted, and the likely burden associated with auditing. Stakeholders suggested that a high degree of automation should be applied in the data gathering, with sampling for audits such that the largest producers (with the highest market shares of packaging PoM) are monitored more closely/ regularly.

[422] Appendix I - Online Public Consultation Report
[423] Ibid.

Most stakeholders agreed that the proposed exemptions would serve **to reduce administrative burden** overall, with a few highlighting risks associated with the exemption for innovative packaging (for example, if packaging that is still not recyclable after 5 years re-applies for a further exemption on the basis of superficial design changes).

Assessment of measure 22c: Defined quantitatively by minimum recycling rate thresholds

9.15.1. Description of the measure

Under this measure, a quantitative definition of recyclable packaging would be developed based on actual recycling rates within a packaging category or packaging item level basis.

Under this approach, packaging would be considered recyclable if it is recycled over a certain threshold across the EU. An EU-wide approach only is considered as Member State level recycling rates would be highly variable and their use in operationalising such a definition could therefore distort the single market.

A statement such as the following would be included in the legal proposal:

> *"By 2030, packaging items shall be classified as recyclable if the specific recycling rate achieved for the packaging item at the EU level exceeds XX %. If producers provide evidence their packaging meets this threshold in practice and at scale within two years of first being placed on the market, it is deemed to be recyclable."*

The recycling rate would be determined in accordance with the measurement method for recycling in a given year as set out in Article 6a of the PPWD and the corresponding Commission Decision 2005/270/EC as amended in 2019 by Commission Implementing Decision (EU) 2019/665, i.e.,

> *the weight of packaging that has become waste which, having undergone all necessary checking, sorting and other preliminary operations to remove waste materials that are not targeted by the subsequent reprocessing and to ensure high-quality recycling, enters the recycling operation whereby waste materials are actually reprocessed into products, materials or substances.*

This measure was first developed in the preceding Essential Requirements scoping study[424], in which the level of the proposed EU-level recycling rate threshold per item was set at 20%. However, the figure could be adjusted upwards and progressively increased to better align with the increased mandatory recycling rate targets as set for the main

[424] European Commission, 2020, Effectiveness of the Essential Requirements for packaging and packaging waste and proposals for reinforcement available at: https://op.europa.eu/en/publication-detail/-/publication/05a3dace-8378-11ea-bf12-01aa75ed71a1

packaging materials in the PPWD for years 2025 and 2030 as the recycling systems and overall performance becomes increasingly harmonised across the EU.

This approach relies on the capability to calculate recycling rates for specific packaging categories at a much greater level of detail than is currently the case. Extensive waste sampling and reporting requirements would have to be introduced to enable the gathering of data at this level to support the implementation and enforcement of this approach. Alternatively, this approach would require the use of technologies like digital watermarking (measure 27d) to enable the tracing of specific packaging items throughout their lifecycles, though such technologies are currently not yet available at commercial scale. **Once such technologies become widely used, they could be applied to determine the current recycling rate for specific packaging types**, which would limit the need for waste sampling/ testing protocols to innovative packaging types. Alternatively, **exemptions could apply to innovative packaging** to allow sufficient time for a recycling rate to be calculated to determine whether a threshold has been met.

9.15.*2*. Effectiveness

The effectiveness of this approach ultimately **relies on the capability to calculate recycling rates for specific packaging product types**. New technologies being developed could make the production of this data much more cost effective and achievable. **Digital watermarking technology and sensor equipment could be used** to register the number of individual functional units of packaging sorted through sorting plants.

As the technology is not yet fully developed, **this approach is unlikely to be effective within the time period out to 2030** and is therefore not likely to be effective from the perspective of operationalising measure by 2030.

Defining recyclable packaging using format specific recycling rates is clearly measurable and more easily operationalised and enforced at a given point in time than other approaches. It also provides a reasonable amount of flexibility for the packaging industry as it is not a prescriptive 'how' but more a target to work within. The definition is based upon actual performance; therefore, it gives a **clear incentive for investment in recycling systems** to ensure the threshold levels are met.

Accordingly, the measure is likely to have significant impacts relative to the baseline, albeit these will not be realised within the 2030 timeframe. By 2040, on the other hand, recycling rates for packaging types that are currently problematic to recycle and unlikely to be impacted in the baseline could **increase by anywhere between 15-31pp (the most significant increases are expected in plastic packaging) relative to the baseline**. This corresponds to **increase in overall packaging waste recycling rates of ~2-3pp relative to the baseline in the year 2040**.

9.15.3. Ease of implementation

The ease of implementation depends, among others, on the granularity in the packaging categories subject to relevant thresholds.

- **The level of the threshold**: the level of the format specific recycling rate threshold proposed is 20%. More ambitious targets would require extensive analysis.
- **If set for broad packaging categories (and not per item), this measure is unlikely to ensure that all packaging is recyclable** if recycling rate thresholds were set for broader packaging categories. Within such broad categories, a proportion of packaging may be unrecyclable. For example, within the category of PET thermoform trays a threshold level of recycling could be attained quite easily through the scaling up of the trial lines that process mono-material clear trays. Once the threshold for recycling has been attained, there is no incentive for the complex constructions of trays that are difficult to recycle to adapt. Therefore, more granular data is needed.
- **There is lack of data and technology is still under development**. The alternative to improved traceability of specific packaging types would involve widespread sampling of waste in order to facilitate monitoring and enforcement against the measure and would be prohibitively costly, especially for SMEs.

9.15.4. Administrative burden

Implementation of this measure would generate significant administrative cost. The Commission will have **administrative cost to develop the framework in a legal text.** The challenge will be related to producing the necessary data relative to the baseline, data on average unit weights, and data on the weight of packaging recycled by category.

Unless discreet recycling systems are used (e.g., a deposit refund system for beverage containers), or new innovative digital watermarking technology is mandated for all packaging, it is likely that detailed analysis of the composition of recycling streams would be required.

Recycling industry will bear a significant burden with the sampling surveys that would need to be carried out. However, these could be funded by those responsible for proving compliance, i.e., the producers. The overall administrative burden is expected to be high.

If this measure is aligned with EPR fee modulation by recycling rate (as in Measure 23), it could be less burdensome.

9.15.5. Economic impacts

The alignment of the definition of packaging that is recyclable with actual levels of recycling attained by a specific packaging type would allow for a high degree of efficiency in both packaging production processes and the development of recycling capacity to meet these thresholds. It would give a clear signal to stakeholders and confidence to investors regarding the need for additional investment in specific products and technologies.

Given the high degree of effectiveness associated with this measure, additional costs associated with the packaging design changes and increased recycling levels discussed above would be anticipated relative to the baseline (though in a longer timeframe than the 2030 period of interest). **Relative to the baseline in the year 2040, additional net costs of packaging production are estimated to be of the order ~1,600m€**.

While the overall increase in the tonnage of packaging waste diverted to recycling is expected to increase the costs of recycling in early years, the significant improvements in packaging design that are expected to accompany this measure will reduce the per unit costs of recycling. This is expected to be due to a significant reduction in contamination, sorting losses, and increased revenue associated with higher quality material outputs. Overall, the increase in the absolute tonnages recycled is estimated to result **in overall extra costs of ~49m€ for sorting and recycling relative to the baseline in 2040**, which will be passed on to producers in the form of higher EPR fees to cover the costs of end-of-life management of their packaging.

9.15.6. Social impacts

Given the impact that this measure is expected to have on improving production processes for packaging (i.e. incentivising producers to make packaging recyclable) and its direct link to increased recycling levels, additional employment benefits are anticipated relative to the baseline, albeit these impacts are unlikely to be felt within the 2030 timeline.

In the longer term (i.e. in the year 2040), an **increase in employment benefits equivalent to as many as ~36 thousand FTEs is anticipated** in the CBA model, with the majority of these (circa 23 000) arising due to the diversion of waste from incineration and landfill to recycling (which is more employment intensive). The remaining impacts relative to the baseline (circa 13 000 FTEs) are estimated to arise due to improvements in packaging production processes, switches to different packaging formats and materials, and increased R&D in the production phase to ensure the thresholds can be met. It is assumed that as the thresholds increase over time, so do these impacts.

9.15.7. Environmental impacts

Should the measure become feasible, which is assumed by 2040, **significant environmental impacts are estimated**, as shown in the table below. These are associated largely with the diversion of waste from incineration and landfill to the recycling stream.

Table 51. Summary of Environmental Impacts for Measure 22c

Summary of Environmental Impacts in 2040 relative to baseline	
Change in GHGs, thousand tonnes CO_2e	-8,300
Change in water use, thousand m^3	-287
Change in GHG + AQ externalities, m€	-2,500

9.15.8. Stakeholder views

Stakeholders were **supportive of this measure**, recognising the clarity it offers and the potential for enforceability should the data and monitoring systems be in place. However, they noted that would be merit in introducing this approach only from 2030 onwards, following the implementation of the DfR approach in measure 22b, so that the criteria for recyclability will have already been harmonised.

Stakeholders also expressed some concern over the challenge of agreeing and setting the threshold levels. In addition, it was pointed out that a quantitative metric does not take quality into account.

Summary and conclusion

When set alongside each other, each measure presents its own advantages and drawbacks:

- The **qualitative definition would set the basic principles of recyclability and is flexible** enough so as not to hamper innovation. However, as a measure used in isolation, it is difficult to implement. There is much room for different

interpretation across Member States and, overall, a qualitative definition lacks the enforceability of other approaches (and as the existing situation exemplifies, enforceability of criteria is key).

- The **DfR approach provides a clearer system for defining 'recyclable**' packaging and supports high-quality recycling. There is an associated administrative burden that arises from implementing this measure, but this can be seen as a reflection of the high degree of complexity that currently exists in the design of packaging.
- **Using recycling rates to define a threshold for packaging that can be considered recyclable** would – subject to data being available - be clearly enforceable and flexible enough to respond to market and technological changes, if thresholds were updated accordingly. At present, however, there is a lack of data at the level of granularity needed to implement this method. Although technologies such as digital watermarking have significant potential in addressing these knowledge gaps, they are currently in their infancy, and cannot be relied upon as a basis for regulation at this moment in time.
- **A combined approach is therefore most appropriate, using a qualitative definition to provide underpinning principles for what constitutes recyclable packaging**, operationalised by 2030 using a DfR approach, that in turn allows for the gathering of data to enable re-consideration of the recycling rate threshold approach to be implemented beyond 2030 (potentially from 2040 onwards). DfR approach will bring about consistent, harmonised, data on the key design features of packaging at a greater level of granularity, and how these relate to both theoretical and actual recycling. This will enable identification of an appropriate level of granularity at which recycling rate threshold should be identified and an understanding of the factors that will affect these thresholds.

Measure 23: Harmonisation of EPR Fee Modulation Criteria

Extended Producer Responsibility (EPR) involves giving producers responsibility for the cost of recovery for the packaging they place on the market with fees typically based on the weight of packaging placed on the market. When subject to EPR, producers often work together through Producer Responsibility Organisations (PROs) to deliver their requirements (collective EPR schemes).

In the future, the fees in collective EPR fees will need to be modulated according to certain sustainability criteria, including – but not limited to – packaging recyclability.

Assigning such financial responsibility to producers provides incentives to prevent wastes at the source and to promote better product design for better recycling.

However, when expressed in terms of the costs per item of packaging, the current costs of EPR fees are rather low and not of the scale to encourage producers to change their choice of packaging, or move to different business models, such as those based on reuse and refill. This is exacerbated in the case of plastic packaging, where despite tonnage-based fees

being higher than for other materials, the lower package weights in comparison to packaging made from other materials leads to a very low cost per item of plastic packaging.

This problem can be addressed if the criteria for such modulation are effectively targeting the core issues and applied consistently across all Member States.

EPR schemes shall be established for all packaging in accordance with Articles 8 and 8a of the Waste Framework Directive by end of 2024 at the latest (see Art. 7 PPWD), and the existing schemes that have been established before 4 July 2018 shall be made compliant with these provisions by 5 January 2023.

At present, all EU Member States that have EPR schemes for packaging waste have some basic differentiation in fee structure already in place. In many cases, fee modulation, if already in place, is based on a range of criteria and different design characteristics, which are not always associated with packaging recyclability or reuse.

This dilutes the price signals to producers and brands regarding preferred design characteristics for recycling, potentially distorting the single market if a criterion is deemed desirable in one Member State but not others.

9.15.1. Description of the measure

The objective of this measure is the smooth functioning of the internal market in packaging production and recycling with increased consistency of incentives across Member States.

Measure 23 is proposed to be implemented with adoption of an implementing act that will address the harmonisation of fee modulation criteria. Namely, the incentive for producers to shift to recyclable packaging design achieved by a certain level of fee modulation can be maximised if consistently applied across all Member States, using legally binding harmonised criteria for fee modulation.

As the measure is aimed only at the harmonisation of criteria, it would not harmonise the actual fees (since the fees are set at country level and are subject to the local context) that is, the magnitude of the modulation. Accordingly, while the magnitude of the modulation (relative to the base fee structure that is reliant on the net costs of recycling each format) might differ between Member States, the direction of the modulation would be consistent across the EU.

The harmonised **design for recycling (DfR) requirements** as described in measure 22b could provide an appropriate basis for the modulation criteria in terms of 'operationalising', since it lends itself well to determining which types of design would incur a penalty (*malus*), which would be on the standard fee, and which would be eligible for a *bonus*. In addition, **promotion of reusable packaging** could be also one of the criteria.

Further detail on the design of this measure has been extensively researched in a study on EPR guidance[425].

An alternative basis for modulation could be recycling rate threshold per packaging item, as suggested in measure 22c, but this may reduce the overall impact of the measure by preferring those packaging types for which recycling infrastructure is already the most advanced. This could hamper packaging and recycling innovations, despite producing efficient results based on existing technologies and infrastructure.

Once the measure has been implemented, EPR fees can be more easily changed by the PRO (e.g. fee value changed every year) to respond to the rapid developments in the packaging design and recycling sectors. In this context, following the initial implementation of harmonised EPR fee modulation criteria for recyclable packaging in an implementing act, the EPR fee mechanism acts as an **ongoing dynamic incentive for improved packaging design** which is flexible and more responsive than regular and ongoing updates to legal instruments.

9.15.2. Effectiveness

In term of effectiveness, this measure is likely to make the attainment of the recycling targets in the baseline more efficient and cost effective. This is because **the harmonisation of EPR fee modulation criteria for recyclable packaging acts as an ongoing dynamic incentive for improved packaging design** which is needed to meet the target. Indeed, the same target can be met at a lower cost/ in a reduced timeframe. At the same time, the harmonised EPR fee modulation criteria could be used to **promote reusable packaging**.

In addition, the implementing act could include provisions related to the harmonisation of packaging reporting formats and frequencies, and of fee categories, with the anticipated effect of:

[425] Study to support preparation of the Commission's guidance for extended producer responsibility scheme - Publications Office of the EU (europa.eu)

1. Improving data;
2. Reducing administrative burden; and
3. Increasing the potential for reducing confusion among importers, identifying and thus tackling both intentional and inadvertent free riding.

However, these should be seen as unintended consequences of the measure and not the rationale for the measure as the efficacy of the policy instrument is improved by retaining a single focus, rather than multiple objectives.

The effectiveness of the measure in **providing an economic incentive to producers to invest in switching design choices and material choices to favour recyclable packaging** is strengthened if implemented alongside measure 22b which would identify which types of design would incur a penalty (*malus*), which would be on the standard fee, and which would be eligible for a *bonus*.

In addition, linking between Measure 22b and 23 would ensure that those packaging types that are not sufficiently incentivised by EPR fee modulation to improve recyclability would still be subject to mandatory DfR criteria and would therefore be ruled off the market in the absence of improvements.

Similarly, linking this measure to Measure 10b and 10c, which is aimed at promoting reusable packaging formats and reuse packaging systems, will further incentivise them.

9.15.3. Ease of implementation

Producers often work together through **Producer Responsibility Organisations (PROs)** to deliver their requirements. As such from the perspective of Member States, this is likely to be straightforward to implement as **PROs already collect much of the data required to operationalise the measure** and would play a **key role in monitoring**. The harmonisation of the criteria and approach also removes the need for each Member State to develop its own system, potentially creating barriers to the internal market, and reduces cost and administrative burden of economic operators. Furthermore, this measure would give clear signals to the economic operators in terms of design of packaging across the internal market and stimulate innovation in coherent manner.

Design for recycling criteria for several packaging types have already been developed and are in use by industry, with broad agreement on the majority of these across stakeholders. Harmonisation of the fee modulation in EPR schemes on this basis should therefore be possible for these packaging types, while for others it will have to be developed. In the absence of measure 22b to harmonise and make mandatory the

packaging categories, criteria, and evaluation procedures, this is likely to be challenging to implement.

In addition, further work will be necessary to **ensure that differing interpretations do not arise on the packaging categories.**

9.15.4. Administrative burden

As fee modulation is already required to be implemented by **Member States**, and this is foreseen in the baseline, the additional administrative burden associated with this measure is limited to the development of a legal instrument, in the form of an implementing act, and on agreeing the criteria for modulation.

Some additional burden on **PROs and packaging producers** in increased data management and reporting to Member States is possible, depending on the granularity of the criteria, which will be developed. However, given that fee modulation is already foreseen, the overall burden may be reduced relative to the baseline.

9.15.5. Economic impacts

The economic impacts of this measure are anticipated to largely affect producers of packaging, though some additional impact is anticipated for other stakeholders as described below.

1. For the **Commission** and the **Member States** there would be administrative cost as described in the preceding section.
2. **Packaging Producers -** the clear, consistent economic incentive for producers to improve the design of their packaging in order to avoid higher EPR fees is most likely to arise among producers of products for which the relative cost of packaging to product is higher (as the modulation of packaging EPR fees will have a greater impact on the cost of the product overall in these cases). Additionally, impacts will be felt by producers of packaging types with several substitutes i.e., for which the functionality of the packaging can be easily replicated (and therefore the value of the product is not compromised). Since fees will be modulated consistently across the EU, producers of the least recyclable forms of packaging will effectively subsidise the end-of-life costs of those with the most recyclable forms of packaging (such that the overall costs of the system are covered). The consistent application of criteria for fee modulation across the EU is anticipated to make the attainment of targets more cost-effective since design features that hamper recycling / reduce the quality of recyclate would be consistently disincentivised, allowing unit costs of recycling to reduce at a more rapid rate than in the baseline scenario.

3. **Recycling Industry -** The harmonisation of the criteria for fee modulation is expected to indirectly allow for greater consistency in the scope of investments in collection, sorting and recycling infrastructure across the EU in the longer term, particularly if implemented alongside measure 22b. However, **the scale of such investment relative to the baseline is not clear at present** and will rely on the extent to which this economic incentive will affect specific formats.

9.15.6. Environmental impacts

The environmental impacts of this measure are expected to be **positive** as they will contribute to minimising the negative environmental impacts of packaging waste management and help attain the compliance with prescribed recycling rates.

9.15.7. Social impacts

The employment impacts associated with this measure depend on the extent to which packaging production processes and materials change as a result of producers avoiding higher EPR fees. Increased volumes of waste recycling are expected to result in some additional jobs in the recycling industry, which may be offset to a lesser degree by losses in incineration and landfill facilities. The CBA model estimates **a net job creation of around 5,700 FTEs relative to the baseline in 2030**.

9.15.8. Stakeholder views

Stakeholders welcomed a coordinated approach to EPR fee modulation that is linked to the Essential Requirements**.** Such opinions were consistently expressed already in the previous study on Effectiveness of the Essential Requirements for packaging and packaging waste and proposal for reinforcement[426].

Workshop participants raised the point that the Essential Requirements related to **p**ackaging recyclability and the modulation of fees under EPR schemes are two sides of the same coin so there needs to be a co-ordinated approach and harmonised definitions.

In the interviews for this IA stakeholders were strongly supportive of the need to harmonise EPR fee modulation criteria in accordance with the other measures proposed (notably measure 22b). They expressed that EPR is seen as the economic tool that can

[426] Effectiveness of the essential requirements for packaging and packaging waste and proposals for reinforcement - Publications Office of the EU (europa.eu) (https://op.europa.eu/en/publication-detail/-/publication/05a3dace-8378-11ea-bf12-01aa75ed71a1)

drive industry to develop in a direction that is aligned to the Essential Requirements and that without harmonisation the market would remain fragmented and localised. Some concerns arise where existing schemes use EPR modulation to incentivise recycled content (France and Germany) as these already well functioning schemes will need to adapt.

Measures discarded and not analysed in depth

The measures that are included in this Impact Assessment are the result of an extensive screening process. Based on a preliminary assessment some measures were discarded in early stage because they were considered to not meet one of the core criteria related to effectiveness, efficiency, fairness, policy coherence.

Measure 22: Defining recyclable packaging Sub-measure 22d: Industry led voluntary design for recycling (DfR) approach

An industry led approach to implementing a design for recycling approach to defining recyclability of packaging was explored as an alternative to Measure 22b.

To support the successful implementation of voluntary industry standards, it is important to include a clear regulatory backstop in the PPWD to ensure they are robust enough and fit for purpose.

The review of suitability of the voluntary standards will be conducted by the Commission taking the following elements into account:

- Firstly, the extent to which the current industry recyclability guidelines have been taken into account (i.e. how much of the 'red' listed items from the current guidelines, such as Recyclass, are included in the standards);
- Secondly, the degree to which cross-value chain agreement has been reached;
- Thirdly, the extent to which the standard drives high-quality recycling and an increase in recycling rates of the various packaging items covered; and
- Finally, assess visibility and use of the standards in practice – and in particular, whether practices are changing at a sufficient rate that would bring the sector on track to achieving the requirement for all packaging to be recyclable [or reusable] by 2030.

However, given the requirement for packaging to be recyclable by 2030, there is a significant risk that this measure is inadequate in terms of timely meeting this objective. The voluntary nature of the measure is flawed in terms of providing a binding definition for packaging recyclability and risks compromising the smooth functioning of the single

market. Hence, this measure was not developed further for inclusion in the Impact Assessment.

Measure 24: Defining high quality recycling

There is considerable interest in ensuring that the recycling process delivers the best environmental outcomes, in terms of quality of material recycled, and the use to which the material is put. As such, high quality secondary raw materials produced are suitable for use in product applications with more demanding requirements, in line with the circular economy objectives.

High quality recycling could be defined relative to the greenhouse gas savings of an application made from recycled materials, for which the recycling is accessible at commercial scale. More detail on a possible definition of 'quality of recycling' and an assessment framework to operationalise this definition is provided in the JRC report "Quality of recycling: Towards an operational definition",[427] Which states that:

"An operational definition for the quality of recycling should be one that supports the circular economy by helping to identify the features of 'quality' or 'value' that can and should be protected during sorting and recycling processes. This aims to maximise the material kept in the inner circular loops. It should be acknowledged that some degree of leakage to outer cycles via other forms of recovery, or to disposal, is always likely."

However, as noted in the report, the implementation of such a **measure is not feasible at present** in the absence of additional analyses of recycling value chains and data on material quality requirements. Further, given that such a definition would need to incorporate considerations of material applications beyond packaging, it would be more effective if implemented as a horizontal intervention beyond the PPWD. As such the measure has not been developed further for impact assessment.

Measure 25: Reducing packaging material complexity

The Circular Economy action Plan (CEAP)[428] requires the Commission to review PPWD with a focus on *"considering reducing the complexity of packaging materials, including the number of materials and polymers used"*. **Reducing the complexity of packaging design would enable increased recycling of packaging**, particularly for multi-layer plastics and packaging with multiple components made of different materials. This could

[427] https://publications.jrc.ec.europa.eu/repository/handle/JRC122293
[428] EUR-Lex - 52020DC0098 - EN - EUR-Lex (europa.eu)

include **restrictions on the use of certain materials in specific applications** or on the use of more than one material in certain applications. Alternatively, requirements for certain packaging applications to be manufactured using only certain approved materials could also be implemented.

This measure overlaps significantly with Measure 22b, which would include material complexity as a criterion to be considered in determining whether packaging is recyclable or not as part of the design for recycling approach. In most cases, material complexity needs to be considered alongside other aspects of packaging design to determine whether packaging is recyclable or not, and so preference is given to Measure 22b. Introducing such restrictions and requirements for only some packaging items is likely to be less cost effective with a higher risk of unintended market consequences. This is the resulting shifts to alternative packaging types and materials, including the development of new packaging materials and types, and impacts on the functionality of packaging and the flexibility of the market cannot be anticipated and controlled for. As such the measure has not been developed further for impact assessment in this study.

Measure 26: Updates to recycling targets

This measure is about an uplift in the recycling targets in Article 6(1), to ensure that there is sufficient incentive for packaging to not just be designed to be recycled, but to be actually collected and directed to recycling systems.

This is related to the fact that the requirement for all packaging to be recyclable by 2030 implies an increase in the volume and quality of recyclable waste packaging material available. At the same time, improvements in collection, sorting and recycling capacity are anticipated, with EPR cost coverage and possible additional funding via the unprecedented Recovery and Resilience Facility, for the Member States that choose to use RRF funding for waste collection, sorting and recycling infrastructure measures. An increase in the recycling targets is therefore likely to be justified for the year 2035, and to a lesser extent for year 2030, for which existing recycling targets have been set in the previous revision of the PPWD in 2018 (in Article 6(1)(h) and 6(1)(i) PPWD). Several variants are explored below.

Measure 26a: Updates to existing recycling targets (2030)

It is noted that a revision of the recycling targets for packaging waste is already provided for in Article 6(1c) “with a view to maintaining or, if appropriate, increasing them”. It may be appropriate to include this revision within the current proposals in order to:

- Provide an incentive for those materials that currently have relatively low recycling rates compared to others in the dominant material category (e.g., aluminium foils compared to aluminium cans, or liquid packaging board compared to paper/cardboard as a whole) and consequently suppress higher recycling rates for the broader material category.
- Encourage further uptake of recycled content among those packaging materials for which supply, rather than demand, for secondary materials has been identified as a barrier (see Problem Definition).

The following proposals are considered suitable within this timeframe:

- **A separate recycling target for liquid packaging board** (e.g., used in food and beverage cartons) should be introduced
  - The target should be set at a level that ensures a level playing field with other materials that are commonly used in similar applications (e.g., plastic bottles, glass bottles, aluminium cans).
  - Industry has already committed to ensuring that "90% of all beverage cartons are collected for recycling and at least 70% of all beverage cartons are recycled" by 2030.[429]
  - This bears further consideration from the perspective of Commission Implementing Decision (EU) 2019/665 on the rules for the calculation, verification and reporting of recycling data, which states that "composite packaging and other packaging composed of more than one material shall be calculated and reported per material contained in the packaging". This means, for example, that beverage cartons are reported within the paper/board category rather than within their own category.
- **The recycling target for aluminium should be increased** (e.g., to 80%)
  - Industry reported that the average recycling rate for aluminium cans in the EU (76.1% in 2018)[430] is already significantly higher than the existing target (60% by 2030). A more ambitious target for recycling of aluminium cans (e.g., up to 80% to align with the ferrous metals target) would therefore be justified.
  - Despite the inclusion of aluminium recovered from incinerator bottom ash in the recycling target, the recycling performance of aluminium foils (including the aluminium fraction of multilayer/ composite packaging) is comparatively poor. The target may therefore need to be separated into aluminium rigids vs foils (with a relatively high target for the former) instead of increased to ensure that sufficient incentives are in place to improve collection, sorting and recycling of both fractions.
- **The recycling target for plastic should be subdivided** to better influence the wide variations in recycling performance of different types of plastic packaging. Flexible packaging (including the plastic fraction of multilayer/ composite packaging) tends to be collected and recycled at comparatively lower levels than rigid counterparts.

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[429] ACE (2021), *The Beverage Carton Roadmap to 2030 and Beyond* at https://www.beveragecarton.eu/wp-content/uploads/2021/03/The-Beverage-Carton-Roadmap-to-2030-1.pdf

[430] European Aluminium/ Metal Packaging Europe, *Towards 100% Real Recycling by 2030: An Ambitious Recycling Roadmap for the Aluminium Beverage Can* https://www.canroadmap2030.eu/CanRoadmap2030.pdf

The current performance of the sector is projected to change significantly over the next decade. In addition, Member States are still implementing the 2018 revision of the PPWD including as regards reaching the intermediate targets for 2025. For these reasons, revisions to the 2030 targets as a measure to improve the recycling of packaging have not been developed further for impact assessment in this study.

Measure 26b: Proposal for increased recycling targets in 2035

The changes to the recycling targets could also be considered for the future, that is, in the context of future recycling targets for year 2035. Given this increased timeframe, additional proposals that could be considered include:

The overall packaging recycling target should be increased (e.g., from 70% by 2030 to 80% by 2035).

- **The proposed increase to the aluminium targets in Measure 26a above could be made more ambitious** (e.g., from 60% by 2030 to 85% in 2035). The alternative (separate targets for aluminium rigids vs foils) could similarly be made more ambitious.
- **The plastic recycling target could be increased** (e.g., from 55% by 2030 to 65% by 2035). The alternative proposed in Measure 26a above (separate targets for plastic rigids vs films and flexibles) could similarly be made more ambitious.
- **The introduction of a new category for liquid packaging board as described in Measure 26a above could be considered** accompanied by a more ambitious target.
- **The recycling target for glass should be increased**
- Subdivision of existing targets by colour of glass (white, amber, green) to encourage separate collection, more targeted sorting and improved quality could also be considered
- A significant **increase in the recycling target for wood** should be considered in light of the requirement for all packaging to be recyclable by 2030 (including reusable packaging, such as wooden pallets, as per measures 21a and 21b)
- The **recycling targets for ferrous metals and paper/ cardboard could also potentially be increased** further, noting however that these are already relatively high, and that there is a limit to how much more recycling could and should be required.

The feasibility of these proposals relies heavily on the implementation of the 2018 revision to the PPWD and a full assessment would be needed to assess feasibility, for which the necessary data are not yet available.

However, given the ambitious commitments of the Commission, industry and Member States, a new package of targets for the year 2035 is justified also in order to give a clear signal of the Commission's continued commitment to increasing the recycling of

packaging waste. This revision is currently mandated in Article 6(1c) PPWD for year 2024 and will be included for consideration and assessment in any future revisions of this legislative text.

INTERVENTION AREA ON RECYCLABILITY AND COMPOSTABLE

9.16 Introduction

This intervention area analyses several issues related to compostable packaging, focussing on the use of **biobased and compostable plastic packaging alongside more conventional fossil-based plastics.** Conventional plastic packaging risks to contaminate compostable plastics used to be collected along with organic waste due to potential **confusion about the correct disposal** of conventional plastic packaging for similarities in appearance despite the clear labelling for compostable plastic bags. Key issues identified are the following:

- Possible improvement of the standard EN 13432. This standard is meant to satisfy the requirements set out in Annex II of the PPWD, that packaging intended for composting should be "of such a biodegradable nature that it does not hinder the separate collection and the composting process", while biodegradable packaging should be "capable of undergoing physical, chemical, thermal or biological decomposition", producing "carbon dioxide, biomass and water". The PPWD as revised in 2018 strengthened the language slightly by requiring that the compostable packaging "does not hinder" the separate collection and composting process rather than indicating that it "should not hinder" the process. The European Commission's Fitness Check of five Waste Stream Directives noted that Annex II of the PPWD (the Essential Requirements) could create confusion by **not clearly differentiating between compostability and biodegradability**.
- The use of conventional plastic materials in packaging applications in which compostable plastics are already widely in use is leading to **confusion between compostable plastic packaging (in industrial facilities or at home) and biodegradable plastic packaging** in the open environment, potentially leading to more littering and contamination of both types of collection system**.**
- There is **no harmonisation of labelling practices** across Member States with respect to the **labelling used on compostable plastics for packaging, contributing to users' confusion** and increasing the risk for contamination of waste systems.
- Important divergences of practices between Member States.

<u>Measures discarded and not analysed in depth</u>

None.

<u>Measures analysed in depth but not carried forward to the options table</u>

- Measure 29c: Ban on all compostable plastic applications where these do not meet the Recyclability Criteria

- Measure 30: Harmonised labelling for compostable plastics

Measures analysed in depth and included in the options table

- Measure 28: Updates of Essential Requirements and EN 13432 clarifying biodegradability and compostability concepts
- Measure 29: Criteria prioritising applications for compostable plastics
    - Measure 29a: Allowing both compostable and/or conventional plastics for selected packaging types
    - Measure 29b: Mandating compostable packaging for specific applications
    - Measure 29d: Mandatory compostability for all selected plastics packaging types and for the remaining ones compostable or conventional plastics possible

Measures analysed in depth and included in the options table

Measure 28: Updates to Standard EN 13432

This measure would contribute to address the following issues in the **Standard EN 13432** on "Packaging requirements for packaging recoverable through composting and biodegradation", meant to satisfy the Essential Requirements related to biodegradability and compostability:

- The difference **between compostability and biodegradability**, as defined in EN 13432, **is not sufficiently clear**.
- The standard **does not consider the current conditions of biodegradation and composting processes** in Member States biowaste treatment facilities. For example, it guarantees full biodegradability only if the conditions for laboratory tests are present, which is not always the case in industrial composting plants (nor in domestic composting processes).

Partially because of these issues, compostable packaging causes operational problems with **industrial composting** processes in several Member States, as such packaging does not degrade in a timely fashion within such processes.

Similarly, these issues cause problems in **domestic composting**, although, due to the very large variation in the practices taking place within domestic composting piles and the variability in environmental conditions affecting biodegradation, it is felt to be too challenging to come up with a pan-European standard to ensure compostable plastics degrade in home composting piles across the continent.

Thus measure 28 focuses on updates to Standard EN 13432 relevant to improving industrial composting processes, while **issues** arising from the placement of compostable plastic packaging items **in home composting** are tackled through improvements in labelling, discussed **under measure 30**: Harmonised labelling for compostable plastics.

9.16.1. Description of the measure

This measure would entail an update to the **Standard EN 13432**. It will require to improve the definitions by **specifying concepts of biodegradability and compostability**, and **ensuring actual composting conditions** currently occurring **within European biowaste treatment facilities are considered.**

The measure aims at reducing the likelihood that compostable packaging causes operational problems with organic treatment systems and issues in the environment in general resulting from poorer compost quality in different Member States, by ensuring that such packaging degrades in a timely fashion within such processes.

It is recommended **to remove the reference to the concept of biodegradable packaging in Annex II of the Essential Requirements**, except where this is incorporated within the context of the definition of compostable packaging. This could be achieved by changing the instances of the word "biodegradable" to compostable in paragraph 3(c) and removing paragraph 3(d). In this way, greater specificity is given to the term "biodegradable" – with more clearly defined conditions under which the packaging is biodegradable (i.e., within an industrial composting facility).

As for the Standard EN 13432, issues to address, to reflect current actual conditions in biowaste treatment facilities, include the lack of post-anaerobic digestion stabilisation stage in most facilities of some countries, reduced maturation period applied in some countries and tighter national standards for levels of visual contamination than those currently incorporated into EN 13432. The review could also consider aligning the standard with other similar standards developed since EN 13432 was first published.

9.16.2. Effectiveness

Improved clarity of the definitions will make it less likely that compostable plastics will cause operational problems with organic treatment systems and issues in the environment in general otherwise resulting from poorer compost quality. This will also lead to an increase in organic recycling rates by reducing contamination rates at biowaste treatment facilities. The increase in organic recycling is anticipated, in turn, to lead to greater compost production. It will also build confidence in the use of compostable polymers and support greater acceptance of compostable plastic products at organics recycling facilities.

However, the reduction of contamination strongly **depends on how food waste management will evolve in the short and medium** and on the harmonisation and coordination between standards and treatment systems.

9.16.3 Ease of implementation

This measure will require the **CEN technical committee CEN/TC 261** which **has already been reconvened** to commence the review and implementation of the Standard.

Given the links between the Standard and the Essential Requirements the **Commission should be consulted on updates to the Standard** by the Committee. Input should also be sought from the European Composting Network and NGOs.

Further, this measure could also bring the standard into alignment with other collection systems taking place within the **Circular Economy Action Plan**. As such the Commission will produce a Communication on Biobased, biodegradable and compostable plastics in 2022, the content of which should also be considered within any updates.

In general, the implementation of updates to the standard is likely to be easier if efforts are made to **harmonise collection and treatment systems** for biowaste across Member States.

9.16.4 Administrative burden

Since updates to the Standard have already commenced, **administrative burden associated to the measure** (e.g. work of CEN technical committee CEN/TC 261 responsible for standards in the field of packaging**) is considered negligible**. Further burden could arise in case the update to the Standard does not align with the Commission's needs. Nevertheless, this situation could be avoided if the Commission is consulted as stakeholder.

The European Commission has to act in order to clarify the differences between compostability and biodegradability in Annex II the PPWD (the Essential Requirements).

9.16.5 Economic impacts

The direct economic impacts of this measure could not be quantified due to uncertainties surrounding future development of biowaste treatment industry and compostable polymers market.

However, **reduction in waste management costs are estimated to be €11 per tonne of contamination removed at biowaste treatment facilities**; this excludes the cost of subsequent residual treatment (incineration costs in the CBA model are on average around €100 per tonne in European countries).

The amount of avoided contamination is difficult to estimate, nevertheless levels are likely to be less compared to Measure 29a.

One-off cost could be required by Suppliers to recertify existing products and/or to develop new products in order to meet the new standard, could be offset by greater product sales from wider product acceptability.

9.16.6 Environmental impacts

The specific environmental impacts are difficult to quantify. Benefits in terms of lower contamination rates and better operations at facilities are estimated to be lower compared to Measure 29a.

In the long run **improvements in compost quality** are likely to arise thanks to the revision of standards, however these improvements are difficult to estimate. Soil quality is improved by compost application in the following ways:

- Inclusion of a source of nitrogen (and other nutrients) for plants that is more stable and less likely to be leached from the soil than conventional fertiliser.
- Improved short-term carbon sequestration.
- As a result of soil carbon increase, water retention improves, as well as the physical condition of the soil for sowing crops.

In addition, it will be less likely that incompletely degraded compostable packaging will be included in compost. The implications on compost quality of this outcome are unclear, as it is not yet clear the extent to which such material might be expected to degrade in the short or medium term.

9.16.7 Social impacts

If the measure generates further development of the compostable packaging industry, combined with higher levels of recycling would be expected to **result in some job creation**. Nevertheless, the potential is estimated to be lower than that of Measure 29a.

Overall, **health impacts are uncertain.** The nature and the extend of health impacts will depend on industry developments over the next decade. Indeed, some existing products are associated with larger pollution release, compared to conventional plastics; while more novel polymers show lower emissions to air than conventional polymers.

9.16.8 Stakeholder views

As part of the stakeholder consultation process, there is **strong support** in the Online Public Consultation, to the definition of **compostability standards.** In fact, nearly 90% of participants felt that updating the **EN 13432 standard would be an efficient and effective way to improve packaging design**.

The **European Bioplastics Association**, among others, confirmed that the key areas to focus on should be the harmonization of biowaste treatment practices and the definition and implementation of best practices for biowaste treatment across Europe.

Some stakeholders also expressed that the standard should be clear enough to **ensure compliance and enforcement** without additional certification. Many stakeholders believe that **the quality of the compost should be prioritised,** and short composting times should not be allowed unless they result in effective results. There was also a strong consensus to consider the actual composting conditions of the facilities.

Regarding **the scope of the standards**, most stakeholders agreed with a revision of the standard that consider **the latest technological developments and best practices**, while the forestry and paper associations have requested that the update of **EN13432 include paper-based products.**

Several stakeholders believe that **there should be an EU standard on home composting** and believe that otherwise this could lead to divergent standards from different Member States, which adds barriers within the single market. However, other stakeholders believe that composting should be limited to industrial processes and/or that home composting could turn out to be environmentally harmful.

Measure 29: Criteria prioritising applications for compostable plastics

Currently both compostable and conventional plastics are allowed on the market across all packaging categories for most Member States, except for various types of plastic carrier bags in some countries.

The use of compostable plastic material in the packaging sector - particularly in applications in which conventional plastics are already widely in use - is increasing, and **leading to consumer confusion** with respect to which **collection system should be used for handling the product, resulting in an increases the possibilities of contamination of both types of collection system**.

This measure addresses this issue.

To do so, **there is a need to focus the use of compostable polymers in those applications where the use has most value.** This requires consideration of the added value of such material use in these applications, relative to reuse, recycling and other recovery operations of their conventional counterparts. Possible **agronomic benefits** associated with the use of compostable plastic in compost/ digestate should be taken into consideration, as well as any particular applications in which the use of compostable plastic materials **improves the quality/ quantity of food waste collected. Its benefits to reuse / recycling** should be as well considered, including both organic recycling as well as the recycling of conventional plastic.

Regarding agronomic benefits, a previous study by Eunomia for the Commission[431] reviewed the case for compostable plastics from this perspective, finding that "**the evidence is weak in favour of any particular agronomic benefit** associated with compostable plastic material in compost or digestate and **therefore material choices for products and packaging should prioritise recyclability over compostability**."[432]

However, there are **areas where the use of compostable plastic is proven to have 'added benefits',** in particular **increasing the collection of organic waste** and its diversion from residual waste **or reduction in plastic contamination of compost**. Particularly given the likely significant **increase in the collection of biowaste** that is assumed to occur **as a result of the introduction of mandatory food waste collections**, there is a need to focus any investment on compostable plastics into those applications which are most likely to deliver beneficial outcomes in terms of organic waste collection.

An aspect to consider as well are the **differences between Member States**, which will strongly influence possible solutions. Both compostable and conventional plastics are allowed on the market across all packaging categories for most Member States except for various types of plastic carrier bags in some countries, e.g. Italy and France – where conventional plastic bags of certain types have been banned. Also some other Member States have policy exemptions for compostable and/or biodegradable lightweight plastic carrier bags to incentivise the use of compostable bags (Austria, Bulgaria, Hungary, Malta and Greece). In these countries, there is either an exemption from the ban on the carrier bag charge or a reduced charge.[1] In the majority of cases the bags must be compliant with EN 13432.

[431] Data compiled by Eunomia in the context of work for DG Environment assessing the implementation of the Carrier Bags Directive

[432] https://op.europa.eu/en/publication-detail/-/publication/3fde3279-77af-11ea-a07e-01aa75ed71a1/language-en/format-PDF

The logic of this measure follows 2 steps:

- Determine **a list** of **packaging applications for which compostable materials should be favoured/allowed,** because of their net environmental added value with respect to conventional plastics. Such added value will be estimated through the scoring of a series of criteria.
- Take measures to favour/allow compostability in those applications. Four alternative measures (29a, 29b, 29c, 29d) are discussed further below.

Establishing a list of packaging applications for which compostable materials should be favoured/allowed:

It is proposed to use as basis a set of criteria to determine the **list**. An initial set of criteria is provided in Table 52 below. It was previously developed in a research project undertaken in 2019-20, through discussions with stakeholders.[433] A weighting is applied to each of the sub-criteria to recognise the relative importance of the different sub-criteria against one another – these weightings are shown in the final column of the table. It should be noted that **these** initial set of **criteria could be complemented by other** criteria like **e.g. the composting time of the given product.**

Table 52. Criteria for Prioritising Applications where Compostable Plastic is likely to be Most Beneficial

	Criteria	Wtg
1	**The use of compostable plastic brings 'environmental benefits' over alternative materials**	
1a	This application could not have been designed for reuse	3
1b	The use of compostable plastic for this specific application can be expected to significantly increase the capture of bio-waste compared to non-compostable alternatives	4

[433] Eunomia (2020) Relevance of Biodegradable and Compostable Consumer Plastic Products and Packaging in a Circular Economy, for DG Environment

	Criteria	Wtg
1c	Through the use of LCA – cradle to grave - or similar environmental assessment tool it can be demonstrated that compostable plastic is the preferred material for this particular application	3
2	**The use of compostable plastic does not directly or indirectly result in a reduction of the quality of the resulting compost**	
2a	The use of compostable plastic for this application does not lead to consumer confusion and subsequent increasing contamination with non-compostable plastics.[1]	4
2b	The use of compostable plastic for this application can be expected to significantly reduce the contamination of compost with non-compostable plastics (from this application) compared with current practice	5

Notes:

1. It is possible to require the whole product group to be designed for composting to avoid the coexistence of compostable with non-compostable materials within the same application.

The application of this criteria to packaging items will also, in practice, **need to consider the readiness of biowaste treatment facilities to accept these items** – which is also linked, in turn, to the potential need to update Standard EN 13432.

The **use of the criteria** is considered to **result in greater confidence in Member States** associated with the use of compostable plastic for the prioritised products and **reduced reputational risk to compostable plastics producers** arising from the use of such products in inappropriate applications.

Applying these criteria to packaging items, it leads to the 9 product types set out in Table 53 being prioritised, based on the product achieving a score above 45% in the assessment.

Table 53. Priority Products for Compostable Plastic

Product type	Notes	% max. score against the criteria
Lightweight plastic carrier bags, LPCB (<50 micron)	Assuming a significant proportion has a second use to capture separate food waste, displacing the use of specific products such as caddy liners[1]	71%
Very lightweight plastic carrier bags, VLPCB <15 mircon) such as single use fruit and vegetable bags	Assuming a significant proportion has a second use to capture separate food waste, displacing the use of specific products such as caddy liners[1]	62%
Fast food trays that are unsuitable for re-use	Targets those used in closed collection / treatment systems, i.e., the waste generation situation takes place in an environment (envisaged to be an event or business) where those with a responsibility for the situation will collect most of the waste on-site (either directly or through a contract). Examples include the food waste produced in festivals, conferences, or on airlines.	72%
Tea bags	Not currently packaging items – assumes legislation is amended to allow this	84%
Fruit & vegetable labels	--	68%

Product type	Notes	% max. score against the criteria
Coffee capsules / pods	Not currently packaging items – assumes legislation is amended to allow this. The focus here is on the capsules that contain dense plastic (rather than those that resemble tea bags).	76%
Plastic film for perishables	Perishable foods are those likely to spoil, decay or become unsafe to consume if not kept refrigerated; examples of foods include meat, poultry, fish, dairy products – and pre-prepared meals containing these items. The measure targets the flexible plastic covering these items.	56%
Film used with food packaging	Film (flexible plastic) covering food trays used for pre-packaged food items. Pre-packaged food items include both trays used with fresh produce (such as fruit and vegetables), and pre-cooked meals designed for re-heating at home.	57%
Trays for fruit & vegetables	These items are the rigid plastics used with pre-packaged fruit and vegetables.	49%
Notes: Evidence from the Italian system – where both plastic carrier bags and very lightweight plastic carrier bags are mandated to be produced from compostable polymers – suggests that use of the lightweight plastic carrier bags is prevalent in this respect. The use of caddy liners has been reducing over time.[434]		

[434] A translated source for the data from the CIC can be found here: https://www.polimerica.it/articolo.asp?id=24090

Such products are prioritised mainly because all (to some degree) result in the additional capture of biowaste as a consequence of their use. The better performing products are also expected to result in a reduction in contamination of compost, associated with a reduction in the contamination currently arising from conventional plastics.

As noted in the table, some **items included within the list are currently not considered to be packaging**. **Annex I of the Packaging and Packaging Waste Directive would therefore need to be updated** to allow for the inclusion of these items (which would need to move from the "non-packaging" to the "packaging" category)[435].

The impact assessment considers the following variants arising from this measure:

1. **Measure 29a:** Both compostable and conventional plastics allowed on the market for the applications under consideration
2. **Measure 29b:** Mandating compostable packaging for specific applications
3. **Measure 29c:** Ban on all compostable plastic applications where these do not meet the Recyclability Criteria
4. **Measure 29d:** Mixed group of 29a and 29b.

Assessment of measure 29a: Both compostable and conventional plastics allowed on the market for the applications under consideration

9.17.1. Effectiveness

This measure would, after determining the list of plastic packaging products selected (like Table 53 above), allow such products to be made from both compostable and conventional plastics. It is expected to be **less successful at reducing contamination at biowaste facilities than** is the case where **a complete ban of conventional plastics** is implemented.

Both types of products still exist and with it, the **potential for consumer confusion**. Consumer confusion may be tackled to a limited extent through clearer labelling, covered by Measure 30: Harmonised labelling for compostable plastics. Since **a certain amount of shift towards compostable carrier bags is assumed in any case to occur** in the baseline, the measure is assumed **to be only modestly effective at bringing about further positive effects associated with the use of compostable polymers**.

[435] For further considerations about the items on the list related to their acceptance in biowaste see section A.5.1 of Appendix K of the support study

The **use of the criteria** is considered to **result in reduced reputational risk to compostable plastics producers** arising from the use of such products in inappropriate applications. This, in turn, is assumed **to result in an increased switch of products across from conventional plastics to compostable polymers**, compared to that which would have occurred in the baseline – although not all products are assumed to be switched for any of the product groups. The potential for these switches to occur is anticipated to be linked to the ease with which compostable polymers can replace the conventional polymers. For some applications – such as films covering perishable items – greater technical barriers associated with the switch are expected, and this, in turn, is anticipated to limit the extent to which packaging moves across to compostable polymers from conventional plastics.

A consideration in respect of contamination of conventional recycling systems for plastics is the degree to which **advanced re-processing infrastructure has been developed within a specific member state**. Such facilities are better able to tackle the contamination of conventional plastics (particularly films) by food waste, leading to less material being rejected. **Further development of this infrastructure is anticipated to take place over the next decade as technology and investment evolve**.

The effectiveness of the measure can be considered both **in terms of the overall group of products as well as** in terms **of specific impacts associated with each product alone**.

The impact by product is expected to vary partly because of the amount of each product. Products arising in only small amounts are expected to have a much smaller impact in terms of the potential for contamination at composting facilities than those arising in much larger amounts.

Table 543 data indicates that the **amount of available product is greatest for single use carrier bags and film for perishables**. On the other hand, **amounts associated with tea bags, fruit labels and fast-food trays (not suitable for reuse) are small**. It is noted that estimates for these products is highly uncertain as relatively limited data exists to identify the specific food applications set out in the list below –particularly for film products and trays. For other products, however – such as the carrier bags – the data is relatively more robust as there are various sources that can be used to verify and benchmark the data.

The table also provides data on the total amount of contamination associated with each of the products – assumed to be comprised of both the plastic product and the amount of food that would potentially be removed with it as contamination. The amount is assumed to vary, depending on the likelihood of the product being used to contain food. For some products, it is assumed that the packaging may be discarded without there being much in the way of food in it, in some cases – this may be the case for the films where the

food product is consumed. In other cases – such as coffee capsules – the drag factor is calculated based on the amount of food (in this case coffee) that the product contains.[436]

Food waste contamination impacts are therefore calculated from the amount of plastic product that ends up in biowaste treatment systems, as well as the additional food waste dragged across with the product should it be removed as contamination from the biowaste treatment facility.

Table 54. Estimated Annual Product Arisings EU-27 and Food waste contamination assumption

Product type	**Estimated annual arisings EU-27 Tonnes**	**Food waste "drag" factor[2]**
Lightweight carrier bags	450,000	2.75
Very lightweight carrier bags, such as single use fruit and vegetable bags	50,000	2.00
Fast food trays that are unsuitable for re-use	4,500	1.20
Tea bags[1]	3,393	1.00
Fruit labels	4,500	1.00
Coffee capsules / pods	98,495	1.80

[436] For plastic bags, the factor is derived based on Italian data based on the drag effect seen at its facilities when plastic contamination is removed. Source: CIC (2020) *Ottimizzazione del riciclo dei rifiuti organici: Sintesi dei risultati del programma di monitoraggio*
CIC – COREPLA (2019-2020)

Product type	Estimated annual arisings EU-27 Tonnes	Food waste "drag" factor[2]
Plastic film for perishables	780,000	1.20
Film for food trays	50,000	1.30
Trays for fruit	50,000	1.05

Notes

1. Includes weight of the tea as well as the bag
2. Factor for the amount of food waste that is assumed to be associated with the compostable plastic item. This factor is multiplied by the arisings figure to calculate the total amount of material that forms contamination which will be removed from the composting facility if the product is not accepted for treatment.

Sources: Eunomia; CIC; Freshfel; Podback; Eurostat

The data suggests there is the potential for greater effectiveness for polymer switches associated with carrier bags and films, due to the amount of product available. Alongside the above data, however, there is the need to consider the technical limitations expected to restrict the amount of compostable film covering perishable items under this measure.

9.17.2. Ease of implementation

This measure will envisage a number of actions, in line with the methods of implementing the criteria to determine a list like Table 53 above, as detailed below.

There is a reasonable amount of evidence relating to the performance of some products against the criteria. However, for some of the criteria (and some products) the evidence base is still developing – and it will continue to evolve over the coming years, as more products are developed and as changes occur in organics processing and plastics re-

processing. The criteria for inclusion in the legislation will need to consider any updates to Standard EN 13432 (should these be taken forward) and may also need further revision in the future to take into account changes in biowaste treatment facilities occurring as a result of the introduction of mandatory food waste collections across Europe.

There are various methods of implementing the criteria, which are summarised below:

- Assessment of products takes place prior to the updates of the Essential Requirements regulations. This would involve reviewing the available evidence for all products at that point in time and adjudicating for specific types of products based on this information. The assessment could be used to inform the amended text in the Annex of the legal proposal, specifying the circumstances under which specific products are to be placed on the market. Under such an approach, the ability to consider country specific variations in infrastructure would likely be more limited. Work would be needed up-front to assess the situation for Member States at that point. Assuming only one such assessment was undertaken, the evidence would be out-of-date relatively quickly, given the anticipated developments in infrastructure likely to take place over the next five years. Compostable products may be less likely to be developed, since producers would be less able to demonstrate their performance against the criteria under changed circumstances in the future.
- Assessment of products described in approach 1 is repeated at intervals over the next decade, to take account of changes in infrastructure occurring over time. This would allow the legislation to be updated in response to circumstances such as the evolution of biowaste processing infrastructure (where considerable change is expected as a result of the introduction of mandatory food waste collection systems), and plastics re-processing. However, under such a situation there would be the need to update the legislation each time such an assessment took place. Development of compostable products is anticipated to be somewhat easier under this approach than in the implementation method above.
- Essential Requirements are updated to include a requirement that all compostable packaging will go through an assessment prior to being placed on the market for the first time. The criteria for assessing compostable packaging would be included within the Implementing Act., which allows for the inclusion of technical information – and an evidence base for assessing the products. This would include default values for products to make it easier for a self-assessment by packaging product producers (and those using products in a specific application, where appropriate) to take place. The assessment process would be overseen by a technical committee; the latter would be able to assess products that are not using default values in their assessment. Under such a situation, the implementation of the Essential Requirements can be more responsive to changes in market conditions and infrastructure; some consideration could be made for infrastructure variations occurring across different Member States. Development of compostable packaging products will be more likely to take place. Effort will be required on an on-going basis to monitor the system, but up-front burdens would likely be reduced.

Assuming the first approach is used for implementation, the timing of that assessment may be important when considering the circumstances under which compostable polymers may

be allowed for specific products. A delay of several years to update the legislation would allow for some work to take place to harmonise biowaste treatment systems, potentially skipping the need for further future updates in the evidence base to account for subsequent changes to treatment infrastructure.

Under the third approach, it is proposed that producers of packaging applications using compostable polymers undertake a self-assessment of their product when it is first put on the market, presenting evidence against each criterion – thereby demonstrating the extent to which the compostable packaging item adds value. The assessments could be verified by a technical committee, which would include representatives from the composting and the compostable plastics industries, the competent authorities and the European Commission.

To make the assessment easier to undertake, it is assumed that producers will be provided with default values representative of key product types. Such values would include data on LCA evidence confirming the relative environmental performance of compostable polymers in comparison with packaging products made from conventional polymers (relevant for criterion 1c), and data showing reductions in contamination levels of organics processing systems as a consequence of the use of the introduction of compostable polymers (relevant for criterion 2b). The onus would then be on the packaging producer to present alternative values to these – and to justify them – as and when new data becomes available. The starting point for the default values could be the assessment undertaken as part of this impact assessment, subject to further verification by industry as appropriate. Such an approach would avoid the need for packaging producers to undertake, for example, an LCA study each time they place a new product on the market. The work of the committee is primarily envisaged to be needed to assess those applications which deviate from the standard values. It would also be able to update the standard values where new evidence becomes available (e.g. as a result of work to standardise biowaste treatment systems).

Depending on the method of implementation, greater assessment of products may be required than in a situation where whole product groups are mandated to be made from either compostable or conventional polymers.

Once the list of products is determined, the ease of implementation is further assumed to vary across the products, and by country:

- As was indicated, compostable carrier bags are already accepted in many European countries' composting systems, and as such, increases in the number of such products at biowaste facilities is expected to present fewer problems.
- For other products – such as those covered by film – acceptability of the product is much lower in biowaste treatment facilities, and an increase in compostable products would therefore be expected to cause more issues.

9.17.3. Administrative burden

There will be administrative burdens associated with each of the different approaches outlined for implementing the criteria. All of the above approaches require some up-front assessment of the evidence for compliance with product groups against the criteria.

Overall burdens will likely be reduced under the first approach – although this depends to a certain extent on the thoroughness of the assessment of evidence that takes place prior to the initial update of the legislation. Under such an approach, it may be more challenging to fully consider future product developments or developments in infrastructure. To meet the latter requirement, there is a need either for further future one-off assessments, or an on-going process to consider the situation for products that deviate from the standard situation.

The second method of implementation will result in higher administrative burdens than the first; the extent of additional burden will relate to how many times the assessment needs to be repeated.

If the third approach to implementation is followed, use of a default set of assessment outcomes is anticipated to reduce administrative burdens on the Commission associated with the on-going need for assessment for new products. Provided new products placed on the market are compliant with EN 13432 this should reduce any administrative burdens associated with enforcement.

9.17.4. Economic impacts

Discussion with industry confirmed that the switch to compostable polymers for some flexible film products – those used to cover perishable items, for example – would require **additional investment in research and development** to account for the changes in equipment needed so that production lines could produce the new packaging items. One major packaging manufacturer estimated the effort required to adapt to the need to produce one of the more challenging products indicated that the following efforts would be required:

- >2-3 years of intense R&D efforts, including lab scale, pilot and industrial trials at the packaging producer.
- >1-2 years of involvement at the customer side, including testing on packaging lines as well as tests in the final application (e.g. shelf life).
- 10-30 million € investment to adapt manufacturing capability to innovative products.
- Similar sizeable investments could be needed at the customer site to enable the new products to run efficiently on packaging lines.

The above estimates are considered to be those seen in a worst-case scenario. The investment is considered to be less likely to occur in the situation where both compostable and conventional polymers are permitted to be placed on the market, leading to relatively low levels of market penetration of compostable products in such a situation. Such investment would also be expected to lead to higher packaging costs in the short-medium term. However, it is noted that similar investment is likely to be needed in many cases to ensure that the product is able to meet the future design for recyclability requirement.[437] For other products – such as the bags – investment needs are anticipated to be relatively low as the compostanble products already exist on the market.

9.17.5. Environmental impacts

Positive environmental impacts can be expected but these are relatively modest as the switch from conventional to compostable polymers is relatively small. However, some benefits occur from the switch away from residual treatment methods and towards composting / anaerobic digestion.

9.17.6 Social impacts

Some positive impacts in employment can be expected by the increase in recycling, but very small. There may be some health impacts associated with the switch to more compostable materials – as was discussed under Measure 28: Updates to Standard EN 13432 - but these impacts are somewhat difficult to quantify and their positive or negative character will depend in part on how the industry develops over the next decade.

9.17.7. Stakeholder views

The open public consultation results indicated strong support from stakeholders to set mandatory compostability of packaging for specific applications. Applications for which the packaging was likely to end up in food waste (e.g. tea bags) were deemed to be the best candidates (identified by 80% of respondents), followed by applications that could facilitate the collection of organic waste (e.g. disposable coffee pods, 65%). Europen added that organic waste accounts for more than 50% of municipal solid waste and that compostable packaging for organic waste would be preferable as it can be collected together and processed accordingly. Other stakeholders expressed preference for measure 29a and rejected any type of restrictions on the market. At the same time, some stakeholders objected to measure 29a on the basis that it would perpetuate the issue of cross-contamination and consumer confusion.

[437] Investment needs for the packaging sector as a whole relating to product investment are discussed in the Recyclability intervention area

Assessment of measure 29b: Mandating Compostable Packaging for Specific Applications

9.18.1 Description of the measure

This measure would, after determining the list of plastic packaging products selected (like table 53 above), impose that such products are made from compostable plastics.

9.18.2. Effectiveness

It is assumed to be more effective at moving products from conventional plastic to compostable polymers – particularly for products where greater investment is likely to be needed to make this happen, such as for the films on putrescible products. Consumer confusion is further reduced for certain products (such as the carrier bags) as there is now only one end-of-life route to be considered. This, in turn, results in a more significant reduction in contamination issues arising at biowaste treatment plants.

For other products – such as the films covering putrescible materials – consumers will probably not consistently recognise that the packaging products should be treated via a composting collection scheme. This is because some other films (e.g. those not used in food production) will not be treated via this route. As such, the potential for some confusion remains.

9.18.3. Ease of implementation

The measure could bear some additional complexity from the perspective of the packaging industry than Measure 29a, as greater investment in research and development will be needed to develop new products in line with the legislation. However, similar investment in many cases will also occur to develop products that meet the design for recycling requirement.

Other points raised under Measure 29a also apply here, with regards to the acceptability of compostable products at bio-waste treatment facilities, and the necessary steps needed to put the criteria in place. There is, however, far less flexibility here to accommodate variability in biowaste treatment systems for specific regions. Under this measure, it is therefore more likely that some work to harmonise biowaste treatment systems across Europe will be required – to ensure that all biowaste treatment systems are able to accommodate the full range of compostable products (of course, if the preliminary list in Table 53 is reduced, harmonisation requirements will decrease as well).

9.18.4. Administrative burden

Where the decision is taken up-front to mandate whole product groups as being produced from compostable polymers – and the legislation updated accordingly – ongoing regulatory burdens for both the industry and the Commission are likely to be relatively minor, compared to the baseline. This assumes that burdens of product-based assessments set out under Measure 29a are deemed not to be necessary. Burdens for the Commission are reduced since there is no need for any on-going adjudication of products against the criteria – which would be required for the second or third approaches to implementation as set out for Measure 29a.

9.18.5. Economic impacts

With regards to waste management costs, this scenario is assumed to lead to greater levels of organic recycling along with a more significant decline in incineration and landfill. There is a financial benefit from recycling under this measure – more material is sent to anaerobic digestion / IVC (In-Vessel Composting) than conventional recycling and the total costs (collection + treatment) of the latter are higher than is the case for the former. The financial benefit from recycling is sufficient to offset the increased cost of purchasing primary compostable materials, in comparison to the conventional plastics. Results are summarised in Table 554. This shows that a significant proportion of the financial benefit arises from the removal of contamination from food waste, levels of which are higher than under Measure 29a. Some financial benefit (seen in the baseline) associated with conventional recycling is lost as a result of the switch to compostable plastics, but levels of conventional plastic recycling in the baseline for some of the products under consideration here are relatively low.

Table 55. Summary of Economic impacts of Measure 29b

Category		**Estimated economic impact, in 2030,** €m
Waste management	Recycling	-103
	Incineration	-53
	Landfill	-4

Food waste contamination removal	-211
Overall impact	**-370**

Costs for switching to the compostable polymers may result in higher material costs initially than was the case for the baseline scenario. However, much of the differential is expected to be eroded over time, as the market adjusts. Total costs of this nature are expected to be higher under this measure as a larger number of products will need to switch from conventional plastic to compostable. However, similar costs would be expected in many cases for these products to meet the design for recyclability criteria that would otherwise apply. Investment costs for other products – such as the lightweight carrier bags, which make up a significant proportion of the products available to be switched to compostable polymers – are likely to be relatively small as the products already exist on the market.

9.18.6 Environmental impacts

The measure delivers more substantial benefits than is seen under Measure 29a as a greater quantity of products are switched from conventional polymers to compostable. This, in turn, leads to a greater reduction in incineration impacts – offset to a minor extent by an increase in landfill impacts (as compostable polymers are associated with greater landfill impacts than conventional plastic). There is a relatively modest environmental benefit associated with a switch from the manufacturing of conventional polymers to compostable polymers. Impacts here are uncertain and carbon benefits may not, in practice, arise; this is dependent in part on the non-fossil carbon content of the polymer. There is some data to suggest water use in production is reduced over conventional plastics, although this is may also vary across the different polymers.

Table 56. Environmental Impacts of Measure 29b

Summary of Environmental Impacts	Annual impacts in 2030
Change in GHGs, thousand tonnes CO_2e	-2,148
Change in water use, thousand m^3	-143
Change in GHG & AQ externalities, € million	-518

It has not been possible to quantify some environmental impacts, including the following:

- Benefits associated with carbon sequestration in the compost.
- Impacts associated with microplastic pollution – both from the conventional and compostable polymers. The measure would be expected to reduce the former, which are likely to cause greater harm than the latter per unit of contamination (since compostable polymers would be subject to degradation particularly where the particle sizes are very small).
- Impacts associated with the reduced requirement to manufacture caddy liners as a result of an increased use of carrier bags in food waste collection systems.

9.18.7. Social impacts

The job creation potential for this measure is higher for Measure 29a, **as a result of the greater switch from conventional polymers to compostable products**. Under this measure, an estimated 28 thousand jobs are created mainly in the waste management industry by 2030. As with Measure 28 and Measure 29a, there may also be some health impacts associated with the changes in pollution, but these are hard to quantify.

9.18.8. Stakeholder views

The open public consultation results indicated **strong support for mandating compostable packaging for specific applications**, as was discussed under Measure 29a.

After the presentation of the measures in the June 2021 webinars, **several stakeholders objected to the criteria for selecting the products and the proposed list of products under measure 29b**.

In general, some stakeholders supported measure 29b (recycling industry, PRO, packaging manufacturers, trade associations) since they believe it will lead to less contamination from conventional plastics and higher quality stream of compostable material and less contamination from conventional plastics. On the other hand, some stakeholders objected to measure 29b for very different reasons: some industries consider it discriminatory and disproportionate, an NGO considers that efforts should rather be allocated to reuse alternatives, other industries consider that bans hamper innovation and/or that producers should be allowed to choose the type of material for their packaging products.

Assessment of measure 29c: Ban on all compostable plastic applications where these do not meet the Recyclability Criteria

9.19.1 Description of the measure

In the absence of the above two measures, **compostable plastics will only be able to be placed on the market if they meet the Recyclability Criteria**. Depending on how the Recyclability Criteria are implemented, this may result in compostable plastics being largely ruled off the market. Measure 29c therefore considers the impact of this approach.

9.19.2. Effectiveness

The net **result** is expected to be **an increase in contamination of recycling systems compared to the baseline, and a more modest increase in recycling**. Contamination levels are higher in food waste collection systems under this measure, as a result of higher levels of conventional plastic (particularly in respect of the bags) - leading to a greater loss of material from these systems as food waste is removed along with the plastic. Although **it is also expected that contamination levels would be reduced in conventional plastic collections**, existing data indicates that compostable packaging currently results in relatively low levels of contamination of these systems even in countries where compostable plastics are prevalent. Data from 2017 relating to Italian facilities sorting conventional plastic waste indicates that less than 1% of the input composition was compostable plastic; at this level, no issues arise with processing the conventional plastic waste.[438]

[438] COREPLA (2017) Monitoring of plastic packaging at sorting facilities

9.19.3. Ease of implementation

Under this measure, **products would need to meet the design for recyclability requirement rather than the compostable packaging criteria** – as discussed under Measure 29a. These **impacts** would potentially fall **on different industries** – the industry that currently produces compostable plastics would no longer be able to produce packaging products. There would be no need to operate a separate system for compostable plastics.

The rise in contamination would likely **place additional burdens on biowaste treatment operators** who would likely need to remove more packaging and lose more food waste; authorities may need to increase communications campaigns to scheme participants with the aim of reducing this contamination.

9.19.4. Administrative burden

Administrative impacts will be similar to those set out under the Recyclability intervention area and may vary depending on which approach is used. **There may be greater administrative burdens in some areas associated with tackling the increased contamination of bio-waste collection systems**, although impacts are dependent on how such treatment systems develop over the coming years. As such, impacts associated with the latter are uncertain.

9.19.5 Economic impacts

Table 57 sets out the economic impacts associated with waste management changes under this measure. **Waste management costs are anticipated to increase under this scenario, as recycling costs are higher than those associated with biowaste management**, and there are only modest benefits associated with the reduction in landfill and incineration. There is also a net increase in the cost of tackling contamination.

Table 57. Economic Impacts: Measure 29c

Category		**Estimated economic impact, in 2030,** €m
Waste management	Recycling	152

Category		Estimated economic impact, in 2030, €m
	Incineration	-17
	Landfill	-1
Food waste contamination removal		79
Overall impact		**189**

As was discussed under Measure 29b, there will be **investment costs associated with the need to meet the recyclability requirement** for those manufacturing the respective products – but avoided costs associated with the reduced requirement to design products to meet the compostable polymer criteria.

9.19.6. Environmental impacts

The measure is anticipated to result in lower environmental benefits in contrast to Measure 29b but higher benefits than Measure 29a, where the climate change impacts are considered. There are increased emissions from incineration relative to Measures 29a and 29b, arising from the products that do not get sent for recycling. This is offset by benefits arising from recycling – climate change impacts for the latter being higher due to the greater recycling benefit (per tonne) associated with mechanical recycling. Water consumption is also assumed be higher for conventional plastics than compostable polymers, although this may be dependent on the polymer.

Table 58. Environmental Impacts of Measure 29c

Summary of Environmental Impacts	Annual impacts in 2030

Change in GHGs, thousand tonnes CO_2e	-93
Change in water use, thousand m^3	36
Change in GHG & AQ externalities, € million	46

9.19.7. Social impacts

Based on the Cost-benefits analysis, the measure is **estimated to create 9 thousand jobs** in the waste management industry by 2030.

9.19.8. Stakeholder views

The open public consultation results indicated **strong support for mandating compostable packaging for specific applications**, as was discussed under Measure 29b.

After the presentation of the measures in the June 2021 webinars, stakeholders had several comments on the criteria and the list of products (see views in measure 29b). Some stakeholders expressed their preference for measure 29c (plastic industry, recycling industries, PROs, a Member State) on the basis that all packaging must be recyclable, while **other stakeholders considered measure 29c discriminatory**, disproportionate and potentially leading to a loss of competitive advantage (and even a barrier to international trade).

Assessment of measure 29d: Mandatory compostability for certain out of the selected plastics packaging types and for the remaining ones compostable or conventional plastics possible

9.20.1 Description of the measure

This measure would, after determining the list of plastic packaging products selected (like table A-3 above), divide them into 2 groups:

- **A smaller group of packaging applications mandated to be produced from compostable plastic polymers** than those considered under Measure 29b. These are

items where the current evidence base for benefits of compostable polymers is the strongest[439]:

- Lightweight plastic carrier bags, including VLPCB,
- Tea bags (and the similar coffee pods or bags); and
- Fruit / vegetable labels.

- **Other products set in measure 29 - Table A3 - that would be allowed to be made from compostable polymers**, provided certain conditions are met to maximise the likelihood of beneficial outcomes.

For all the products included under the two mixed group, **benefits will be highest under the following circumstances**:

- where the packaging product is most contaminated with food; this will depend in part on the amount of residue left on the product (and so will be application specific); and
- where there is no or limited consumer confusion and thus limited cross-contamination
- where there is relatively little advanced plastics sorting infrastructure in place, resulting in higher levels of rejected conventional plastic packaging – this is likely to vary across Member States and is also subject to future change.

The benefits of utilising a compostable polymer will only be realised if the compostable plastic is accepted by the biowaste treatment infrastructure within a given locality. Acceptability is lower for the product group where both compostable and conventional products are allowed than is the case for those included within the group that would be mandated to be made from compostable polymers under this option; acceptability is lower still for rigid plastics than those products that are flexible plastic (i.e., the films).

Compostable packaging applications would only be allowed on the market for the mixed group under conditions aimed at maximising the benefits associated with the use of these products. Assessment of these conditions is anticipated to be largely related to adherence to the same criteria as set out above in Table 52, but such an assessment would also potentially allow for the situation within specific Member States to be considered.

- As is indicated above, one condition would be the acceptance by bio-waste treatment operators of the compostable polymers within that country.

[439] This selection is in line with the Scoping study to assess the feasibility of further EU measures on waste prevention and implementation of the Plastic Bags Directive . Part II, Implementation of Plastic Bags Directive - Publications Office of the EU (europa.eu) and the respective report from the Chief Scientific advisers ec_rtd_sam-biodegradability-of-plastics.pdf (europa.eu)

- Further conditions could be a lack of separate collections targeting the packaging application in question and / or a lack of advanced plastics sorting facilities, which would lead to contaminated products being rejected.

By virtue of the definition of the group's members as set out above, there is a greater degree of uncertainty associated with the benefits associated with the mixed group, as this group of packaging products is less commonly produced from compostable materials. Data on the levels of contamination at a product level are not available at present for packaging products made from either compostable or conventional polymers. As such, it is difficult to reach a firm conclusion as to the extent to which such products might result in a reduction in contamination levels**. It is understood, however, that contamination levels are likely to remain higher in the situation where both types of products remain on the market, such as would be the case under this measure for this group of packaging applications**.

9.20.2 Effectiveness

For those products and applications under Measure 29d **where only compostable packaging is permitted, the measure is assumed to be more effective at moving products from conventional plastic to compostable polymers** – particularly for products where greater investment is likely to be needed to make this happen, such as for the films on putrescible products. Consumer confusion is further reduced for certain products (such as the carrier bags) as there is now only one end-of-life route to be considered. This, in turn, results in a more significant reduction in contamination issues arising at biowaste treatment plants.

For other products where both products are allowed on the market, the situation described under Measure 29a is applicable**: the potential for consumer confusion remains** as a result of both types of products being permitted on the market. However, it is noted that there would be some consumer confusion even under Measure 29b for some of these products – since certain types of film (i.e., those not contaminated with food residue) would not be made from compostable polymers.

9.20.3 Ease of implementation

For **products that are in the group where only compostable polymers are permitted**, the measure may be less easy to implement from the perspective of the packaging industry than Measure 29a, as **greater investment in research and development will be needed** to develop new products in line with the legislation. However, similar investment will be needed in many cases to develop products that meet the design for recycling requirement. There is less flexibility here to accommodate variability in biowaste treatment across

Member States for this product group – since all these items need to be made from compostable polymers.

For the group where both types of polymers are allowed, the situation set out under Measure 29a is applicable. Different methods of implementing the criteria are possible, and this, in turn, may have some impact on the extent to which products shift across to compostable formats from conventional polymers. For products in this group, acceptability issues are more likely to arise at biowaste facilities – this is particularly the case for the rigid plastics applications (trays and coffee capsules). It is noted, however, that biowaste treatment operators will have to accommodate the treatment of some compostable items by virtue of some products being mandated to be made of compostable materials. As such, there is less flexibility in respect of Member State variations in biowaste treatment capacity under Measure 29d than is the case under Measure 29a.

9.20.4 Administrative burden

As was outlined under Measure 29b, where products have been mandated to be produced from compostable polymers, **the burdens are reduced,** since these products do not need to go through an assessment process.

For those products where co-existence of both types of polymers is permitted, the burden may vary to a certain extent depending on the method of implementing the assessment process for adjudicating on the criteria, as outlined under Measure 29a.

9.20.5 Economic impacts

With regards to waste management costs, this scenario is assumed to lead to greater levels of recycling than that shown for Measure 29a, along with a more significant decline in incineration and landfill. Benefits are however somewhat lower than under Measure 29b since both types of polymers will be permitted on the market for some product applications, reducing the potential for reduction in contamination.

There is a financial benefit from recycling under this measure – more material is sent to anaerobic digestion / IVC than conventional recycling and the total costs (collection + treatment) of the latter are higher than is the case for the former. Results are summarised in Table 58. This shows that a significant proportion of the financial benefit arises from the removal of contamination from food waste, levels of which are higher than under Measure 29a.

Table 58. Summary of Economic impacts of Measure 29d

Category		Estimated economic impact, in 2030, €m
Waste management	Recycling	-33
	Incineration	-25
	Landfill	-2
Food waste contamination removal		-138
Overall impact		**-199**

Costs for switching to the compostable polymers may result in higher material costs initially than was the case for the baseline scenario. However, the differential is expected to be eroded over time, as the market adjusts. Industry costs associated with adapting to the new production lines are discussed under "Economic impacts" for Measure 29a. Total costs of this nature are expected to be higher under this measure as a larger number of products will need to switch from conventional plastic to compostable. However, similar costs would be expected in many cases for these products to meet the design for recyclability criteria that would otherwise apply. Investment costs for other products – such as the carrier bags, which make up a significant proportion of the products available to be switched to compostable polymers – are likely to be relatively small as the products already exist on the market.

9.20.6. Environmental impacts

Impacts associated with this measure are set out in Table 58. The measure delivers more substantial benefits than is seen under Measure 29a as a greater quantity of products are switched from conventional polymers to compostable – although benefits are, however, lower than was the case under Measure 29b. The larger amount of material switched leads to a greater reduction in incineration impacts – offset to a minor extent by an increase in landfill impacts (as compostable polymers are associated with greater landfill impacts than conventional plastic). There is a relatively modest environmental benefit associated with a

switch from the manufacturing of conventional polymers to compostable polymers. Impacts here are uncertain and carbon benefits may not, in practice, arise; this is dependent in part on the non-fossil carbon content of the polymer. There is some data to suggest water use in production is reduced over conventional plastics, although this is may also vary across the different polymers.

Table 59. Environmental Impacts of Measure 29d

Summary of Environmental Impacts	**Annual impacts in 2030**
Change in GHGs, thousand tonnes CO_2e	-1,091
Change in water use, thousand m^3	-73
Change in GHG & AQ externalities, € million	-262

9.20.7. Social impacts

The job creation potential for this measure is higher than is seen for Measure 29a, as a result of the greater switch from conventional polymers to compostable products. Impacts, are, however, somewhat lower than Measure 29b as both types of polymer are permitted for some products.

Under this measure, an estimated **17 thousand jobs** are created mainly in the waste management industry by 2030. As with Measure 28 and Measure 29a, there may also be some health impacts associated with the changes in pollution, but these are somewhat hard to quantify.

9.20.8. Stakeholder views

The open public consultation results indicated strong support for mandating compostable packaging for specific applications, as was discussed under Measure 29a.

This measure was not presented in the June 2021 webinars, but the comments under Measures 29a, 29b and 29c should be applicable.

Measure 30: Harmonised labelling for compostable plastics

The issues addressed by this measure are the following:

- **Conventional and compostable plastics** are often used for similar products with the result that consumers are **not always clear on the recycling systems for such products** and there is contamination of both conventional recycling systems and food waste treatment systems.
- Furthermore, **labelling practices are not harmonised** and/or are not sufficient clear for the consumers. There is no harmonisation of labelling practices across Member States with respect to the labelling used on compostable plastics for packaging.

9.18.1. Description of the measure

This measure aims at reducing the likelihood of contamination of both organic waste management systems and conventional recycling collections. It also aims at reducing the risk of littering, by providing consumers with clearer information on end-of-life management routes for packaging products produced from compostable plastics.

Under this measure, labels are recommended to include the following messages:

- This product is suitable for industrial composting – place it in your food or garden waste bin. Do not place this packaging in your recycling bin.
- The product is not suitable for home composting.
- Do not litter – this package will harm the environment.

The relevant messages could potentially be delivered via the use of logos or graphics, assuming appropriate graphics can be developed to convey the relevant information.

Labelling should also confirm which certification the product complies with.

This measure would complement the updates to Standard EN 13432 (measure 28). It would in particular address issues arising from the placement of compostable plastic packaging items in home composting piles, not addressed in measure 28.

9.18.2. Effectiveness

This **measure will be effective** since it will **reduce the confusion of consumers on labelling and thus it will support the reduction of waste contamination**. The effectiveness will be increased when this measure will be accompanied by communications campaigns raising awareness with consumers on the importance of labelling and covering the operation of biowaste and recycling services.

9.18.3. Ease of implementation

The **implementation is considered easier for products where the space for labelling is available**. For other small products – such as tea bags and coffee capsules – the product itself could not be labelled directly due to the size, so the box would be labelled.

For other products, the end-of-life labelling might be more difficult for the space available when such space that would otherwise be used for marketing.

9.18.4. Administrative burden

Regular compliance with the labelling standards might need to be ensured. Compliance could be a tasks of the market surveillance authorities.

9.18.5. Economic impacts

This measure is expected to result in modest benefits since the changes. The labelling required could be incorporated into other changes in branding and marketing and would not necessarily require additional investment by product producers.

The European Commission will support the development of a standardised format of labelling across the Member States, and some work to ensure enforcement of the legislation.

9.18.6. Environmental impacts

Environmental impacts could not be quantified because of lack of data. Nevertheless, considering that the measure will implement clearer labelling practices, this will result into a reduction in littering. Therefore, a reduction in plastic pollution in the environment is expected.

9.18.7. Social impacts

Social impacts could not be quantified because of lack of data. Nevertheless, considering that the measure will implement clearer labelling practices, this will result into a reduction in littering. Therefore, positive impact for the society is expected.

9.18.8. Stakeholder views

Over 90% of respondents to the Open Public Consultation indicated **support for harmonised labelling in respect of compostable plastic packaging**. Some stakeholders expressed their recommendations for digital watermarking solutions. Others expressed concerns on the availability of space in labels to include additional messages. Furthermore, some stakeholders highlighted that that vague, confusing, or misleading terms (especially "biodegradable") should be forbidden. On the other hand, some stakeholders believed that more labelling would only add to the existing confusion.

INTERVENTION AREA RECYCLED CONTENT

9.19 INTRODUCTION

This intervention area analyses issues related to recycled and bio-based content in new plastic packaging, in particular the absence of specific mandatory minimum contents.

Key issues identified are the following:

- Despite the Essential Requirements and accompanying standards, there is currently a lack of consistent, officially reported data on levels of recycled content in packaging at the level of granularity needed.
- There is no definition of the term "recycled content" in packaging legislation nor a harmonised methodology for the measurement of recycled content in packaging placed on the EU market. Therefore, there is a mis-functioning of the internal market in terms of verification, comparability and transparency of claimed recycled contents and a risk of misleading consumers.
- The uptake of recycled content in plastic packaging is currently low, although a high proportion of plastic packaging is collected and is available on the market for recycling. However, recycling into high quality recyclates or even closed loop recycling is still relatively rare. This results in continued dependence on virgin, predominantly imported materials in the sector, associated with high GHG emissions and other negative environmental externalities.
- There are no reliable data on trends in recycled content uptake in the EU plastic packaging market over time. However, recent trends in rPET prices signify increased demand for recycled content in packaging. The price of food-grade rPET pellets has been increasing since 2017 and continued to rise in late 2018 / early 2019 even when the price

of virgin PET significantly declined. Similarly, non-food grade rPET flakes remained below the price of virgin PET but in mid-2018/ early-2019 remained stable despite a sharp decline in the price of virgin PET. This indicates that demand for recycled plastic content is largely decoupled from the price of virgin resin, which is likely driven by consumer demand, linked to brand commitments to recycled content in packaging as well as the need to meet future targets set in EU legislation.

Measures discarded and not analysed in depth:

- Measure 34a: Updates to Essential Requirements operationalised through harmonised standards
- Measure 35d: Mandatory recycled content targets for *all* packaging
- Measure 36: Polymer substitution quotas
- Measure 39: Harmonisation of EPR Fee modulation criteria based on recycled content

Measures analysed in depth but not carried forward to the options table

- Measure 35a: Material-specific target for plastic packaging (average across *all* plastic packaging)
- Measure 35b: Product-specific targets for plastic packaging (5 plastic packaging product groups)
- Measure 35c: Detailed targets based on contact-sensitivity
- Measure w: Targets for biobased content in plastics packaging, integrated into the recycled content targets

Measures analysed in depth in the Annex and included in the options table

- Measure 37: Definition of Recycled Content and measurement method
- Measure 34b: Mandatory reporting requirement for recycled content for all packaging
- Measure 35em: Broad targets for plastic packaging based on contact-sensitivity.
- Measure 35eh: Higher ambition, broad targets for recycled content in plastic packaging based on contact-sensitivity for 2030 and 2040

Measures analysed in depth and included in the options table

Measure 37: Definition of Recycled Content and measurement method

This measure introduces a provision for an implementing act to establish a **harmonised methodology for the calculation, reporting and verification of recycled content levels** in packaging, as well as **clarifying the definition of the terms recycled content** (and indeed, the scope of any associated terms like “recycled plastics”) and placed on the market in the context of the packaging sector.

9.19.1 Description of the measure

The exact scope of the measure and the elements of the implementing act will depend on whether either or both Measure 34 and Measure 35 are taken forward in the legislative proposal based on the impact assessment. Measure 37 is a key supporting measure to implement mandatory recycled content targets (Measure 35).

To maximise efficiency, the development of the implementing act should draw on the findings of the ongoing study to develop recommendations for calculation of the **SUPD targets** and on **ISO 14021, 2016**, which states that recycled content is the "proportion, by mass, of recycled material in a product or packaging". However, it is noted that this definition is very broad, and implies that any kind of recycled "material" that is incorporated in the final packaging item may be reported as recycled content.

To encourage a greater degree of circularity in the sector, the above definition for recycled content would be accompanied by **definitions for recycled materials relevant to each of the key packaging materials** (glass, paper/ card, steel, aluminium, wood and plastic). If the target in Measure 35 is specified to focus on increasing the uptake of post-consumer recycled plastics, **the definition above should be modified to reflect this change in scope** from "plastic waste recycling" to "post-consumer waste recycling". Since the term "post-consumer waste" is not defined in legislation, this would ideally be included in the legislation itself, as an implementing act is not an appropriate instrument to introduce such a definition.

Additional elements of the calculation methodology that should be considered as a part of this implementing act are **the measurement points**, particularly the point at which packaging is considered to be placed on the EU market as outlined in measure 35;

- **the format of the packaging product** when it can be considered placed on the market (e.g. empty or filled, when sold to the end consumer or at the end of the manufacturing process, etc);
- **the point in the supply chain** that this corresponds to, and the implications for the data gathering and calculation, including those associated with intra-EU movements and third party trade.
- Finally, any **adjustments in the calculation** related to contaminants, moisture, additives etc that may be present in recycled plastics but do not necessarily make their way into the final packaging item.

However, the most important aspect of this measure is the determination of a **verification procedure to ensure that the calculation is robust and reliable**. This is particularly challenging because there is no way to determine the quantity of recycled plastic in a finished product – necessitating tracing of materials through the supply chain to ensure that what is reported corresponds to the recycled content input into a given item. To that scope the physical traceability should be considered a crucial aspect of the implementing act, with any deviations (for example, to allow a batch-based calculation as opposed to an item specific one) needing to be carefully justified. Therefore, a range of chain of custody approaches and

technologies summarised under the umbrella of chemical recycling, e.g. pyrolysis and gasification could be applied, each having its own merits and demerits and resulting in different types and quantities of material being able to be counted as recycled material.

This suggests the need for development of the verification process to be undertaken alongside the finalisation of the level of the recycled content targets, since there is a risk of adopting a too-flexible verification process that would render a recycled target meaningless or not ambitious enough, and vice versa. Finally, the revised PPWD should also make clear any provisions regarding the actual implementation of the verification procedures that are designed. It is proposed that **authorised third party certification processes**, similar to those used in the Renewable Energy Directive could be considered here as well.

9.19.2 Effectiveness

This measure is a prerequisite for the implementation of Measure 34: Updates to the Essential requirements and Measure 35: Mandatory recycled content targets. The effectiveness of Measure 34 and Measure 35 discussed above therefore rely heavily on the implementation of this measure.

9.19.3 Ease of implementation

This measure is likely to be **moderately challenging to implement**, depending on the level of clarity and direction provided in the legislation itself. In particular, ensuring robust, consistent results, coherence and prevent duplication within the implementing act and the SUP Directive can be burdensome to implement.

9.19.4 Administrative burden

The magnitude of administrative burden associated with this measure will differ significantly based on the chosen approach for verification and certification in the implementing act.

The administrative burden discussed in Measure 34 and Measure 35 above will be significantly mitigated for Member States and brands if a harmonised measurement methodology and definition are included in an implementing act. As such, any added administrative burden on the Commission is likely to be justified in view of some benefits (prevent vagueness in the legislation and potentially conflicting methods of measurement and verification) and the significant impacts on the effectiveness of Measure 34 and Measure 35.

9.19.5 Economic impacts

This measure is a prerequisite for the implementation of Measure 34 and Measure 35. The economic impacts of Measure 34 and Measure 35 discussed above therefore rely heavily on the implementation of this measure.

9.19.6 Environmental impacts

This measure is a prerequisite for the implementation of Measure 34 and Measure 35. The environmental impacts of Measure 34 and Measure 35 discussed above therefore rely heavily on the implementation of this measure.

9.19.7 Social impacts

This measure is a prerequisite for the implementation of Measure 34 and Measure 35. The social impacts of Measure 34 and Measure 35 discussed above therefore rely heavily on the implementation of this measure.

9.19.8 Stakeholder views

Many stakeholders noted that Measure 37 will form a **fundamental feature of any framework for increasing recycled content in the sector.** As such they are unlikely to support the introduction of both Measure 34 and Measure 35 above in the absence of harmonised definitions and a measurement method for recycled content.

Some expressed preference for the measure to be implemented via an implementing act as opposed to the use of harmonised standards. Some noted there may be a need for an associated standard for labelling of products that contain recycled content in line with the definitions and methodology established in this measure.

MEASURE 34B: INTRODUCING MANDATORY REPORTING REQUIREMENT FOR RECYCLED CONTENT IN ALL PACKAGING

In neglecting recycled content, setting a very low bar to be classed as recyclable and allowing all plastics to be incinerated, it is accepted that the Essential Requirements and accompanying standards stimulate neither the demand for nor the supply of recycled materials in packaging.

Key problems to address

- To establish a clear market signal in favour of incorporating recycled materials in all packaging placed on the EU market without undue administrative burden or risk of unintended consequences;
- To enable transparency and a common understanding of current practice to inform future policy on recycled content by gathering data at the required level of granularity using against a harmonised methodology; and
- To allow economic operators to adapt supply and manufacturing processes associated with the calculation and verification of recycled content in packaging ahead of the implementation of mandatory targets.

9.20.1 Description of measure 34b

Starting from 2025, this measure will introduce a **mandatory reporting requirement to Member States on the levels of recycled content in their packaging at the level of the specific packaging type** placed on the EU market for all economic operators. This data will then be reported by Member States to the Commission and made public. Some exceptions should form a part of the declaration when recycled content cannot be incorporated due to consumer health and safety concerns, or legal restrictions.

It is anticipated that data gathering of information will be supported by PROs, with market surveillance authorities supporting in enforcement and auditing activities into electronic databases of packaging with a high level of granularity on specific packaging products.

The implementation of measure 34b relies heavily on the development of a **harmonised definition for recycled content** and the application of a consistent **measurement method** for determination of recycled content levels (see measure 37 Harmonised definition and measurement method).

Measure 34b could play a role in **increasing recycled content and developing transparent and evidence-based policy on recycled content targets** in the packaging sector in the future, as well as ensuring that producers are **improving the design of packaging to include higher levels of recycled content** in the present.

This would also enable **the identification of best-in-class packaging formats and materials from the perspective of recycled content uptake and** provide some incentive for producers to maximise recycled content in their packaging with the threat of further regulation and targets for those items that perform poorly or with inadequate justification for low levels of recycled content (i.e., for reasons other than consumer health and safety/ legal restrictions as above).

9.20.2 Effectiveness

This measure does not contain any binding requirements regarding a specific level of recycled content to be used, however, it is important to prevent market disruption given the lack of data on the technical, legal, and economic feasibility of incorporating recycled content into various packaging applications/materials at this time. It will allow such data to be gathered to inform future policy making and it will send a clear market signal that further regulatory requirements regarding recycled content can be anticipated.

To increase its effectiveness, **this measure should ideally be implemented alongside measure 35 and measure 37**. In this way, economic operators have a chance to adapt to the new harmonised calculation and verification methodology (measure 37) and invest in the necessary supply chain changes before mandatory targets are implemented in 2030 (measure 35).

9.20.3 Ease of implementation

The measure would include a requirement for mandatory declaration of recycled content levels in packaging **within the new Regulation and updating reporting formats in its Annex.** Further work will be required to determine **the types of information that should form a part of the mandatory declaration**, as well as in terms of the gathering, verification, collation and reporting of such data by Member States and subsequently by the Commission.

The use of existing PRO databases, electronic registries and declarations that form a part of other regulatory requirements (e.g. REACH regulations, Regulation (EC) No 282/2008 for food contact applications, Regulation EC No. 1223/2009 for cosmetics applications, etc.) should be considered to identify any potential overlaps and minimise additional effort on the part of Member States. A rapid alert system could also allow Member States to share information and evaluation findings about particular types of packaging and to reduce the need for producers to report the same data for the same type of packaging in several different ways and platforms across the 27 Member States. Data will probably need to be reported at the end of the process in aggregate to protect the commercial interests and sensitivities of business operators.

9.20.4 Administrative burden

The administrative burden associated with ongoing monitoring, gathering and reporting of the data across the entire supply chain would involve some effort, and hence some costs. The costs per firm may not, on average, be significant but a large number of firms would have direct requirements placed on them.

The administrative burden may be more material for SMEs, since the declaration of recycled content is a novel requirement. In general, for plastic packaging producers, it is noted that this effort would be required in any case from 2030 onwards depending on the implementation of the targets proposed in measure 35.

9.20.5 Economic impacts

Given that this measure does not directly incentivise increased uptake of recycled content in packaging, economic impacts relative to the baseline are not anticipated to be significant.

9.20.6 Environmental impacts

As noted above, this measure does not directly incentivise increased uptake of recycled content in packaging, and therefore environmental impacts relative to the baseline are not anticipated to be significant.

9.20.7 Social impacts

The direct social impacts of this measure are negligible.

However, indirect impacts include greater consumer awareness of the sustainability of packaging, the extent of these impacts are uncertain.

9.20.8 Stakeholder views

Stakeholders were largely supportive of this measure, with some expressing concern about the administrative burden in the absence of clear targets.

Some Stakeholders expressed a clear preference for such a system to be adopted across all packaging types prior to the setting of specific recycled content targets, to allow industry and policy makers to adapt to a new framework for recycled content (this is linked closely to the establishment of harmonized definitions and a measurement methodology in Measure 37).

MEASURE 35: MANDATORY RECYCLED CONTENT TARGETS

This measure introduces **recycled content targets and respective information requirements for plastic packaging**. These targets need to be met by economic operators placing packaging on the EU market from the year 2030 onwards.

9.21 Measures 35em Broad targets for recycled content in plastic packaging based on contact-sensitivity for 2030 & 2040 and 35eh Higher ambition, broad targets for recycled content in plastic packaging based on contact-sensitivity for 2030 & 2040

9.21.1 Description of the measure

This measure would set mandatory targets for post-consumer[440] recycled content in plastic packaging from the years 2030 and 2040, with a medium and a high ambition. This measure is similar to measure 35c in that;

- The targets would be applied, based on the methodology for their quantification as explained in measure 37, as a requirement on each item of obligated packaging as opposed to an average to be met across a group of packaging items;

[440] There is no definition of post-consumer in EU law, but ISO 14021 defines it as *"Material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product which can no longer be used for its intended purpose. This includes returns of material from the distribution chain."*

- The basis for the targets would be packaging placed on the EU market, such that they would be implemented by operators monitored and enforced by the Member States.

However, these targets are aimed at three core groups; contact and non-contact sensitive and beverage bottles. “Contact Sensitive” is a term not yet defined in law, but under this measure refers to plastic packaging material that has specific requirements defined by its proximity to sensitive contents such as food, pharmaceuticals and cosmetics. Beverage bottles are already subject to 2030 targets set in article 6(5) of the SUPD and therefore are excluded from the ‘medium ambition’ targets. However, for the ‘high ambition’ targets, in order to be consistent in ambition for all plastic packaging, a target of 50% is also proposed for beverage bottles. See Table for a summary.

When combined, the targets for these three product groups are calculated to provide indicative overall plastic packaging targets of 30%, 40% and 60% for medium, high and 2040 respectively. These are only indicative given that if any of these three groups change relative to each other this will change the overall recycled content proportions.

Table 60. Measure 35e Post-consumer Recycled Content Targets

Product Group	2030		2040
	Medium Ambition	High Ambition	
Contact Sensitive	25%	30%	50%
Non-Contact Sensitive	35%	45%	65%
Beverage Bottles	Already included in SUPD (30%)	50%	65%
Total Indicative across all plastic	*~30%*	*~40%*	*~60%*

packaging (not target)			

9.21.2 Effectiveness

There are many different factors that will influence the effectiveness and feasibility of this measure. The impact cannot be accurately forecast due to the lack of primary data and that this measure is the first of its kind on a global scale. However, the following provides some scenario analysis that can be used to determine which factors and what extend they affect the feasibility of the measure based on the level of the proposed targets.

For context on the size of each group, in the 'high' ambition target, of the 5mt of additional material required, 34% goes into contact sensitive, 52% into non-contact sensitive and 14% into beverage bottles (based on their relative market sizes) – this is summarised in Table 61 showing that this measure is expected to increase the amount of recycled content in plastic packaging by 2,980—11,770kt relative to the 2030 (medium and high ambition respectively) and 2040 baselines.

Table 61. Measure 35e Post-consumer Recycled Content Increases (kt)

Group	Material	2030		2040
		Medium	Ambitious	
Contact Sensitive	Polyolefin	900	1,140	2,900
	PET	160	230	770
	Other	280	340	770
	Total	**1,340**	**1,710**	**4,440**

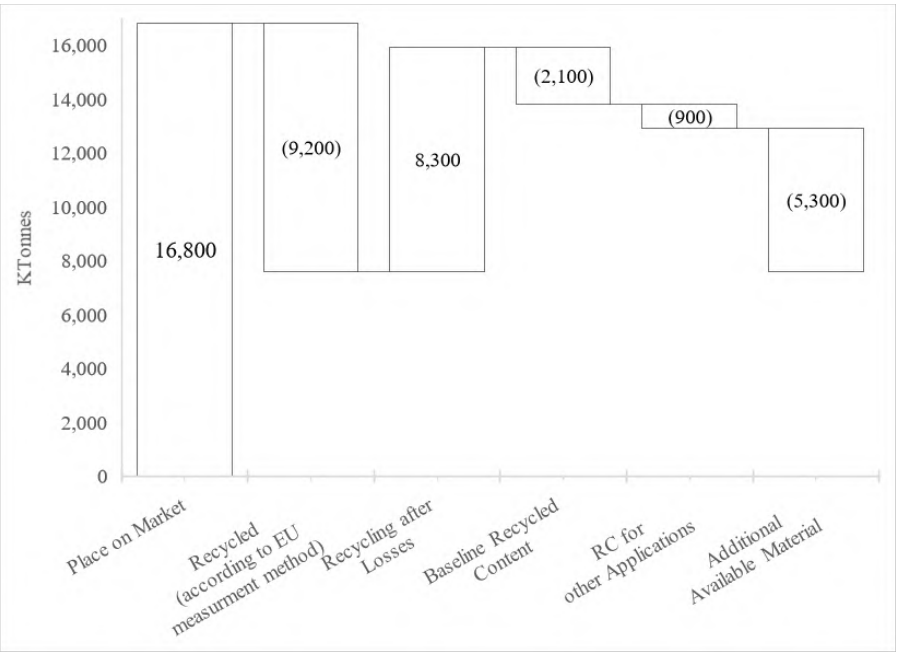
Non-Contact Sensitive	Polyolefin	1,270	2,080	4,940
	PET	40	50	90
	Other	330	440	780
	Total	**1,640**	**2,570**	**5,810**
Beverage Bottles	Polyolefin	-	30	50
	PET	-	670	1,470
	Total	**-**	**700**	**1,520**
Grand Total		**2,980**	**4,980**	**11,770**

With a 55% plastic packaging recycling rate target already set for 2030 in the current PPWD, it is estimated that 9.2mt of recycled *post-consumer* plastic will be available at that point. No material from other sources is included (or expected) because currently plastic packaging is a source of recycled content for other industries (e.g. textiles, automotive). Additionally, recycled plastic for food contact, with its strict requirements, cannot come from non-food contact sources. Given the point of measurement is the point of entering the recycling operation after rejects, it is further estimated that a maximum of 90% of the material (8.3mt) will become plastic recyclates available for the manufacturing of new plastic products. With a baseline recycled content tonnage of 2,100 and 900kt *currently* going to other sectors this means that there will be up to 5.3mt more recycled plastic available compared to 2018 (3.5 times more). See Figure 53 for a graphical presentation of these figures.

It is also calculated that due to the 90% *collection rate* target that already exists for beverage bottles by 2030, an additional 1.8mt of recycled plastic (primarily PET) will also be

available. These additional 1.8mt from plastic bottles are not included in the figure below as this impact assessment does not consider the impact of additional material resulting from SUPD targets. Thus, the total additional potential for recycled content in 2030 would be ~7.1mt.

Figure 53. Plastic Packaging Mass Flow (excluding beverage bottles) – 2030 Baseline



The 'medium' 2030 scenario assumes that around 56% of the additional recycled material available will go directly into plastic packaging whereas the 'high' scenario takes 80% of the theoretically available material. However, the latter scenario relies much more heavily on developments in chemical recycling which will potentially result in greater system losses. The exact material available will depend upon how much chemical recycling capacity is available and utilised for packaging. Currently there are very few alternatives to produce recycled food grade polyolefins, so there is a need for innovation and approval of chemical recycling technology. Additionally, the draft Regulation on *recycled plastic materials and articles intended to come into contact with foods, and repealing Regulation (EC) No 282/2008* is aimed at increasing the availability of plastic recycled content for food packaging by providing a route for authorisation of innovative processes. If successful, this will increase the availability of mechanically recycling plastic from sources other than PET.

Potential chemical recycling outputs are calculated from a membership survey conducted by Plastics Europe and using the "fuels excluded" mass balance allocation method. There will be competition from other sectors, such as the automotive, for the resulting recycled material, therefore it is assumed that 80% will go to *contact sensitive* plastic packaging which allows for other sectors to utilise some of the material as it the case currently. This results in a total

output capacity of 1.7mt for *contact sensitive* plastic packaging polyolefins from pyrolysis. If this total was realised, the theoretically available material would be reduced from 8.3mt to 7.9mt due to the lower overall efficiencies of the process compared with mechanical recycling (noting due to the emergent nature of such technologies, there is considerable uncertainty around exact deployment at this stage).

If, under the 'high' scenario the full 1.7mt of chemically recycled polyolefins will be available for the contact sensitive product group, a ceiling to recycled content begins to be reached given the amount of material available to be used. This scenario, with the inclusion of chemical recycling takes over 86% of the available material (compared to the 80% with mechanical recycling only). If either, more material is sent to chemical recycling or the yields are even less than predicted, there would not be enough material left to reach the targets, unless the losses to other sectors is decreased or recyclates from other sectors enter plastic packaging. Equally, if less chemical recycling is deployed, there will be more material available, but technologies that can produce food grade packaging will be needed to fill the gap.

An output capacity of 0.7mt for PET depolymerisation assumed to go entirely to packaging is also considered with a process efficiency similar to mechanical recycling—therefore deployment of this technology is not likely to reduce the total pool of recycled material in the same way as pyrolysis is likely to.

Additionally, the baseline model assumes that demand from other industries for recycled plastic from packaging will stay static at 900kt. This accounts for around 31% of the total recycled plastic from packaging demand. If this is maintained at 31% to 2030, an additional 1,600kt will be taken by other industries leaving 3,300kt for the packaging industry that required 3,000kt for the medium ambition target (92% of the material). This scenario shows that the medium ambition target is still achievable particularly given the lack of market or legislative drivers for recycled content in order sectors. However, in this extreme case, the high ambition target would be unachievable as there would be a 900kt shortfall.

The results of this measure are also affected by the choice of the other measures in Option 3 and 4. As both options show a significant decrease in plastic waste arising, this also reduces the pool of *additional* available material to be incorporated in recycled content (assuming 1.7mt of chemically recycled polyolefins is deployed). The result is that for both options the 'high' ambition scenario will require close to 100% of the additional available material in order to fulfil the targets. This increases the risk of some plastic packaging products failing to secure the material and the resulting competition increasing costs substantially. Maintaining at least a 30-40% buffer between is the amount of material that is *theoretically* possible to be available (based on the modelled measure) and what might be available in in practice will reduce this risk. Material, movement between packaging product groups, other industries competing for the material, the reliance on the meeting of current recycling targets, and the

current technical limitations to higher levels of recycled content in contact sensitive applications all add to the uncertainty and the risk. This buffer may be reduced once actual data can be collected as part of supporting measures aimed at improving data collection (e.g. Measure 34b on mandatory reporting of recycling content).

The 2040 targets are modelled as aspirational based on the current understanding of the limits to circularity due to quality requirements and loss rates during the collection and recycling process. For example, with PET bottles, to maintain high quality recycled content has a theoretical limit of between 61-75%. This is lowered to 47-56% for other types of PET packaging.[441] The 2040 targets provide the plastic packaging industry with a clear long-term goal that creates a level of certainty around investment decisions.

9.21.3 Ease of implementation

The majority of the considerations for the implementation are identified under Measure 35c, however it is important to reiterate that this measure also requires rules on the calculation, verification and reporting of recycled content against the targets that are covered under Measure 37. A key aspect of this will be to determine an approach to using 'mass balance' as a chain of custody method which is recognised as a key enabler of chemical recycling. This must take into account that the aim should be to create a framework for newer recycling technologies to contribute, but as highlighted in sections on *effectiveness* and *environmental impacts*, excessive reliance on some types of chemical recycling will reduce the overall possible positive impact of the measure and available quantities of recyclates. A recent JRC study confirmed the better performance of mechanical recycling compared to chemical recycling in impact categories, such as climate change, particulate matter and resource use.

Further to this, it is also recommended that the suggested implementing act also include some sustainability criteria which must be met alongside chain-of-custody verification. This can be implemented in a similar way to the REDII[442] and as described for the joint bio-based target under Measure w. As a minimum, determining minimum GHG reduction thresholds will ensure that only recycling that has a positive impact compared to the status quo can contribute to the target. Compared to REDII, fewer (or no) other sustainability criteria may be necessary as the need to regulate bio-mass origin is not the same for recycled content. To reduce the burden on already established recycling processes that have a strong evidence base for high levels of net GHG reduction, exemptions (or a presumption of compliance) to this requirement could be included. Introduction of a minimum GHG threshold is consistent with the intervention logic that aims to facilitate a transition to a circular and low carbon economy.

[441] Zero Waste Europe (2022), How circular is PET?
[442] Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources, available at http://data.europa.eu/eli/dir/2018/2001/oj

However, care must be taken in implementation that this requirement does not suppress the recycling innovations needed to reach the targets.

It is expected that the calculation rules and any sustainability criteria will be set by a Commission implementing act where accreditation criteria and the process will be defined. Member States would be required to appoint a notifying body that would be responsible for accrediting within that MS to the criteria set out in the legislation. To avoid 27 variations to this and economic operators requiring separate certification in each MS, the MS must recognise the notifying bodies in the other MS.

Finally, whilst an implementing act will be required, key definitions must appear in the parent legislation. As the current measure is aimed at creating a minimum requirement for *post-consumer* recycled content this must be defined.

- *Exemptions*

No exemptions to compliance with the target have been modelled although several industries have been consulted about requests for exemptions or extensions to meeting the targets in this measure. The following identifies the key groups that require further investigation during the legislative process which predominantly consist of products that would fall under the 'contact sensitive' target.

- *Medical/Pharmaceutical/Cosmetic Applications*

The medical and pharmaceutical industry commonly use plastic packaging. However, this packaging is subject to strict controls that build on the current Food Contact Regulations. Whilst it is not prohibited in the EU to use recycled content, the barriers are such that very little is used in this industry. The process for testing and verifying new materials can be up to ten years in duration. However, material from chemical recycling (mass balanced and of virgin quality) could be used today with no issue if available. The amount of plastic packaging produced by this industry is not currently known but is expected to be a relatively small proportion of the overall market.

Plastics that come into contact with food for infants and young children are also subject to stricter requirements under 10/2011[443] whereby some types of common plastic food packaging would not be allowable in this application. This extends to recycled plastic, but the lack of supply of food grade recycled plastic more generally is exacerbated by these stricter requirements. For context, according to the industry, baby food accounts for 0.56% of the EU food market, by value.

[443] Regulation (EU) No 10/2011 of 14 January 2011 on plastic materials and articles intended to come into contact with food Text with EEA relevance at http://data.europa.eu/eli/reg/2011/10/2020-09-23

Regulation (EU) 2017/745 on Medical Devices (MDR) and Regulation (EU) 2017/746 on In Vitro Diagnostic Medical Devices (IVDR) govern medical technologies, their packaging, and accompanying information with regards to safe disposal. At the same time, they regulate the need for specific packaging functionalities to minimise the risks for patients and ensure device performance. A recent BCC Research Market Data Report shows that healthcare packaging is 7.2% of overall plastics packaging volume in the EU based on 2019 data. However, this research does not delineate between primary, secondary, and tertiary plastics packaging. The contact sensitive primary packaging is expected to be approximately 25% of the overall mix. Primary packaging is, therefore, estimated to account for 1.8% of overall plastics packaging volume in the EU, with secondary and tertiary packaging accounting for the remaining volume of plastics.

Cosmetics packaging is also subject to requirements although there are no specific regulations governing the inclusion of recycled content in cosmetic produced under 1223/2009[444] (EU Cosmetics Regulation). However, an Implementing Decision for 1223/2009[445] suggest that 1935/2004[446] (Materials and Articles Intended to Come into Contact with Food) could be a useful reference to prove the safety and therefore packaging produced for food contact is likely to also be suitable for cosmetics. According to the cosmetics industry, plastic cosmetic packaging accounts for around 6% of the EU plastic packaging market.

- *Compostable Plastics*

Compostable plastic packaging under this measure would likely be restricted from being placed on the market due to the inability of most compostable plastics to use plastic recycled content. This is possible to address in the following ways:

- To provide an exemption for those packaging products that also adhere to the requirements under measures (29b/d) in the intervention area on compostable packaging
- Extend the definition of recycled content to include other non-plastic waste e.g. producing bio-based plastic from biowastes. This would still restrict compostable plastic made from biomass grown specifically for the purpose.

None of these alternatives apply to fossil-based compostable plastics which would be, in effect, restricted from the market unless they contain the specified proportion of bio-based

[444] Regulation (EC) No 1223/2009 of the European Parliament and of the Council of 30 November 2009 on cosmetic products, available at http://data.europa.eu/eli/reg/2009/1223/2022-03-01

[446] Regulation (EC) No 1935/2004 of the European Parliament and of the Council of 27 October 2004 on materials and articles intended to come into contact with food and repealing Directives 80/590/EEC and 89/109/EEC, available at http://data.europa.eu/eli/reg/2004/1935/2021-03-27

plastic. In reality, exclusively fossil-based packaging plastics are very uncommon as it is typical to blend polymers into compounds to achieve the right level of biodegradability balanced with physical properties.[447] For example, fossil PBAT is often blended with bio-based PLA to produce flexible films with high biodegradation properties.

- *Dangerous Goods Packaging*

Packaging designed to be in contact with chemicals are subject to specific requirements (high molecular weight polyolefins) that can make incorporation of recycled content challenging. Some packaging may also be classified as hazardous waste in itself due to its contents (either as a residue after use or as a disposal means for the contents e.g. hospital waste) and therefore cannot be recycled. The industry already works to ISO 16103:2005 'Packaging – Transport packaging for dangerous goods –Recycled plastics material' which already significantly restricts recycled content. It is therefore recommended that these packaging fall under the 'contact sensitive' target to lower the burden.

- *Multi-material (composite) Packaging*

Packaging that is not principally made from plastic but contains plastic that cannot be separated by hand can be problematic to include recycled content. An example is beverage cartons (and the equivalent for foods) which are comprised of 65-80% paperboard, ~5% aluminium, and 20-30% plastic. These enter a paper recycling process whereby only the board is recycled, although more sophisticated separation and recycling processes have been developed but are yet to be widespread—including these products in the target(s) will likely accelerate this development. The industry is also currently exploring the use of mass-balanced chemically recycled polyolefins and bio-based as alternative feedstocks. The former would potentially count towards this measure and the latter would be excluded.

Currently, composite beverage cartons are excluded from the SUPD target, but are considered to be included (along with food cartons) under "contact sensitive" targets for those parts of the packaging in contact with food. For other layers, targets related to "non-contact sensitive" should apply. An alternative approach is to apply the "contact sensitive" targets for all plastic in the packaging which may be preferable from a verification perspective (maintaining a chain of custody and verification for two streams of recycling content may be challenging).

- *De minimis Thresholds*

[447] Nova Institute (2016) *Market study on the consumption of biodegradable and compostable plastic products in Europe 2015 and 2020*

A de minimis threshold should be considered in the legislation to protect smaller companies from the burden of including recycled content due to the challenges of competing with much larger operators.

The only example of this currently is the recently introduced plastics tax in the UK[448], where producers of fewer than 10 tonnes of packaging per year are exempt from the tax. It is unclear how this threshold was suggested, but it can be considered to be on the extreme low end of the annual capacity for a plastics converter.

A recent report estimated that 20,000 producers of plastic packaging are SMEs[449]. With 20 million tonnes of demand for packaging in the EU (although not all destined for the EU), this would mean, on average, each converter processes 1,000 tonnes of material annually. It would therefore be appropriate that the threshold be set in the 100's rather than the 10's of tonnes given the scale of operations. For example, if a threshold set at 100 tonnes is applied and it affects 10% of plastic packaging convertors (2,000), this would result in reducing the recycled content in the 2030 medium target by 200kt —around a 4% reduction in the total mass of recycled content and ~1 percentage point reduction in the overall average plastic packaging recycled content.

The implementation will also be important, as it is impossible to retrospectively comply with the target requirements once over the threshold, therefore this would need to be based on the previous years' tonnages placed on the market. There would be an admin burden for all organisations that place plastic packaging on the market regardless of size, to declare whether they have met the threshold. Random, periodic, compliance checks by members States may be required.

Importantly, the obligation may not always be on the plastics convertor as this will depend upon how the term 'placed on the market' is defined. This could apply to any value chain actor from the convertor onwards (i.e. one an item of packaging is produced) depending upon the intention.

9.21.4 Administrative burden

As was the case for Measures 35a-c, additional administrative burden is anticipated for the Commission and Member States, including market surveillance authorities, PROs and third-party certification bodies that will be involved and monitoring and verification.

[448] https://www.gov.uk/guidance/work-out-which-packaging-is-subject-to-plastic-packaging-tax
[449] https://plasticseurope.org/knowledge-hub/plastics-the-facts-2021/

Under this measure **there will be an administrative burden for the Commission both in the development of the legislative proposal and subsequent supporting legislation**. This is related to the drafting of the legislative proposal comprising EU taxonomy of packaging categories for assessment, negative list of packaging characteristics, which will need to be regularly updated, and criteria and procedure for accreditation of certification bodies. It will also need to draft an implementing acts on the measurement method for calculation and verification of recycled content (which should be consistent with the implementing act developed for the SUPD).

Member States will have a moderate administrative burden related to the enforcement of this measure at an average of 1.5 FTEs per Member State, resulting in recurring costs of €1.8 million. Member States will also need to accredit the third-party certification bodies, which has been estimated at an average costs of €17,000, by an average of one certified body per Member State,[450] resulting in annualised costs (over 10 years) of €22,000.

o Certification Costs to Industry

Further to the description of the admin burden associated with certifying plastic recycled content under Measures 35a-c, the following estimates the magnitude of these costs. This are likely to be similar for all measures given the assumption that the whole plastics packaging value chain would be affected and the target levels or product groupings will not have a considerable effect.

It is estimated that the EU plastics industry value chain has ~60,000 actors across raw material producers, recyclers, converters and compounders.[451] Packaging accounts for ~40.5% of the end use market for plastics.[452] And therefore it is assumed the same proportion of plastics industry actors are involved in the plastic packaging value chain across the EU (~24,300) and these actors will all required certifying.

A summary of the estimated administrative costs associated with certifying recycled content is presented in Tables 62 and 63. Individual costs have been taken from various existing voluntary schemes and therefore are based on current practice. One-off costs are estimated to be €31-32m and recurring annual costs are estimated at €119-126m. The range reflects that in the future, as the recycled plastic industry develops, the number of actors involved, and therefore certificates required, may increase. For example, currently it is estimated that ~495 recyclers produce 4.3mt of plastics recyclate from packaging across the EU.[453] In order to meet the proposed recycled content targets it is estimated that between 342 and 1,347

[450] Assuming that most certification bodies will operate in several Member States as is current practice.
[451] Based on information provided by Plastic Recyclers Europe
[452] https://plasticseurope.org/knowledge-hub/plastics-the-facts-2021/
[453] Derived from: PRE, 2020, *Report on Plastics Recycling Statistics*, https://www.plasticsrecyclers.eu/_files/ugd/dda42a_2544b63cfb5847e39034fadafbac71bf.pdf

additional operators may be required, depending upon the target level. Some certifiers also charge a price per tonne of material in addition to the business-level costs. These are the only costs which increase as a result of higher targets (i.e. more material). However, these fees are nominal compared with the other fees and therefore the annual cost per tonne of certifying plastic recycled content to meet the targets under this measure are €21 for medium ambition, €13 for high ambition and €8 for the 2040 target.

These costs are based on best available estimates, applied to the plastics industry as it is today. There are some additional nuances that should be considered when interpreting these costs:

- If a harmonised methodology for certifying recycled plastic content across the EU was introduced, the associated efficiencies would likely reduce costs for those currently certifying material – the estimated costs assume one harmonised scheme rather than the several that exist currently.
- There are numerous other factors driving the plastic packaging industry to audit and certify recycled content (e.g. other legislation such as the SUPD and national plastic taxes, EPR eco-modulation, brand / consumer pressure etc.). The industry is therefore already moving towards increasing the amount of certified plastic recycled content, though this measure may accelerate this shift. It not currently known what proportion of the plastics industry is already certifying recycled content, nor is it known how this would evolve in the absence of mandatory recycled content targets, and therefore it is not possible to estimate what portion of the costs presented may be additional to baseline costs. **The estimated costs are therefore an upper limit assuming that no certification is taking place currently and that every value plastic packaging value chain actor requires certification.**

Table 62. Certification One-off Costs

Type of cost	Stakeholder	Cost
Certification scheme registration	Applicant	€6.1-6.4m[1]
Main audit	Applicant	€24.6-25.6m[2]
[1]Based on €250 * 24,640-25,650 applicants. It is possible that the registration fee charged per applicant will decrease as the number of applicants increases.		

[2]Based on 24,640-25,650 applicants * €4,000 main audit cost

Table 63. Certification Recurring Costs

Type of cost	Stakeholder	Cost per year
Applicant administrative costs	Applicant	€66-69m[1]
Annual monitoring audit	Applicant	€49-51m[2]
Certification / Licence fee – per tonne of material	Applicant	€4.1-5.1m[3]
[1]Based on 24,640-25,650 applicants requiring 75 hours to apply for certification and manage the audit process. Assuming €35.6 hourly wage for "ISCO 2 Professionals", Eurostat Structure of Earnings Survey, Labour Force Survey Data for Non-Wage Labour Costs. [2]Based on 24,640-25,650 applicants * €2,000 monitoring audit cost [3]Based on (24,640-25,650 applicants * €150 certification fee) + (€0.10 tonnage fee * 5.1mt of recycled content in packaging)		

9.21.5 Economic impacts

Similar to the other recycled content measures (35a-c) it is expected that the price of recycled plastic –and potentially the price for plastic packaging- will increase, at least in the short term and there are likely to be ongoing process changes required to allow for more incorporation of recycled content. Whilst it is difficult to estimate any increases and whether they will be permanent, there is clear evidence from the rPET market that the introduction of recycled content targets has a direct effect on price well before the 2025 implementation date. This is, in part, also due to the lack of supply which highlights the need to institute mechanisms to increase supply as well as act on the demand side.

At the beginning of 2022 rPET was shown to have doubled in price over the course of a year and became more expensive than virgin PET.[454] The exact price differential frequently changes due to many factors including the price of energy and oil, but if a €100 per tonne price increase were to be maintained across the plastics packaging sector this would be an increase in costs to the industry of €270m annually for the medium ambition 2030 target, using an average of 30% recycled content. For the high ambition targets, the additional costs would be in the order of €500 million annually. To put cost increases into context, for a 13g PET beverage bottle using 100% vPET at €1,000-1,500/tonne the cost of the material would be €0.013 - 0.02 and increasing this by 10% by using rPET would result in a cost of €0.014 - 0.021. This demonstrates that the price increase per packaging is relatively small compared to the likely value of the product itself.

One important additional driver of the price differential is the fluctuation in oil prices that increasing recycling content insulates against—there is no guarantee that virgin prices will become and stay lower than recycled prices. Carrying out recycling and incorporating recycled content within the EU reduces the effect of the uncertainty of oil supply associated with geopolitical issues. In terms of fossil fuel use, the production of one tonne of HDPE requires around 1.05 tonnes of crude oil and natural gas as a feedstock and a further 0.75 tonnes is burned during the process[455]. The medium ambition 2030 target would therefore reduce fossil fuel requirements of the EU by 3.1 million tonnes per year, and the high ambitious scenario by 4.5 million tonnes per year.

It should be noted, that due to the specific challenges faced by the product groups affected by the 'contact sensitive' targets (principally food contact packaging, but also other more niche groups as identified in the *ease of implementation* section), the economic impacts are likely to be significantly higher than for the noncontact sensitive. This is why the targets are set at lower levels compared with 'non-contact sensitive', but there are still considerable uncertainties around exactly how 'contact sensitive' targets will be met given the technological developments (e.g. chemical recycling) required and the economic costs of doings so.

Those economic operators located in Member States that find it challenging to meet the 55% recycling rate targets for plastic packaging may have additional issues obtaining material at a reasonable cost. As previously mentioned, derogation or deferment may be an option if material supply is preventing adherence to the targets. Also, given the production of plastic packaging in Member States is not always consistent with its consumption there will be considerable movement of plastic waste between Member States to those that have greater recycling and/or convertor capacity. The exact impacts of any additional material movements

[454]https://www.packaginginsights.com/news/recycled-plastic-prices-soar-as-rival-industries-dip-into-beverage-producers-supply.html
[455] Plastics Europe (2016), Eco-profile of HDPE

is unclear, but may, to a certain extent, be offset by the material staying in the EU rather than being exported for processing outside.

In regards to the costs distribution throughout the different actors in the value chain, as noted previously, the exact cost pass-through is not known. However, there is a key transfer in revenue from the virgin plastic producers to plastic recyclers. For instance, if it is assumed a 10% increase in the price of recycled plastic, converters and subsequently retailers will have increased costs accordingly. Therefore, if these costs are passed through to the retailers and thus to the EU citizen/consumer, there could be an increase in prices of appx. €270 annually. This should be balanced against the environmental monetised benefits to society of €770 m which results in an annual benefit of €1.70 per EU citizen.

9.21.6 Social Impacts

There is likely to be job creation, although the benefits of this may not be entirely attributable to this measure. An increase in recycling rate is required for a corresponding increase in recycled content and this is supported by the existing PPWD target for plastic packaging of 55%. This measure does help to ensure 'high quality' recycling that is required for circular applications. Member States working towards this recycling rate target will necessarily need to invest heavily (and facilitate industry investment) in collection and sorting. What is uncertain is the final destination of the collected plastic. A large proportion may currently be destined for export outside of the EU, but the introduction of a recycled content target for plastic packaging ensures that more will stay within the EU. This means that there is likely to be an **increase in plastics recycling related jobs in the EU** (and a slight corresponding decrease in jobs related to residual waste treatment). For the current measure this is estimated to be between 26k (medium 2030), 43k (high ambition), and 100k (2040) of additional jobs (FTEs) although it is unclear just how many of these would have been created without this measure. Increased employment is based upon an increased number of jobs associated with collection and reprocessing of plastic waste (9.3 FTE per 1,000 tonnes) and a corresponding decrease in residual waste collection and treatment (0.7 FTE per 1,000 tonnes).

One area that these additional jobs are likely to be realised is in research and development of new recycling technologies. The legal certainty that introducing a requirement for recycled content provides, will accelerate these developments and increase investment due to greater financial incentive.

The other key social impact will also be on health due to the reductions in GHG and AQ impacts resulting from the reduced need for primary material. There should be no negative health benefits to consumers as a result of incorporating more plastic recycling content in food packaging due to how highly regulated this is currently and will continue to be.

9.21.7 Environmental impacts

This measure reduces the requirement for manufacture of virgin raw materials and the disposal in residual waste of the plastic packaging waste. The calculation of GHG emissions takes into account a split of chemical and mechanical recycling with the assumption that all additional recycled content required to meet the targets for contact sensitive plastic comes from chemical recycling. This results in 35-40% of polyolefins and 10-20% of PET coming from chemical recycling. The exact proportions are unknown, but the more chemical recycling is deployed, the smaller the GHG reductions will be due to higher energy use and lower efficiencies (Table 64).

Table 64. Summary of Environmental Impacts for Measures 35em and 35eh

Indicator	2030		2040
	Medium Ambition	High Ambition	
Change in GHGs, thousand tonnes CO_2e (1)	-6,500	-12,000	-28,400
Change in water use, thousand m^3 (2)	-540	-930	-2,200
Change in GHG + AQ externalities, m€ (2)	-710	-1,350	-9,250

(1) Includes mechanical and chemical recycling mix
(2) Uses only mechanical recycling for all recycled content

The results should be treated with caution given the uncertainties round the exact deployment of technologies and the fact that the impacts are likely to vary considerably even within the same technology group. GHG emission data for chemical recycling is becoming more common but is still based on early stage demonstrator facilities. These facilities could both improve in future due to advances and economies of scale, but also the difficulties in

obtaining inputs of homogenous plastic waste streams without excessive contamination could also affect yields and subsequently reduce any benefits.

Despite the unreliability of the data, the overall conclusion that chemical recycling technologies do appear to have higher GHG impacts than mechanical recycling is the important aspect to consider. The same trend is followed in the resource use impact category according to a upcoming JRC study. For example, for the 2030 medium ambition targets, the GHG reduction would be around 6,500kt CO_2e.

9.21.8. Stakeholder views

Stakeholders consulted for this measure (and previously for recycled content in general) are generally in favour of plastic packaging recycling content targets in order to help drive the demand for plastics recycling and increase the circularity of plastic packaging. However, there are some concerns around the potential to switch to other materials if the measure results in high costs or unavailability of material.

This measure is aimed at addressing the concerns voiced for measures 35a and b that either were not considered to be granular enough (an overarching single target) or are overly complex with too many product-specific targets. The key distinction between contact and non-contact sensitive, particularly with regard to food grade applications has been well received given the challenges of the former. Given those challenges, many stakeholders also expressed the need for increase the number of authorised recycling processes beyond that of PET in order to meet the proposed targets. This, combined with the uncertainty around the deployment of new recycling technologies such as chemical recycling, means that there are calls for the targets to be re-evaluated in ~5 years to avoid unnecessary market prohibitions if the material is not available. There are concerns that without a right to priority access that other industries (potentially with higher margins) may out-compete the packaging industry for the material.

MEASURES ANALYSED IN DEPTH BUT NOT CARRIED FORWARD TO THE OPTIONS TABLE

Assessment of measure 35a: Material-specific target for plastic packaging (same target average across all plastic packaging, applied at brand level)

Description of the measure

This measure suggests the introduction of a target of minimum average percentage (by weight) of recycled plastics to be used in across all plastic packaging placed on the EU market. The target would be set at the level of:

- 25% (low ambition) - considering the supply of adequate quantity and qualities of recycled plastics
- 30% (medium ambition) - based on consultations with stakeholders and current technical, economic and legal barriers
- 40% (high ambition) - considering that recycling capacity increases over years.

These **targets would apply at level of individual brands** which are placing packaged products on the market. Exemptions might be required in the form of a *de minimis* threshold based on sales volumes, so that smaller brands are not disproportionately impacted. Further exemptions might be considered for brands specialised in a single type of product which cannot meet packaging recycled content targets due to other legal restrictions based on consumer health and safety concerns (pharmaceuticals, for example).

To ensure flexibility, these targets would apply as an **average target across the packaging portfolio of a particular brand**. This means that some types of packaging may exceed the recycled content target in order to make up for those in which such high levels of recycled material incorporation are not yet technically or economically feasible.

Data reported to PROs will form the basis for monitoring and verification activities, which will need to be collated, verified, and published by the Commission at the EU level, while Member State market surveillance authorities will be tasked with enforcing compliance and audits.

Effectiveness

The use of recycled plastic in packaging is expected to increase from ~12% in the baseline on average at present to a **level of ~15% average recycled plastic content across all plastic packaging by 2030.**

The table below summarises the estimated increase in recycled plastic material use (expressed in both tonnes and percentages) as a result of the measure, modelled at different target levels relative to the 2030 baseline. These figures do not take into account any exemptions for small producers that may be necessary and should therefore be considered as an optimistic estimate.

Table 65. Estimated additional recycled plastic uptake for Measure 35a

2030 proposed target level	**Estimated additional recycled plastic uptake in packaging relative to 2030 baseline**

	(Thousand tonnes)	(relative to baseline of 15%)
25%	~+2,100	~+10%
30%	~+3,100	~+15%
40%	~+5,200	~+25%

Given that the target is set as an average to be achieved by brands across all plastic packaging, it is not expected that all packaging types will achieve the target level, with some going beyond this to make up for those that (due to legal or technical constraints) cannot. Plastic packaging includes plastic beverage bottles, which are already subject to a 30% recycled content target in 2030 under the SUPD and may go further than this to support the attainment of these new PPWD target.

Increased level of recycled content will be achievable in non-PET food contact plastic applications by 2030. Several food contact applications besides beverage bottles already do incorporate some recycled plastic content, albeit at relatively low levels. Based on this assumption, for a given target level, the average recycled plastic content levels in 2030 are expected to be achievable for both food contact and non-food contact applications.

The targets are likely to be effective in improving the environmental performance of packaging by reducing reliance on virgin materials.

This measure may need to be accompanied by a requirement for Member States to separately collect all plastic packaging for recycling, to guarantee the supply of recycled materials (to the extent possible) to obligated brands that otherwise have no access to the necessary recyclates. This would suggest some scope for additional collection, sorting and recycling of plastic packaging waste streams, though the likely magnitude of this impact is uncertain.

Ease of implementation

Considering that the target is set at the brand level and is applied as an average across all plastic packaging, this measure allows a degree of flexibility in compliance, and prevents unintended risks of market disruption due to perverse incentives. However, the full

implementation of **the measure is likely to be challenging to implement**, in particular in relation to monitoring and verification due to the lack of previous experience in the field.

Administrative burden

Additional administrative burden is expected for the Commission and Member States, including market surveillance authorities and PROs, given the challenges set out above.

For brands: they will have a one-time cost to register their obligated packaging at a more detailed level of granularity, and to subsequently report recycled content levels annually to demonstrate compliance will also arise. Moreover, they will have a high administrative cost for compiling the necessary data across their packaging supply chains and undertaking the necessary calculation and verification procedures.

Packaging converters and plastic producers will need to comply with any verification processes, which may require them to collect and report additional data.

Economic impacts

In the **short term**, **increased demand for recycled plastics might drive prices up** with a corresponding increase in plastic packaging production costs (which may be transferred to brands, and onwards to the consumer). There may be additional costs associated with changes to production processes that will be necessary to allow greater quantities of recycled plastics to be incorporated in packaging. It is noted that in the high target level scenario (40%) in particular, it is more likely that brands will switch to other packaging materials for some of their products to avoid excessive costs. Smaller brands, who are less able to absorb these cost fluctuations and compete with larger brands, might be more highly impacted.

In the longer term, as volumes of recycled plastics on the market increase, and confidence in the availability of end markets increases, prices should stabilise or decline. In addition, higher values for recycled material could have the effect of reducing net costs paid by producers to cover the costs of meeting recycling targets (as per the revised EPR requirements).

Given that a small number of large brands are responsible for a disproportionate majority of packaging placed on the EU market, **an exemption for SMEs could therefore be considered to prevent negative impacts on competition and innovation in the EU market**. The requirements should apply to all brands, including importers and e-commerce fulfilment operators, to ensure that the competitiveness of the EU plastic packaging value chain is not disproportionately impacted.

A positive economic impact is anticipated in the form of R&D investment to develop new packaging production processes, sorting and recycling technologies, and plastic packaging formats to enable the targets to be met in increasingly cost-efficient ways over time.

Finally, the willingness to pay for packaging that includes recycled content varies in different Member States, and there may therefore be uneven distribution of packaging and costs by brands (with packaging incorporating more recycled content placed in those Member States where willingness to pay for such packaging is higher).

Environmental impacts

Considering the uncertainty associated with the impacts of the measure on recycling level and plastic packaging production processes, the environmental impacts modelled focussed on a change in materials used, assuming that virgin plastic materials are directly substituted by recycled counterparts.

The table below summarises the impacts in terms of the change in GHG emissions relative to the baseline, as well as the change in the cost of environmental externalities relative to the 2030 baseline (including not only GHGs but also air quality externalities). The impacts are compared across the three levels of the target proposed – as expected, greater positive environmental impacts are associated with higher levels of targets.

Summary of Environmental Impacts	**25%**	**30%**	**40%**
Change in GHGs, thousand tonnes CO_2e	-4,330	-6,640	-11,270
Change in GHG + AQ externalities, € million	-1,180	-1,810	-3,070

Social impacts

The net impact on employment is unclear, since the target will not be applied to all plastic packaging, but as an average. Some additional positive impacts on employment relative to the baseline may similarly be anticipated if an increase in plastic packaging waste collection and recycling is realised, though this is uncertain.

Stakeholder views

Stakeholders broadly supported the introduction of a material-specific target for plastic packaging (average across all plastic packaging), noting the need for flexibility in the

attainment of targets. In terms of implementation, concerns were raised regarding the administrative burden involved with the calculation of an average target, the nature of enforcement activity and the potential for this measure to penalise small, specialised brands in favour of large multinationals.

Measure 35b: Product-specific targets for plastic packaging (average across each of 5 plastic packaging product groups, applied at brand level)

Description of the measure

At present, consistent and reliable data on current and future feasible levels of recycled content by plastic packaging type are lacking. Specifically, in terms of the level of granularity required to specify targets not only by application but also by contact and polymer sensitivity.

Therefore, **average targets are proposed at for 5 priority packaging** types below, using broader groupings. There is flexibility regarding the specific applications and polymers that will achieve higher levels of recycled content to potentially offset others so that, on average, the group's target is met. These packaging groups, and the levels proposed for each, are shown in the table below:

Packaging group	Proposed 2030 target
Plastic bottles, flasks, carboys and similar articles (<5L in capacity) including their caps and lids (including contact sensitive applications in this category)	55%
Plastic pots, jars, tubs, trays, punnets and similar articles (including contact sensitive applications in this category)	15%
Plastic films used in primary packaging applications including pouches, bags, liners, peel-off lids, wraps, etc. (including contact sensitive applications in this category)	25%
Plastic films used in secondary packaging applications including stretch and shrink wrap, liners, sacks, bubble packing, envelopes, etc. (including any contact sensitive applications in this category)	70%

Plastic crates, pallets, boxes and bulk storage containers and similar articles (including any contact sensitive applications in this category)	70%

Effectiveness

Overall, the measure is estimated to impact 55% of all plastic packaging (based on data from Germany for the year 2017-18)[456], with an average recycled plastic content of 45% across impacted plastic packaging types. This represents an increase in levels of recycled plastics of ~25% relative to the baseline, corresponding to an additional ~5,250 thousand tonnes of recycled plastic material used in the packaging sector.

Ease of implementation

Considering that this measure is very similar to that described in Measure 35a with targets as averages across the EU market implemented at the level of brands, the ease of implementation can be considered very similar too. However, it would require additional effort for the Commission to define the product categories and related guidelines.

Administrative burden

The administrative burden is very similar to the one of Measure 35a. However, given that each individual target must be implemented, monitored and enforced, there may be additional burden associated with the need for additional data reporting, interrogation and publication. Moreover, a mechanism needs to be established to ensure compliance for imported packaging without creating a barrier to trade.

Economic impacts

The economic impacts will be similar to those of Measure 35a but larger, with the effort needed higher than the effort needed to meet the 40% target under Measure 35a. However, the distribution of these impacts will be different, **focussed on the producers of the packaging types that are subject to the product specific target**s, while producers of other types of plastic packaging will face no additional costs.

[456] GVM Gesellschaft für Verpackungsmarktforschung mbH for BKV GmbH (2020), Study: Potential for the Use of Recycled Plastics in the Production of Plastics Packaging, available at https://www.bkv-gmbh.de/studies/potential-for-the-use-of-recycled-plastics-in-the-production-of-plastics-packaging-in-germany-gvm.html

Environmental impacts

The table below highlights the scale of these impacts specific to the product-specific targets proposed in this measure. The impacts of each of the five categories would be proportional to the tonnage of recycled content uptake per packaging type.

Table 66. Summary of Environmental Impacts for Measure 35b

Summary of Environmental Impacts relative to baseline in 2030	
Change in GHGs, thousand tonnes CO_2e	-11,300
Change in GHG + AQ externalities, € million	-3,070

Social impacts

The social impacts of this measure are anticipated to be very similar to those discussed in Measure 35a. However, the distribution of these impacts will be different, focussed on the supply chains of the packaging types that are subject to the product specific targets, while there will be no change in employment impacts associated with other, non-obligated packaging types

Stakeholder views

Stakeholders highlighted the benefits of this measure in ensuring recycled plastic materials towards the specific applications, as well as in making implementation and enforcement more straightforward. Some preference was indicated for making targets even more focussed. However, given the lack of data at present regarding current and future potential recycled content levels at this level of granularity, stakeholders agreed that there was significant risk of unintended consequences if such targets were set without underpinning analysis.

Questions were raised regarding the framework of incentives created by application specific targets, whereby packaging applications in which recycled content is most easily integrated are currently being burdened with higher targets (and any associated costs) compared to those with lower potential to include recycled content.

Measure 35c: **Detailed targets based on contact-sensitivity**

Description of the measure

This measure would set **mandatory targets for recycled content in plastic packaging from the year 2030** onwards, with the following key differences in design from those in 35 a and b:

- The targets would be **applied as a requirement on each item of obligated packaging** as opposed to an average to be met across a group of packaging items;
- The **targets would be differentiated based on types of application and contact sensitivity** as opposed to broader product groups or material.

The proposed categories for such targets and the associated target levels are provided in the table below:

Packaging Category	*2030 proposed target*	*2035 proposed target*
Contact-sensitive rigid packaging		
Primary packaging	30%	50%
Secondary/ tertiary packaging	10%	25%
Contact-sensitive flexible packaging		
All (primary, secondary, tertiary)	10%	25%
Non-contact-sensitive packaging		
All (primary, secondary, tertiary)	50%	70%

A distinction is made firstly between contact-sensitive and non-contact sensitive packaging. This reflects the current legal requirements for several packaging applications that present potential risks to human health and safety. Therefore, the targets for non-contact sensitive plastic packaging are initially proposed to be higher than those for contact-sensitive counterparts. It should be noted that the terms contact sensitive and non-contact sensitive are not currently defined in EU law.

A further distinction is made between rigid and flexible packaging, though only in the context of targets for contact-sensitive packaging applications. This reflects the fact that recycled PET is the only recycled plastic polymer that can currently be used widely in food contact and other similar applications based on the relevant regulation. Given that contact-sensitive packaging made of rPET is therefore not restricted in the same way as contact-sensitive packaging made of other polymers, and that rPET is technically more suited to rigid packaging applications than flexible ones, it follows that the targets for contact-sensitive rigid packaging should be higher than that for contact-sensitive flexible packaging.

As was the case in the use of the term "non/contact sensitive", the terms **rigid packaging and flexible packaging are commonly used across industry, though no legal definition** currently exists in EU law. Therefore, this term requires further definition to ensure that plastic packaging with both rigid and flexible properties are clearly classified.

Similarly, a final **distinction is made between primary and secondary/ tertiary applications**, in the context of contact-sensitive rigid packaging only. This is because within the contact sensitive rigid packaging category, rPET is mostly used in primary packaging applications (bottles in particular), rather than in secondary/tertiary applications. Hence, the targets for contact-sensitive rigid primary packaging are higher than that for the relevant secondary/tertiary sub-category, in which the only ways to increase recycled content at present would be a switch to PET materials or multi-layer production with a recycled mid-layer encapsulated in virgin inner and outer layers. This would risk creating too much competing demand for limited supplies of rPET and the potential for material shifts and packaging designs that changes that could have negative environmental or regulatory consequences.

With regards to the use of the terms "primary," "secondary," and "tertiary" packaging, Article 3(1) in the PPWD already provides a useful basis for distinction between these types:

> *Packaging' consists only of:*
>
> *(a) sales packaging or primary packaging, i. e. packaging conceived so as to constitute a sales unit to the final user or consumer at the point of purchase;*
>
> *(b) grouped packaging or secondary packaging, i. e. packaging conceived so as to constitute at the point of purchase a grouping of a certain number of sales units whether the latter is sold as such to the final user or consumer or whether it serves*

only as a means to replenish the shelves at the point of sale; it can be removed from the product without affecting its characteristics;

(c)I transport packaging or tertiary packaging, i. e. packaging conceived so as to facilitate handling and transport of a number of sales units or grouped packagings in order to prevent physical handling and transport damage. Transport packaging does not include road, rail, ship and air containers.

However, this is unlikely to be sufficient to support the implementation of the targets above, as in many cases, these definitions can be interpreted to imply that some forms of secondary packaging may also be considered to be primary packaging, e.g., a multipack of crisps potato chips in which the smaller individual packets within the larger are not meant to be sold to the consumer individually. This has resulted in some forms of secondary packaging being produced to the same specification as primary packaging since the final intended use of the secondary packaging is not clear. For example, crates and pallets used for food-contact applications are often manufactured using to align with food contact requirements to reflect the fact that the food items contained within them are not always protected by primary packaging (e.g., loose fruit and vegetables). **Therefore, it would be important the determination of which target should apply in such cases. Finally, the definitions of primary, secondary and tertiary packaging should be updated and made fit for purpose for the implementation of the targets.**

Effectiveness

The inclusion of contact sensitive packaging types in the targets is also likely to result in **higher quality recycling and materials being targeted at higher value applications** than would be the case in either measures 35a or b. However, these impacts are associated with certain risks of unintended consequences, which may result from switches between packaging types and heightened competition for secondary materials for which demand may outstrip supply.

A target is already set in article 6(5) of the SUPD for SUP beverage bottles in 2030 (which would fall under the category of rigid contact sensitive primary packaging). The target level of this measure has therefore been set at 30% in 2030, to ensure that there is no conflict with the level set in the SUPD. However, a key difference lies in the fact that the SUPD targets may be implemented as an average across a group. Conversely, **the targets proposed by this measure require that each packaging item in the relevant category attains a minimum level of 30% recycled conten**t – including the rPP and rHDPE SUP beverage bottles that for the same reason did not necessarily have to meet this target as per the SUPD requirements.

The packaging in the rigid, contact sensitive, primary packaging category can feasibly be subject to a higher target than the 30% for the plastic beverage bottles in the SUPD in 2030.

Ease of implementation

Member States will be required to report to the Commission against minimum targets for the proportion by mass of "recycled plastic content" that must be contained in each item of packaging belonging to a specific category that is placed on the EU market. **A framework for calculation and verification against these targets must be established**. In terms of monitoring and enforcement, Member States should be encouraged to make use of existing electronic registries and PRO reporting databases as a mechanism to gather the necessary data, which would ideally be harmonised in content (see measure 42).

This is therefore closely **linked to measure 37**, creating a **requirement for the Commission to establish an implementing act to set out the calculation and verification methodology** by a certain date in advance of the enforcement of the targets, as well as the timeline for Member States to report against these targets (e.g. per calendar years, with reporting a maximum of 18 months after the date of implementation–- July 2032 for the targets first enforced in January 2030). **Market surveillance authorities should be empowered to support monitoring and enforcement** activities at the level of obligated economic operators, which is enabled by the application of the targets at the packaging item level, along with a certification process.

Finally, given the above considerations around the structure and level of these targets, as well as the current limitations of this proposal in terms of a lack of robust data and analysis, this measure in its current form is associated with a high degree of uncertainty and risk of unintended market consequences. Therefore, the following supporting framework of implementation is proposed to reduce the potential trade-offs of this measure:

- A provision should be made within the revised PPWD to allow the Commission to revise these targets in a delegated act, allowing time to monitor the data arising from the reporting requirement above and market developments in terms of the supply and demand of requisite recycled plastics to meet these targets.
- The measure should be implemented alongside measure 34, so that reporting on recycled content levels by economic operators to Member States and, subsequently, the Commission, is made mandatory for all packaging placed on the EU market, followed by the implementation of targets for recycled plastic content levels in plastic packaging in 2030. This allows valuable data to be gathered to inform any necessary amendments to the targets set above and allows economic operators to adjust their supply chains and practices in line with new verification procedures before the mandatory targets are imposed.
- The measure should be implemented after further development of measure 37 and in view of the results from the Commission's ongoing work to develop rules on the calculation, verification and reporting of recycled content against the targets in article 6(5) of the SUPD and more broadly applicable thinking emerging from this work. This is because:
    - Decisions regarding the specific materials that may count as 'recycled' for the purposes of the target and the acceptable methodologies for chain of custody verification and for allocation rules under 'mass balance' (particularly relevant to chemical recycling) against this have a direct bearing on the approach and

ability of the market to meet the targets and therefore the levels at which the targets should therefore be set;

- The combination of these factors will effectively establish a framework of incentives for increased investment in the use of specific plastic packaging materials and types, as well as in recycling infrastructure to support increased quantities of specific recycled plastic outputs of a certain quality; and
- In the absence of a regulatory framework of verification that encourages transparency and, proportionality, and reliability that is considered reliable by civil society and consumers, broad support for recycled plastic uptake may result in greenwashing and a lack of credibility among consumers at best, and a shift to sub-optimal systems of recycling with negative environmental consequences at worst.

Administrative burden

Administrative burden is anticipated for the Commission and Member States, including market surveillance authorities, PROs and third-party certification bodies that will be involved and monitoring and verification.

Following these implementing steps, as with measures 35 a and b, a **one-time cost to economic operators to register their obligated packaging at a more detailed level of granularity** (rigid vs flexible, contact vs non-contact sensitive, primary vs secondary vs tertiary), and to subsequently report recycled content levels annually to demonstrate compliance will also arise (cost estimates on this are done for measures 35e).

The additional ongoing administrative burden to these operators associated with meeting the targets and coordinating across packaging supply chains to compile and report the necessary data will likely be high. However, this should be lower than the burden associated with also determining the best allocation of recycled materials across a packaging portfolio and calculating the average, as was the case in measures 35a and b, since here, each and every item of packaging must meet a clearly predetermined target.

Further down the supply chain, **packaging converters and plastic producers will need to comply with any verification processe**s, which may require them to collect and report additional data. Food contact packaging producers that currently do not use any plastic recycled content and are therefore not subject to Commission Regulation (EC) No 282/2008 may also have to bear costs associated with complying with this regulation in the future.

Economic impacts

A quantitative assessment of the economic impacts of measure 35c has not been feasible. However, in qualitative terms, the economic impacts are anticipated to be broadly similar to those discussed in the assessment of measures 35a and b, but with a potentially important difference of more directly driving investment in innovation and infrastructure for non-mechanical recycling and more advanced forms of mechanical recycling.

It is noted that given the application of the target on each packaging item rather than as an average across a group, a further likely outcome of this measure within the contact sensitive rigid primary packaging category is a shift from the use of other recycled polymers to rPET in the manufacture of most of such packaging. This effect will be more pronounced at higher levels of the target, due to the stringent requirements on the use of recycled plastics in contact sensitive applications that to date only rPET can be used to achieve. This may result in significant market disruption, particularly if the desired quantities of rPET cannot be supplied to meet the targets, or the targets are set too high in this regard. To some extent, the SUPD requirement for a 90% collection rate for SUP bottles will mitigate against this risk, by increasing the supply of waste PET bottles that can be reincorporated in the packaging sector. However, competition for this high quality, homogenous material is already intense, both within the packaging sector and across others (e.g. a large amount of rPET is currently used in the textiles sector). T**here will be significant demand from the beverage sector driven by brand commitments as well as mandatory targets, and the low yield of material from non-bottle PET packaging waste recycling processes may exacerbate a structural deficit in rPET supply to some parts of the market (**e.g. pots, tubs and trays). This limited supply coupled with competition and high levels of demand would push rPET prices up, stimulating the recycling industry but effectively driving out smaller packaging producers and supply chain operators who are not able to compete. It is therefore suggested that provision should be made to revise the proposed targets prior to 2030 based on the development of the market till that date. Exemptions for SMEs may also be considered to mitigate against these impacts, although this would result in some reduction of the effectiveness and environmental benefits associated with the measure.

Similar consideration must therefore also be given to the setting of **the targets for contact-sensitive flexible packaging**, in which the potential for the use of rPET to achieve the targets is limited. Instead, in this case, it is anticipated that **non-mechanical recycling technologies will play a significant role** in ensuring that recycled materials of the necessary quality (to satisfy the legal requirements for contact sensitive applications) and quantities (to meet the targets) are available on the market. This is clearly subject to significant uncertainty, however, given that such technologies are nascent and are yet to be fully assessed and evaluated for their environmental impacts (note ongoing work at the JRC to clarify the role of such “chemical recycling” and “physical recycling” technologies as recovery or recycling operations).

An alternative (or complementary) channel may be through advances in mechanical and chemical recycling that, with further investment in research and development, may have the ability to achieve the quality necessary to satisfy the legal requirements for contact sensitive applications.

Social Impacts

The social impacts of this measure are anticipated to be very similar or higher to those discussed in Measures 35a and b above, having a long-term positive impact on employment in the recycling sector. However, as the measure has not been subject to a quantitative impact assessment, the magnitude of such impacts is not clear.

Environmental impacts

This measure has not been subject to a quantitative impact assessment, in the absence of which the environmental impacts cannot be estimated. However, the environmental impacts of the measure are anticipated to be positive, in line with and potentially greater than the discussion in measures 35a and b above, resulting from the substitution of virgin plastic materials and increased recycling of plastics. In addition, given that the measure requires a fixed minimum target for all packaging items placed on the EU market, it is anticipated that the impacts will likely be of a higher or similar magnitude to those described in measure 35b, with targets applying to each and every item of packaging and with a more targeted impact on encouraging recycled plastics to be utilised in higher value packaging applications beyond PET to a greater extent than in 35 a and b.

Stakeholder views

The stakeholder views on measures 35a and b have been used to inform the description of this measure. This includes consideration of the differences in contact-sensitive and non-contact sensitive packaging applications from the perspective of technical and legal feasibility to incorporate recycled content, as well as concerns about the potential enforceability and administrative burden associated with measures 35a and b. However, this measure was added to the study following the completion of all stakeholder engagement activities and workshops, and therefore has not been presented to stakeholders for further feedback and refinement.

Measure w: Targets for bio-based content in plastics packaging, integrated into the recycled content targets

Introduction

Conventional fossil-based plastics pose challenges for the environment throughout their life-cycle and there is a clear mandate to move towards a low carbon economy. Biobased plastics are considered to be an important way of reducing reliance of fossil fuels and therefore reducing GHG emissions. The key issues identified are:

- Lack of standardised methodologies and criteria for assessing sustainability;
- Lack of agreed labelling and certification criteria for biobased content.
- The confusion around the differing proposed benefits of biobased biodegradable/ compostable vs non-biodegradable/compostable.
- There is a lack of a level playing field between biobased and fossil-based plastics
- (Mandatory) compostable plastics cannot be made from using RC

The following measure therefore proposes to address these problems with the aims to:

- Increase the use of biobased plastic packaging with environmental benefits;
- Increase transparency of sustainability of biobased feedstocks for plastics packaging; and,
- Reduce environmental impacts from plastic packaging.

Description of the measure

This measure is predicated on the implementation of a recycled plastic content target and therefore is designed to work alongside Measure 35e. Measure 35e specifies three recycled content targets for plastic packaging based on whether or not the end use application is 'contact sensitive' and is placed on the economic operator for each individual plastic packaging item placed on the market in the EU. **The current measure proposes that the economic operator may also choose to fulfil the same targets by incorporating biobased plastic (BBP) instead of, or alongside recycled content ("joint target").** It is also proposed that the biobased content must also meet sustainability criteria in a similar way to which biofuels are required to do so under the recast Renewable Energy Directive (REDII)[457]. This requirement will ensure that the net release of fossil-based carbon is lower overall in comparison to current fossil-based plastics. Furthermore, minimum GHG reductions should be set at an ambitious level for 2030 (e.g. 30% net reduction) and could then be raised again for 2040 to incentive further improvements and forge a pathway towards net zero for packaging plastics.

o Determining Environmental Equivalence

If a joint target is to be set, determining equivalence between biobased and recycled content is an important part of the justification. However, the system boundaries of the two are very different and not directly comparable without setting particular cut-offs. These may include:

- Comparing against primary material production (i.e cradle to gate), not the full lifecycle as the material producer will not reasonably be expected to know what takes place downstream (e.g. processing etc.).
- Benefits of avoided waste treatment of the recycled material are included – in the below example this is incineration with energy recovery. It should be noted that without this 'credit' chemical recycling is significantly worse than primary fossil production.
- Biogenic carbon is set to zero – this is important for cradle to gate and assumes the carbon will be released at end of life. This is a conservative approach which excludes carbon sequestration benefits from recycling. While the industry on biobased plastics argues to include this carbon sequestration, at this moment there is no scientific consensus doing so. Awaiting this consensus, a conservative approach is valid.

[457] Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources, available at http://data.europa.eu/eli/dir/2018/2001/oj

Table 8 shows example comparisons given the above assumptions between current primary production of the two main packaging polymers and the alternatives based on a target of 25% (medium ambition for *contact sensitive* applications under Measure 35e). Invariably, the benefit gained from including mechanically recycled material is higher than including biobased as emissions from the recycling process are lower than that of the biobased value chain (taking the conservative approach noted above. Further, some biobased plastics might have higher GHG reductions). In order to reach parity, both the biobased content and the GHG benefit threshold would need to be increased to ~65% which is likely to be an unrealistic threshold to meet (i.e. 65% biobased content with a 65% GHG reduction). Compared with chemical recycling of polyolefins (pyrolysis) the difference is smaller whereby increasing only the emissions reduction threshold to 50% will achieve parity.

Table 8 - Polymer Production GHG Emissions (tonnes/tonne material)

All targets set at 25% content in line with recycled content targets setting activity (Measure 35e).

	Primary Fossil	25% Biobased Content *	25% RC - Mechanical Recycling	25% RC – Chemical Recycling
PE	1.85	1.71	1.11	1.62
PET	2.19	2.03	1.36	1.63

*Works on the assumption that a minimum GHG reduction threshold is set at 30% - this would form part of 'sustainability criteria' built into the legislation. A similar threshold could also be set for chemical/advanced/innovative recycling.

Effectiveness

In creating a joint BBP and recycled content target, the plastics packaging industry are presented with more options for compliance. In theory this should result in the target(s) being easier to achieve and therefore there creating a justification for raising them accordingly.

A 30% reduction in GHG emissions for BBP can be considered as a high threshold given the state of the market today, however only 25% of the BBP packaging market would need to achieve this by 2030 in order to meet the proposed joint target. Table 67 shows a potential scenario to demonstrate how a joint target might affect the point in which it is set. The baseline 2030 scenario assumes the same market share is kept with a CAGR of 4.5% from 2018.[458]

There is no way of determining at this stage, the exact effectiveness of the measure (resulting in an increased uptake of BBP in EU packaging), however the modelled scenario assumes the market share doubles by 2030 (an unprecedented CAGR of 14%). Thus, the BBP meeting the GHG threshold would yield 300 ktonnes, which is 1.4% of the overall plastic packaging input. This is potentially the percentage points in which a joint target could be increased by to compensate (e.g. a 25% target increased to 26.4%). In practice, this difference is well within the realm of error/accuracy for such a target and therefore raising accordingly does not appear to be beneficial or justified.

Table 67. Biobased Plastic Packaging Forecast Scenario (ktonnes)

	2018	2030 (baseline)	2030 (measure)
Biobased Plastic Packaging Market (of total plastic packaging)	271 (1.9%)	386 (2.6%)	771 (5.1%)
Market reaching 30% GHG reduction (of total plastic packaging)	Unknown	Unknown	2310 (1.5%)

[458] This growth rate is broadly in line with some published estimates, but it should be noted that biobased growth estimates typically vary considerably depending upon the author and estimates from the industry have often overstated growth over the last decade.

Ease of implementation

The implementation will require a supporting Implementing Act in order to define the measurement method and the specific sustainability criteria. The implementation would follow a similar approach to the REDII whereby sustainability criteria—including GHG thresholds—are introduced and defined which have the possibility to increase over time. The Implementing Act will also define the framework for verification and certification of the BBP and provide a framework for recognising voluntary schemes that demonstrate compliance with the mandatory sustainability criteria. As a minimum the criteria should be set with the following priorities based on REDII whereby the requirements for biomass are aligned between the two legal instruments:

- Reducing climate impact
- Ensuring sustainable sourcing of biomass
- Promotion of residues and wastes
- Limiting indirect land use change and its impacts

In contrast to recycled content, it is possible to determine the actual biobased content of a plastic packaging product with a lab test using radiocarbon analysis. Therefore, a chain of custody approach is not necessary to calculate the mass of biobased plastic in a final product. There are several European and international standards that are commonly used, although EN 16785-1 is regarded as the key standard within the EU and can form the basis of requirements under this measure.

However, more recently, the use of a chain of custody based certification model is also being deployed under EN 16785-2 which is similar to the 'mass balance' approach used for chemical recycling. In the same way, it allows certification of material from mixed sources when the end product does not necessarily physically contain the biobased content. The system certifies that the correct amount of biobased content has been placed on the market and it can be assigned to any product. During the development of the proposed implementing act it must be determined whether a mass balance method is desirable. The benefit is that is provides more options for biobased content and allows producers some flexibility in reporting. However, the direct measurement of biomass in a plastic product is simpler to enforce. Nevertheless, there will still be a requirement for supply chain verification to validate the meeting of sustainability criteria and biobased content testing cannot replace this.

There is still significant work that needs to be undertaken to provide the basis for any secondary legislation. Unlike biofuels under REDII, the main challenge is determining, in a fair and balanced way, what the comparison should be that reductions are benchmarked against i.e. the fossil-based reference product. This is challenging, as the raw material is not the end product, and it is possible that more or less material could be used for an equivalent

application, depending upon the material properties (However, this also happens when alternative 'conventional' plastics are used for the same application, this is thus not a new issue). Ultimately, it may not be feasible to require direct biobased to fossil based comparisons, however benchmarks based on virgin or recycled plastics can also be used.

It should also be considered whether the biogenic carbon captured in biomass should be treated in the same way as REDII (i.e. zero rated) as the short cycling of carbon for fuels may not apply to plastic packaging if it is subsequently recycled—linking credits for carbon sequestration to recyclability may be mutually beneficial. Nevertheless, a standardised methodology for calculating GHG emissions will be required which can build upon the work already conducted by the JRC in this area.

- *Compostable Plastics*

Compostable plastics are a subset of BBP (although they can also be made from fossil carbon) and are subject to their own requirements with regard to the end-of-life addressed in their specific intervention area. Nevertheless, promotion of BBP also promotes compostable plastics and this measure provides a route for compostable BBP to remain on the market (subject to other requirements) when a recycled content target is also required; without this measure, or an exemption, the inability of most compostable plastics to use recycled content would effectively restrict them from the market. This measure allows these to exist but would also place additional sustainability criteria on them beyond those specified in their own intervention area.

Fossil-based compostable plastics are, in effect, restricted from the market unless they contain the specified proportion of BBP.

In reality, exclusively fossil-based packaging plastics are very uncommon as it is typical to blend polymers into compounds to achieve the right level of biodegradability balanced with physical properties.[459] For example, fossil PBAT is often blended with bio-based PLA to produce flexible films with high biodegradation properties.

Administrative burden

As was the case for Measures 35a-e for recycled content, administrative burden is anticipated for the Commission and Member States, including market surveillance authorities, PROs and third-party certification bodies that will be involved and monitoring and verification, however

[459] Nova Institute (2016) *Market study on the consumption of biodegradable and compostable plastic products in Europe 2015 and 2020*

for Member States, most of this is not in addition to the burden expected for implementation of recycled content measures as the current measure will be integrated.

Under this measure **there will be an administrative burden for the Commission primarily in development of the supporting legislation**. It will need to draft an implementing act on the measurement method for calculation and verification of biobased content along with developing a method for the sustainability criteria assessment.

Member States are not likely to have an additional burden related to enforcement beyond that already indicated under Measure 35e.

o Certification Costs to Industry

The administrative burden associated with certifying biobased content in plastic packaging is likely to be similar to that associated with certifying recycled content and several certifiers currently run a dual scheme that has similar requirements for recycled content and biobased material.

A summary of the estimated administrative costs associated with certifying biobased content is presented in Table and Table 63. Individual costs have been taken from various existing voluntary schemes which also operate recycled content verification. The verification and auditing process is expected to be similar in terms of time and costs and therefore the cost base is similar to Measure 35e. With BBP assumed to take 5% of the market for plastic packaging, the value chain actors are assigned accordingly. As discussed under *ease of implementation*, whilst it is possible to determine biobased content of the end product from lab testing, the requirement for certification of the sustainability criteria requires a full value chain approach. In practice, testing all products at the SKU level is also likely to be impractical and expensive; for example, application and lab testing fees are around €1,000[460] per product and apportioning packaging SKU count to the BBP packaging would result in 600,000 SKUs and a total market cost of €600m initially and for every retest.

One-off costs are estimated to be €2-3.2m and recurring annual costs are estimated at €8-13.7m

[460]https://www.dincertco.de/din-certco/en/main-navigation/products-and-services/certification-of-products/packaging/biobased-products/

Table 68. Certification One-off Costs

Type of cost	Stakeholder	Cost
Certification scheme registration	Applicant	€0.4-0.6m[1]
Main audit	Applicant	€1.5-2.6m[2]
[1]Based on €250 * 1,558-2,562 applicants. It is possible that the registration fee charged per applicant will decrease as the number of applicants increases. [2]Based on 1,558-2,562 applicants * €4,000 main audit cost		

Table 69. Certification Recurring Costs

Type of cost	Stakeholder	Cost per year
Applicant administrative costs	Applicant	€4.2-6.9m[1]
Annual monitoring audit	Applicant	€3.1-5.1m[2]
Certification / Licence fee – per tonne of material	Applicant	€0.7-1.7m[3]
[1]Based on 1,558-2,562 applicants requiring 75 hours to apply for certification and manage the audit process. Assuming €35.6 hourly wage for "ISCO 2 Professionals", Eurostat Structure of Earnings Survey, Labour Force Survey Data for Non-Wage Labour Costs. [2]Based on 1,558-2,562 applicants * €2,000 monitoring audit cost [3]Based on (1,558-2,562 applicants * €150 certification fee) + (€0.10 tonnage fee * 5.1mt of recycled content in packaging)		

Economic impacts

Assuming a 2-fold increase in the use of BBP packaging compared to the baseline, so that an additional 500kt is switched from fossil plastics to BBP, and assuming a price range of 1.0-1.5 EUR per kg for fossil plastics (e.g. PP, PE, PS) and 1.4-2.4 EUR per kg for BBP (e.g. bio-PP, bio-PE, PLA), this would **result in higher costs in the range of around 200 million EUR to 500 million EUR per year.** The higher material costs would likely be partly absorbed by value chain, but possibly passed on to consumers / end users via product prices. However, it is expected that the prices of BBP will drop when the economy of scale of production, conversion into products and logistics becomes more favourable.[461] Additionally, ever growing fossil fuel prices might reduce the price differential significantly as discussed under Measure 35e for recycled content, particularly for those biobased polymer manufacturers that can employ the use of renewable energy during production. This measure may contribute significantly to this given that currently, global BBP packaging production capacities around 1.1mt and forecasted to reach 1.5mt by 2030. If the scenario in this measure becomes a reality, *global* BBP capacity for packaging would grow by 30% and overall global BBP capacity would need to grow by an additional 15%.

There will be a shift of revenue from suppliers of fossil feedstocks (oil & gas and petrochemicals industry) to agriculture. Therefore, this measure could be a significant economic boost for agricultural regions suitable for production of feedstocks for BBP. It would also reduce the dependence on fossil-fuel imports.

Social Impacts

It is unclear whether there will be a **net impact on job creation**. Whilst there would be potential for an increase in the BBP industry, due to the small volumes involved this may not be significant. However, considering that Europe imports the vast majority of the oil and gas involved in fossil fuel based plastic production, this should not necessarily lead to a loss of jobs but rather the restructuring of processing and manufacturing methods, which would most likely —in addition to the newly introduced administrative requirements as part of the certification process— lead to new jobs. It is expected a slight increase of jobs linked to the reporting of the amount of BBP content, difficult though to quantify.

Higher prices can be expected due to the higher cost of producing BBP at this time, which can vary from between 20-100% increases for drop-in equivalents (bio-PP, PE).[462] This may or may not be passed on directly to the consumer which will likely depend on the value and

[461] Martien van den Oever, Karin Molenveld, Maarten van der Zee, Harriëtte Bos (2017): Biobased and biodegradable plastics – Facts and Figures. https://www.wur.nl/upload_mm/1/e/7/01452551-06c5-4dc3-b278-173da53356bb_170421%20Report%20Biobased%20Plastic%20Facts.pdf

[462] Martien van den Oever, Karin Molenveld, Maarten van der Zee, Harriëtte Bos (2017): Biobased and biodegradable plastics – Facts and Figures. https://www.wur.nl/upload_mm/1/e/7/01452551-06c5-4dc3-b278-173da53356bb_170421%20Report%20Biobased%20Plastic%20Facts.pdf

margins of the packaging product. Equally, prices are also likely to increase for the inclusion of recycled content

Environmental impacts

The method carried out to estimate the GHG emissions for biobased plastics was based on the assumption of a minimum threshold of 30% reduction compared to fossil-based equivalent. Therefore it is not possible to also include air quality (AQ) and water use data due to the likely high variability of these factors for different biobased polymers and would not necessarily directly link with the reduction in GHG. For instance, a 30% reduction in GHG does not necessarily lead to a 30% reduction in AQ and water use. Indeed, water use is likely to be somewhat higher for biobased material due to agricultural practices. However, an inventory of water use is not an adequate comparative indicator of impact and the location of the water use/extraction has a much greater bearing on water use impacts than the amount being extracted.

There is no reliable data available on what might be the average environmental impact of biobased packaging on the market currently. The variation is likely to be wide and therefore determining the spread of the best versus worse performing across the biobased market is challenging. In a scenario calculation substituting all fossil-based plastics with BBP in the EU, the EEA calculated that overall lifecycle GHG emissions would be reduced to 146 Mt of CO_2e in total for BBP yearly, 30 % less than the emissions of 208 Mt of CO_2e from the fossil-based value-chains.[463] In the absence of market data this reduction is also assumed for the assessment of the GHG impact of this measure.

The following key assumptions are therefore used for the modelling of the GHG impact of the measure:

- The BBP packaging market will double in size from the 2030 baseline and continue to increase at the same rate to 2040.
- All BBP packaging will have 30% in GHG emissions compared to fossil plastics – this is despite the fact that the target would only apply to the first 25-35% of the material (depending upon contact sensitivity application). The remaining amount could theoretically include much worse performing material.
- Biogenic carbon is set to zero and sequestration is not accounted for and therefore benefits are likely to be underestimated. This aspect should be explored in greater detail during the development of sustainability criteria.

[463] EEA (2021). GHG emissions and natural capital implications of plastics (including BBP) [online]. Available at: https://www.eionet.europa.eu/etcs/etc-wmge/products/greenhouse-gas-emissions-and-natural-capital-implications-of-plastics-including-biobased-plastics

Table 70 shows the results of the analysis compared with the baseline where virgin fossil production is assumed. The use of biobased material results in an overall reduction as would be expected. However, compared with the same material coming from mechanically recycled plastic waste there is a net increase in GHG impact.

Table 70. Summary of Environmental Impacts for Measure w

Change in GHG Emissions (kt CO_2e)	2030	2040
Baseline Comparison (fossil)	-300	-1,700
Change in GHG externalities, m€	-30	-466
Recycled Content Comparison (mechanical)	+200	+1000
Change in GHG externalities, m€	+17	+269

Land use

Existing land use for feedstock for BBP packaging at present is very minimal. No data on land use for BBP feedstocks specifically in the EU was identified, but an estimate is made in the following. The land used to grow feedstock for the production of BBP amounted to approximately 0.79 million hectares in globally in 2019 and the global production capacity for BBP in the same year was 2.11 million tonnes.[464] This is equivalent of around 0.37 ha per tonne of BBP on average which results in 182k ha of land for the production of 491kt in the 2030 baseline. This would rise to 363k ha under the scenario for this measure. However, this estimate would entirely depend upon the current land intensity for biobased plastics being maintained. The yield from different crop types may increase or decrease this. For example, 1.47 kg of sugar is needed to produce 1 kg of PLA whilst 2.82 kg of sugar is needed to produce 1 kg of (biobased) PET. Typically biobased plastics can be produced from sugar or starch, but starch crops (corn, potato, wheat) are more land intensive than sugar crops (sugar

[464] European Bioplastics: Bioplastics market data 2019. https://docs.european-bioplastics.org/publications/market_data/Report_Bioplastics_Market_Data_2019.pdf

cane and beet). [465] Furthermore, using recycled feedstocks (biowaste) may require no additional input of virgin biomass. Further, the sustainability criteria to which the allowed BBP need to comply with, would limit several of the land related impacts, in particular linked to biodiversity.

Stakeholder views

Stakeholders are broadly supportive of this measure particularly from those industries that produce packaging for contact sensitive applications. This measure is viewed as an additional way of meeting the target for producers who may be relying on new or underdeveloped technologies such as chemical recycling. The potential result is that there may be fewer justifiable calls for exemptions from the recycled content targets which supports the targets being more ambitious.

The BBP plastics industry are also supportive of the measure, including the verification of sustainably sourced raw materials similar to that of REDII. However, some key issues were raised around how the baseline comparison would be calculated and whether the proposed 30% GHG reduction is a suitable metric. These issues are previously discussed in the implementation section.

MEASURES THAT WERE DISCARDED IN AN EARLY STAGE

The measures that are included in this Impact Assessment are the result of an extensive screening process. Based on a preliminary assessment some measures were discarded in early stage because they were considered to not meet one of the core criteria related to effectiveness, efficiency, fairness, policy coherence,

Measure 34a: Updates to Essential Requirements operationalised through harmonised standards

This measure introduces the use of recycled content in packaging linked to the Essential Requirements for packaging to be placed on the EU market.

Wording to the effect suggested below could be considered for inclusion within Annex II as part of the requirements specific to the manufacturing and composition of packaging:

[465] IFBB, Biopolymers facts and statistics 2021 Production capacities, processing routes, feedstock, land and water use

"Packaging shall be designed, produced and commercialised in such a way as to substitute the use of virgin materials with recycled materials in so far as this is technically feasible to maintain the necessary level of safety and hygiene for the consumer."

Noting the current lack of data and a clear intervention logic to potentially justify such an Essential Requirement so that the alternative measure 34b is also considered. This would include a mandatory reporting requirement for all packaging that would be included in the main body of the PPWD as opposed to forming an Essential Requirement, thereby achieving many of the benefits of an Essential Requirement to this effect, but without the same level of stringency which is difficult to justify in the absence of data to support such a requirement.

There is already a CEN Report (CR 13504) on Packaging – Material Recovery – Criteria for a Minimum Content of Recycled Material which sets out the factors to consider in determining the potential recycled content, but does not include an actual process to assess whether the potential recycled content has been maximised – as is recommended here. In addition, EN 15343:2007, Plastics - Recycled Plastics – Plastics recycling traceability and assessment of conformity and recycled content, alongside EN 15342, 15344, 15345, 15346, 15348 do not include any packaging application specific and relate to the recycled material in question, rather than an assessment of the product into which it is potentially being incorporated (which is the subject of the standard proposed here).

Based on feedback received during the previous Essential Requirements scoping study[466], this proposed process in the harmonised standard would therefore take into account at least the following key factors:

- The maximum possible recycled content that could be used;
- The maximum recycled content that could be used in the packaging without leading to significant negative impact on the essential functions of the packaging like mechanical strength and flexibility (but excluding impacts such as on marketing or visual appearance);
- Legal restrictions that limit the use of recycled content (such as in food-contact applications).

Measure 34a may not be effective at stimulating any significant change in uptake of recycled content, because it does not place any direct requirements / incentives on producers to encourage this.

[466] Eunomia, COWI, Adelphi, Ecofys (Navigant), Milieu (2020), *Effectiveness of the Essential Requirements for Packaging and Packaging Waste and Proposals for Reinforcement* at https://op.europa.eu/en/publication-detail/-/publication/05a3dace-8378-11ea-bf12-01aa75ed71a1

Measure 35d: Mandatory Recycled Content Targets for All Packaging

This Measure proposed that mandatory product-specific recycled content targets should be included within the PPWD**.**

However, **recycled content use is already reported to be relatively high for packaging of some materials.** For example, the average proportion of recycled content used in packaging across the EU in 2017 was estimated at 58% for steel packaging[467], ~55% for container glass (average of all colours)[468] and ~89% for corrugated paper packaging.[469]

Additionally, for some materials, such as wood and glass, the introduction of targets for recycled content must consider not only the recycling targets for these packaging materials (which is a determinant of the supply of relevant recyclate), but also in view of the potential for systems for reuse to be expanded for such packaging. For example, although the scope for including recycled content in wooden pallets is reported to be limited, the scope for refurbishment and reuse of such pallets is significant, and, from the perspective of the waste hierarchy, preferable. In such cases, **therefore, mandatory recycled content targets may not be suitable to drive additional environmental benefits.**

Measure 36: Polymer Substitution Quotas

This Measure **involves setting minimum quotas on plastic resin manufacturers** (both virgin and recycled) **requiring them to produce a proportion of recycled plastic resins relative to the overall volumes produced**. This would be **combined with a credit trading system** to allow producers to buy and sell credits based on their respective production volumes. The reduced supply of virgin plastics on the market should result in higher prices, thus providing a financial incentive to use recyclates, which in turn could become cheaper through economies of scale.

To comply with the quotas, resin manufacturers would either have to produce their own recycled resins to meet the quota, or buy credits from recyclers/ other manufacturers who have production volumes in excess of the quota, in order to comply. A producer of virgin plastics must therefore invest in the recycling industry in order to remain active on the market. Over time, the quota for the minimum proportion of recycled resins could be increased, and a minimum floor price could be included to allow the price to be determined by the market but without significant risk.

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[467] APEAL (2019), web article *Recycled Content for Steel Packaging?*, accessed on 19th December 2019 at https://www.apeal.org/news2/recycled-content-of-steel-for-packaging/

[468] FEVE (2019), Position paper: "RECYCLED CONTENT AND GLASS PACKAGING", accessed on 19th December 2019 at https://feve.org/wp-content/uploads/2019/07/Recycled-Content-FEVE-Position-June-2019.pdf

[469] CEPI/ FEFCO (2018), *European Database for Corrugated Board Life Cycle Studies* (p16), accessed on 19th December 2019 at http://www.fefco.org/lca

As an alternative to setting up a new credit trading scheme, the existing infrastructure of the **EU-ETS (Emissions Trading System)** could also be leveraged to implement this measure, by integrating the plastics and recycling industry in the CO2 emissions trading scheme, thereby giving recycled plastics an advantage in price competition with virgin plastics and generating stronger demand.

However, since that resin manufacturers are not responsible for the applications to which their resins are directed in the market –this model would include all plastic applications, not just plastic packaging (which only accounts for ~40% of plastic raw material demand) or individual product categories. It would also include all standard polymer types, but potentially with different recycled content quotas. In addition, it is particularly challenging for this measure to **ensure that the recycled plastics produced to meet the quota are of a high enough quality to be included within packaging applications**, and that **imports of plastics are treated equally such that local producers are not disadvantaged are key among these**. In contrast, measures that are proposed at the level of plastic packaging are easier to implement and monitor since the scope of the products to be monitored is clearer.

Therefore, although **the measure is recommended for further consideration by the Commission**, it is not taken forward in this impact assessment.

Measure 39: Harmonisation of EPR Fee Modulation Criteria based on recycled content

This measure includes recycled content as a criteria for fee modulation in EPR schemes. In theory, this would provide an incentive for packaging to be designed not only to be recyclable, but to keep recycled material in the economic cycle by reintegrating it into packaging applications.

This measure **would require the development of harmonised recycled content criteria for achieving the recycled targets** (such as those proposed in measure 35), to determine the basis for any meaningful modulation, as well as an **implementing act to harmonise definitions, a calculation methodology and a verification procedure**, in line with measure 37. In the absence of measure 35 and 37 the intended outcomes are unclear.

However, it must be noted that even in those Member States in which EPR fee modulation on the basis of recycled content has been introduced (France and Germany), there has been no significant impact on recycled content levels in packaging. This has been attributed to the fact that in some cases, the magnitude of EPR fees relative to the overall value of packaged products is too low to provide any incentive for design changes. In addition, **the costs of incorporating recycled content in packaging often outweigh the additional EPR fees that must be paid for failing to do so**. The implementing and administrative burden associated with introducing this requirement is therefore likely to outweigh any resulting environmental benefit associated with increased recycled plastic uptake.

In addition, it has been noted in previous Commission studies[470] that:

> *"A key principle in applying fee modulation…is that it is better to focus a policy instrument on doing one thing well, than on seeking to achieve multiple objectives. A tension can be created within an EPR scheme if it is seeking to do too many things. A focus on seeking to meet the recycling targets in a way that is cost-effective and fair to different packaging formats gives a clear steer to the way in which an EPR scheme should use fee modulation. However, to also introduce an incentive for recycled content can disrupt the efficient operation of the price signals."*

This has been the case for plastic trays in recent years, which have been associated with relatively high levels of recycled content (which would suggest low EPR fees as per this measure), but with very low recycling levels in reality (which would suggest higher fees).

Further, it is important to note that **different materials and packaging formats would be more or less amenable to incorporation of recycled content**. Food contact packaging, for example, are subjected to more legal restriction than for other types of packaging. In addition, given the significant price differential between secondary materials and virgin counterparts in some cases (e.g., recycled plastics and virgin plastics), the level of fee modulation that would be required to encourage a switch to recycled materials would have to be relatively significant.

It would thus be better for recycled content to be incentivised through other means, leaving EPR schemes for packaging with a clear focus on achieving the recycling targets in the most appropriate way. This is also more aligned with the principles of extended producer responsibility, designed to cover the costs of end of life management of packaging rather than regulating the production of packaging.

This measure is therefore not developed further for impact assessment in this study.

Intervention Area Enabling measures - Hazardous Substances

Introduction

Studies indicate that many different substances are incorporated in packaging, including in plastic packaging, rubbers, and paper and board. These are used for technical purposes to provide different properties and functionalities to those packaging materials. We know that some of these substances have specific hazardous properties while for many others we know they are not hazardous, or information on their potential hazards is lacking. We often also do not know to what extent they are used to manufacture packaging and to what extent they remain therein. However, if hazardous substance would be released this can lead to exposure of humans and of the environment, increasing the overall toxic burden and potentially leading to increased disease and mortality.

It is necessary to have a better understanding about the presence of substances in packaging and to determine whether they possess specific hazardous properties and the extent to which these may pose a risk to human health and to the environment. In order to achieve this, and provide legal clarity to the general minimisation provisions embedded in the essential requirements of Annex II, a clear definition in terms of the scope of the hazardous substances covered has to be provided.

The knowledge gap that exists about hazardous substances in packaging requires action to identify and map the presence of such substances in the different packaging materials, in particular in non-food contact packaging, which is out of the scope of the food-contact materials legislation. Several measures have been assessed in terms of their effectiveness to address this gap.

Finally, where information about the presence and concentrations of specific hazardous substances in packaging indicates a potential risk to human health or the environment, which would need to be addressed at Union level, the means to limit or prohibit such substance in packaging would have to be in place. Two different measures have been assessed on how to most effectively put such specific substance restrictions in place.

<u>Measures discarded and not analysed in depth</u>

Not applicable

<u>The following measures have been analysed in depth and then included into the option table:</u>

- Measure 31: Update of ‘hazardousness’ definition
- Measure 32: Expanding the information base on hazardous substances
    - Measure 32a: Expanding the information on hazardous substances based on existing information

    - Measure 32b: Notification of substances of concern in packaging
    - Measure 32c: Notification of all substances in packaging
- Measure 33: Restriction of substances
    - Measure 33a: Restrictions of substances under REACH[471]
    - Measure 33b: Restrictions of substances under the reviewed PPWD

[471] Registration, Evaluation, Authorisation and Restriction of Chemicals

Measures analysed in depth and included in the options table

9.22 Measure 31 – Update of definitions concerning hazardous substance

From its publication in December 1994, the PPWD restricts the use of four heavy metals in packaging, specifically lead, cadmium, mercury and hexavalent chromium. No other restrictions on chemicals have been introduced since then. Annex II of the Directive, laying down essential requirements on the composition of packaging requires that the presence of *noxious and other hazardous substances and materials* is minimised so that the presence of these substances in emissions, ashes or leachates, resulting from waste treatment, is also minimised.

"*Packaging shall be so manufactured that the presence of noxious and other hazardous substances and materials as constituents of the packaging material or of any of the packaging components is minimized with regard to their presence in emissions, ash or leachate when packaging or residues from management operations or packaging waste are incinerated or landfilled." (Annex II, Section 1, 3rd indent)*

The limited scope of impacts considered, limited to effects on the environment and associated only to emissions from waste management resulting from incineration and landfilling is not consistent with current life-cycle approaches to the risk management of substances in products, nor to current waste management priorities, which strongly target waste prevention, preparation for reuse and recycling.

Furthermore, the terminology used to define the substances in scope is not consistent with the definition of hazard classes in the CLP Regulation[472] that refer to hazardous substances, nor with the concept "substances of concern" used in the "interface communication"[473] and further developed in the Chemicals Strategy for Sustainability[474] and the Commission proposal for an Ecodesign for Sustainable Products Regulation (ESPR). .

This scope should address risks to human health and to the environment, throughout the full life-cycle of packaging.

Under the current baseline only four metals are restricted under the Directive. In terms of the emissions and exposure to substances of concern contained in packaging, the baseline is expected to result in maintaining the current emission levels of substances of concern in packaging to the environment, leading to increased pressures on the environment and on

[472] Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006. OJ L 353, 31.12.2008, p. 1.
[473] COM(2018) 32
[474] COM(2020) 667 final. In its footnote 16 it is indicated that substances of concern include "substances having a chronic effect for human health or the environment (Candidate list in REACH and Annex VI to the CLP Regulation) but also those which hamper recycling for safe and high quality secondary raw materials"

human health which is already largely impacted by the presence of hazardous chemicals in the environment.

The objective of this measure is to:

- provide legal certainty about the substances in scope of the minimisation provisions under the essential requirements for packaging; and
- extend the scope of impacts addressed under the reviewed PPWD to cover impacts on human health and environment, throughout the life-cycle of packaging materials, including those of the resulting recycled material.

9.22.1 Description of the measure

This measure proposes to introduce the following changes in the legal proposal:

- to expand the narrative objectives in Article 1 of the Directive to include the protection of human health in coherence with other EU rules; and
- to require considering the whole life-cycle of packaging, including recycling, when establishing essential requirements on the content of hazardous substances in packaging; and
- to increase legal certainty by replacing the term 'noxious and other hazardous substances and materials' in Annex II by the term 'substances of concern', as described in the Chemicals Strategy for Sustainability and defined in the Commission proposal for ESPR..

The general requirement to minimise the presence of substances of concern due to their effects on human health and on the environment[475], defined by this measure, would apply without prejudice to specific requirements imposed upon food-contact packaging in Regulation (EC) No 1935/2004 on materials and articles intended to come into contact with food, as that regulation applies to all constituents of such materials which could endanger human health when they transfer to food.

The generic provisions in terms of minimisation of substances of concern, introduced by this measure are complemented by specific provisions defined under measure 33 'Restriction of substances'.

9.22.2 Effectiveness

[475] See Ernstoff et al (2019). https://link.springer.com/content/pdf/10.1007/s11367-018-1569-y.pdf . The lifecycle approach proposed, which considers human exposures via the environment, is supported by conclusion of this study: "*The "evidence-based" scenario built on the limited data available for chemicals in HIPS packaging material, starting concentration, and toxicity data, suggested that the human toxicity impact scores due to human exposure to environmental life cycle emissions far exceeded those due to exposure to chemicals in food packaging migrating into food*".

Extending the scope of the Directive to include human health amongst its protection targets and extending the scope of the environmental impacts and life-stages covered under essential requirements for chemicals in packaging, under Annex II, will update the Directive and introduce greater legal certainty as to what the protection objectives of the Directive are.

Defining that Essential Requirements for substances in packaging requires the minimisation in the use of "substances of concern" provides legal clarity as to the nature of the obligation. This is achieved by linking the scope to the definition in the Chemicals Strategy for Sustainability which specifies that the concept of "substances of concern" should apply to "substances having a chronic effect for human health or the environment (Candidate list in REACH and Annex VI to the CLP Regulation) but also those which hamper recycling for safe and high quality secondary raw materials"[476]. This approach, i.e. addressing "substances of concern", is consistent with that used in the proposal of the Commission for a Regulation on Ecodesign for Sustainable Products.

There is currently no precise definition or an inventory of substances which, for reasons other than their toxicity, "hamper recycling for safe and high quality secondary raw materials". It is conceivable that further clarity on criteria to define This this potentially small sub-set of substances of concern will be provided following developments under the Chemicals Strategy to define safe and sustainable-by-design criteria for chemical substances. This should enable each sector, including that of packaging, to identify relevant substances that hamper recycling.

By providing legal certainty about the objectives of the reviewed PPWD and the scope of substances for which minimisation of their use in packaging is required, operators will be able to better identify and implement measures to substitute or minimise such use. This measure should therefore clearly lead to the minimisation of the presence of substances of concern in packaging by reducing the ambiguity, increasing legal certainty and therefore reducing confusion about the substances in scope of this obligation.

9.22.3 Ease of implementation

For producers of packaging to implement the obligation to minimise the use of substances of concern in packaging they need to be able to: 1) identify which substances contained in the materials used to produce packaging meet that definition and 2) implement measures to minimise their presence (e.g. via process modifications, substitution).

Given that having information about substances in packaging was already required to meet the existing minimisation obligation, the current provision does not change due-diligence obligation of manufacturers to undertake all reasonable efforts to know what substances are present in the packaging products they place on the market. Information on the classification of substances can be found in Annex VI of the CLP Regulation (harmonised classifications)

[476] Chemicals Strategy for Sustainability, p. 2.

and in the CLP inventory[477] maintained by the European Chemicals Agency. Consequently, no additional burdens are envisaged in terms of implementation.

9.22.4 Administrative burden

No additional burden is expected for authorities as compared with the previous provision. In both cases a general obligation is defined that can only be controlled via targeted market surveillance or inspection and audit of packaging manufacturing processes.

No significant additional administrative burden is envisaged for producers of packaging given the obligation to be informed about substances in materials used to manufacture packaging, and the associated supply chain communication due diligence, already existed, in order to comply with essential requirements. Supply chain communication obligations are defined in article 33 of REACH for "substances of very high concern" and have applied for over a decade. Manufacturers may however need to engage in new communication with their suppliers, to update information based on the more precise definition of substances covered ("substances of concern" as compared to "noxious and other hazardous substances and materials").

9.22.5 Economic impacts

As indicated above, increased scope of substances and nature of impacts addressed may require additional minimisation efforts from packaging manufacturers. This could take the form of additional communication with suppliers with regards to the substances present in packaging materials and potentially, adaptation costs by changing the formulation of packaging materials or switching packaging formats. The extent of this impact could not be determined given the current lack of a specific mapping of relevant substances of concern in packaging, the frequency and extent of their use and of precise information about their alternatives and level of process modification that any specific change would entail. See also measure 33.

9.22.6 Social impacts

An expected social benefit is improved protection of human health thanks to the minimised use of substances of concern in packaging and the clear reference to human health protection as an objective of the Directive. The greater precision in the definition of substances in scope increases legal certainty and should enable manufacturers of packaging to better implement this obligation. A quantitative assessment of the possible increased reduction in the use of such substances in packaging, or how this would translate into a reduction of human exposure is not possible.

[477] https://echa.europa.eu/information-on-chemicals/cl-inventory-database

9.22.7 Environmental impacts

Positive effects upon environmental health are expected thanks to reduced presence of substances of concern in packaging. Such reduction should translate in reduced emissions of hazardous substances due to leaching or dust generation during service life and subsequently in waste management. Such reduction or elimination of substances of concern should also contribute to increase recycling into high quality secondary materials and in a reduction in the use of primary materials, with the associated benefit in terms of greenhouse gas emissions. A quantitative estimation of these positive effects is however, not possible.

9.22.8 Stakeholder views

As a general comment, many stakeholders from brands, industry associations and EPR schemes believe that the issues of hazardous substances in packaging should be addressed via REACH, the EU Chemicals Strategy for Sustainability and the Food Contact Material (FCM) regulations. They see a potential policy duplication if addressed via PPWD and claim that PPWD is not the appropriate legislative tool for this area.

Some stakeholders requested a clear reference to the Food Contact Material (FCM) legislation, some even suggesting that it should be clear that FCM prevails over PPWD. Feedback from recycling industries is supportive of eliminating substances that render recycling difficult already at the design stage, to increase recyclability and uptake of recycled material. Several stakeholders agreed with aligning PPWD's term 'noxious and other hazardous substances and materials' with the term 'substances of concern' to facilitate compliance. One notable exception believes that PPWD should only refer to actual substances known to be present in packaging rather than to general lists of substances (such as the candidate list or a sub-set of substances listed in Annex VI of CLP) that might not be fully applicable to packaging.

Summary and conclusion

Measure 31 is proposed to be conserved and taken up in the options table of this impact assessment. No other measures to update the scope of the PPWD as regards protection targets or to clarify the definition of which substances are in scope of the minimisation obligations defined in Annex II were analysed.

This is justified by the fact that coherence with policy requirements defined under current EU legislation and policy instruments already require: 1) protection of human health and the environment; 2) a full life-cycle approach and 3) define substances of concern as the key substance set to address for purpose of traceability and risk management, in product policy.

Consequently no other alternative measures seem appropriate to implement these specific provisions and provide the required legal certainty.

Measure 32 – Expanding the information base on substances

There is little information on the use of hazardous substances in packaging. This matter is addressed in section 2 "problem definition" of the body of the Impact Assessment. In the absence of this information, it is not possible to design and implement risk management measures such as the introduction of restrictions or the promotion of minimisation or substitution.

Groh *et al*[478] identified a significant lack of information on the use of chemicals in plastics manufacturing. Available studies also show that the use of hazardous substances in plastic packaging may be extensive. Information on the use of chemicals in other packaging material such as paper and cardboard[479] or metals[480] is more limited but point in a similar direction. The general problem of lack of adequate information on the chemicals in products has also been highlighted by the Commission in its Communication on options to address the interface between chemical, product and waste legislation[481].

Annex I to Regulation (EU) No 10/2011 on plastic materials and articles intended to come into contact with food[482] provides a list of monomers and additives authorised for use in plastic food contact materials. This list focuses on a limited set intentionally added substances, with some derogations e.g. for colourants. Aside from a similar list of substances to be used for the manufacture of regenerated cellulose film for food contact[483], no such list exists for non-food plastic packaging or for packaging made of other materials at EU level.

The baseline is defined by existing legal provisions which have relevance on the safe use of chemicals and to their identification and control in products, including on packaging.

The REACH Regulation[484] is the primary regulatory instrument in the EU to ensure the safe use of chemicals. A number of provisions in REACH are particularly relevant in determining the use and traceability of substances in mixtures and in articles:

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[478] Ibid.
[479] RIVM (2019) Section 3.3. identifies published studies of sources leading to MOAH contamination in food. In many cases associated to recycled paper and cardboard. https://www.rivm.nl/bibliotheek/rapporten/2019-0048.pdf
[480] Geueke et al (2018). https://doi.org/10.1016/j.jclepro.2018.05.005
[481] COM(2018) 32 final, Section 3.1.
[482] Commission Regulation (EU) No 10/2011 of 14 January 2011 on plastic materials and articles intended to come into contact with food, OJ L 12, 15.1.2011, p. 1–89.
[483] http://data.europa.eu/eli/dir/2007/42/oj
[484] Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals. OJ L 396, 30.12.2006, p. 1).

- Article 7(2) of REACH requires producers and importers to notify to ECHA SVHCs in articles when these are present above a concentration of 0.1% weight by weight and if present in articles in quantities totalling over one tonne per year.
- Article 10 of REACH specifies the information to be included in the registration dossiers of substances subject to registration. This includes information on the manufacture and use(s) of the substance. The provision of such information is supported by the use descriptor system[485] developed by ECHA. The combination of information available for each substance about its sector of use (SU), chemical product category (PC) and article category (AC) in which the substance is contained is a valuable source of information for the investigation of substances used in packaging. Article categories are defined for packaging articles, made of different materials and which distinguish between food packaging and other packaging.
- Article 31 of REACH requires suppliers of substances or mixtures to provide the recipient of these with a safety data sheet compiled in accordance with Annex II for 1) substances or mixtures which are hazardous according to criteria in the CLP Regulation; 2) substances which are persistent, bioaccumulative and toxic or very persistent and very bioaccumulative in accordance with the criteria set out in Annex XIII of REACH; or 3) substances which are listed as SVHCs in the "candidate list" for reasons other than those referred under 1) or 2).
- Article 33(1) of REACH requires suppliers of articles containing substances identified as *substances of very high concern* (SVHC) in a concentration above 0.1 % w/w to pass on sufficient information on the substances contained in the article down the supply chain to allow safe use. Suppliers of articles are also required to provide such information to consumers upon request (Article 33(2)).

Under the Waste Framework Directive[486], ECHA is required to establish a database with information on articles containing SVHCs. Notification of articles to the SCIP database is mandatory from 5 January 2021 for all suppliers of articles, including packaging, containing SVHCs in a concentration above 0.1% by weight. The rationale behind this notification obligation is that "*the presence of hazardous substances may render waste unsuitable for recycling or the production of secondary raw materials of high quality*" (WFD Recital 38). SCIP notification allows information about the presence of SVHCs in articles to become available throughout the whole lifecycle of the article, including at the waste stage. Notified information about SVHCs in millions of articles is available via ECHA's SCIP dissemination portal[487].

In addition to this, the presence of hazardous substances in food-contact packaging is governed by Regulation (EC) No 1935/2004 which is currently under revision. Food contact packaging and substances therein are out of the scope of the current Impact Assessment. Commission Regulation (EU) 10/2011 on plastic materials and articles intended to come into contact with food establishes a union list of substances that are authorised for intentional use

[485] Guidance on Information Requirements and Chemical Safety Assessment. Chapter R.12: Use description. December 2015. https://echa.europa.eu/documents/10162/13632/information_requirements_r12_en.pdf/ea8fa5a6-6ba1-47f4-9e47-c7216e180197

[486] Article 9(2) Waste Framework Directive 2008/98/EC as revised by Directive (EU) 2018/851.

[487] SCIP dissemination platform. https://echa.europa.eu/scip-database

in the manufacture of plastic food contact materials and articles. Annex I of this Regulation lists over 850 substances and sets specific restrictions and specifications, including migration limits, and limits on the use. Substances are only added to the list following a risk assessment by the European Food Safety Authority ('EFSA') and subject to a published scientific opinion.

Finally, the Annex VI of the CLP regulation[488] provides harmonised classifications, agreed at EU level, for over 4300 substances of groups of substances[489]. This information provides a sound basis for determining whether a specific substance is a "substance of concern" due to its adverse chronic effects on human health and on the environment[490].

The objective of the measures considered is to increase the knowledge base on the presence of substances of concern in packaging by gathering information of the chemical composition of packaging.

By obtaining comprehensive information on the chemical constituents used in packaging materials or present in the final packaging product, their known hazardous properties can be determined by cross checking with the different information sources outlined above. This should enable subsequent prioritisation of specific risk management measures on these chemicals in packaging, as appropriate.

Assessment of measure 32a – Expanding the information on hazardous substances based on existing information

9.22.1 Description of the measure

Under this measure existing information is collected and analysed in order to obtain a better understanding about substances of concern in packaging. This can be achieved via some or all of the following approached:

- Data analysis of substances of very high concern notified in packaging and packaging materials to the SCIP database
- Analysis of packaging-relevant notified uses under Article 7(2) of REACH and of relevant identified uses in REACH registration dossiers.
- Analysis of information on substances in packaging material in the scientific / technical literature and building upon relevant projects, such as the Plastics Additives

[488] Ibid.
[489] https://echa.europa.eu/information-on-chemicals/annex-vi-to-clp
[490] A list of relevant hazard classes and categories, as defined under CLP, are listed in the definition of "substance of concern" in Article 2(28) of the Commission proposal for a Regulation of the European Parliament and of the Council on eco-design for sustainable products [COM(2022) 142 final].

Initiative[491], initiated by ECHA and 21 sector industry organisations in late 2016. A recent study by OECD on "A Chemicals Perspective on Designing Sustainable Plastics"[492] resulted in the publication of two packaging case studies[493] [494]which also offer relevant information on additives used in plastic packaging.

Under this measure existing information would be used to identify and prioritise relevant substances of concern in packaging for which potential additional risk management actions, such as the imposition of limitations or restrictions could be envisaged. Such identification and prioritisation work could be supported by technical assistance studies by the Commission or by Member States.

9.22.2 Effectiveness

This measure represents what can be done under the current baseline and may not be sufficient to gain a comprehensive overview of the hazardous substances contained in packaging. The existing SCIP reporting only covers substances of very high concern identified under REACH (which currently contains 224 entries as updated on 10 June 2022). Some of these entries cover groups of substances so the actual number of substances covered by the entries in the candidate list is in fact higher than the number of entries. Some of the substances included in the list of most hazardous substances likely associated with plastic packaging provided by Groh et al. (2019) are not contained in the so-called "Candidate list" of SVHCs established under REACH. Furthermore, SVHCs in concentrations below 0.1% in packaging material would not need to be reported. Such concentrations may be too high to ensure safe use of substances in packaging, for instance in food-contact applications.

As outlined in the point above, this limitation could be at least partly compensated by the dedicated review of existing scientific literature and the information in the REACH registration database and building upon existing studies on additives used in plastics and other materials used in packaging.

9.22.3 Ease of implementation

[491] This joint project by ECHA and industry resulted in a list of over 400 functional additives or pigments used in plastics, including information on the polymers they are most commonly found in and the typical concentration ranges. The mapping considered substances registered under REACH at above 100 tonnes per year, and focused on plasticisers, flame retardants, pigments, antioxidants, antistatic agents, nucleating agents and various types of stabilisers. https://echa.europa.eu/plastic-additives-initiative

[492] OECD (2021), A Chemicals Perspective on Designing with Sustainable Plastics: Goals, Considerations and Trade-offs, OECD Publishing, Paris, https://doi.org/10.1787/f2ba8ff3-en.

[493] OECD (2021), Case study on detergent bottles: An example of weighing sustainability criteria for rigid plastic non-food packaging , OECD Series on Risk Management, No. 63. https://www.oecd.org/chemicalsafety/risk-management/sustainable-plastic-products-detergent-bottles.pdf

[494] OECD (2021), Case study on biscuit wrappers: An example of chemical considerations for sustainable plastics design, OECD Series on Risk Management, No. 64. https://www.oecd.org/chemicalsafety/risk-management/sustainable-plastic-products-biscuit-wrappers.pdf

This measure would face no major difficulties in its implementation given it relies upon existing information about the presence of certain substances of concern in packaging. No dedicated data reporting and management systems would need to be set in place. It could be envisaged that specific data mining (e.g. of information contained in the SCIP database or in the REACH registration database) would be required, as well as specific technical assistance studies to screen and gather information in the literature or build upon previous relevant studies.

However, it has to be noted that the measure will be implemented on the basis of a study, carried out by the European Chemicals Agency (ECHA) to determine restrictions on substances of concern in packaging. In particular, this study by ECHA, will determine the conditions under which the concentration level of certain substances of concern, do not apply to recycled materials and to product loops which are in a closed and controlled chain. It will also detail the reasoning of setting exemptions from the requirements of the proposed regulation for certain types of packaging.

9.22.4 Administrative burden

Given no new reporting obligation is envisaged in this measure, the administrative burden for suppliers of packaging would remain unchanged as regards current legal obligations. Only a small increase in administrative burden would be expected to occur for the European Commission, the European Chemicals Agency and the national administrations, which would translate in the effort to run dedicated data mining in existing databases and to tender and run support studies for the identification and prioritisation of substances in packaging. It could be envisaged this effort could be shared between the European and the national administrations.

9.22.5 Economic impacts

The economic impact associated to the execution of this measure is modest and would be on the public administrations, responsible for running and paying for the data mining and support studies described above. Such studies are part of the normal activity of the public administrations and could result in an estimated additional, one-off costs of between 300.000 – 1.000.000 € depending on the extent and number of studies.

9.22.6 Social impacts

No significant social impacts are envisaged from this measure given it only entails desk work information gathering and analysis and as such does not result in any obligation on stakeholders or in regulatory measures.

9.22.7 Environmental impacts

No significant environmental impacts are envisaged from this measure given it only entails desk work associated to information gathering and analysis and as such does not result in any obligation on stakeholders or in regulatory measures.

9.22.8 Stakeholder views

Stakeholders provided feedback after presenting the measures in a webinar in June 2021, and the majority of stakeholders who responded were in favour of this measure. More details can be found in Appendix E Stakeholder Synopsis Report.

Assessment of measure 32b – Notification of substances of concern in packaging

9.23.1 Description of the measure

Under measure 32b, in addition to the use of existing information, described under 32a, a new legal obligation would be introduced in the revised PPWD, according to which all substances of concern used in packaging would have to be notified. The duty-holders concerned by this obligation would be those economic operators placing packaging and packaging materials in the EU market.

The substances to be notified would be all substances, meeting the definition of "substance of concern" as contained in the proposal of the Commission for a Regulation on Ecodesign for Sustainable Products (or as subsequently modified) and having a harmonised classification pursuant to Annex IV of the CLP Regulation. This provides legal certainty as regards the classification of all substances in scope. A concentration threshold for the substance in the packaging, below which notification would not be required would also need to be defined. For consistency with the limit set in Article 33(1) of REACH, and with the existing reporting obligation implemented under SCIP, this limit would reasonably be set to 0.1% weight by weight.

The notification of this information could be envisaged according to three possible notification schemes:

- To a centralised European Database of substances of concern used in packaging. Such a system could be envisaged to operate on an expanded development of the IT infrastructure of the current SCIP database.
- To Member State run EPR schemes (link to EU-database in measure 42a). Like in the case above a dedicated IT infrastructure would have to be developed to support notification and data storage and management.

- Integrated in the information contained in a Digital Product Passport, most likely based on a decentralised IT architecture, as defined in the Commission proposal for a regulation on eco-design for sustainable products[495].

9.23.2 Effectiveness

This measure is much broader than measure 32a in terms of the amount of substances covered. There are currently over 4300 substances or substance groups listed with a harmonized classification in the CLP regulation, so the potential scope of substances to be reported is much larger than that covered by the 224 entries in the "candidate list". However, this measure also has its limitations given that according to the study by Groh et al. (2019), less than a third of the chemicals likely associated with plastic packaging had a harmonised classification under CLP or were identified as PBT[496], vPvB[497] or EDC[498] under REACH. Therefore, requiring producers to report all substances of concern contained in packaging and having a harmonised classification under CLP (due to hazard classes associated to chronic effects) might not be sufficient to gather a comprehensive overview of all possible hazardous substances[499] that may be contained in packaging. Furthermore, it is likely that many of the substances listed in CLP with a harmonised classification have no use in packaging. Out of those that do, only some will meet the criteria to be considered "substances of concern".

Therefore, as in the case of 32a, this reporting requirement would not guarantee a full mapping of all hazardous substances in packaging but it would provide information on all substances of concern, based on their harmonised classification under CLP. As in the case of 32a, the reporting approach can be complemented by supplementary technical assistance studies of the relevant literature and to build upon the outcomes of existing relevant research projects.

9.23.3 Ease of implementation

This measure requires the putting in place of the means collect and manage the data reported as a result of the new obligation. As indicated above, three possible systems are envisaged for this purpose, one relying on an expansion of the existing SCIP database, a second on the creation of reporting systems under the umbrella of national packaging EPR systems and a third relying on the envisaged future decentralised infrastructure supporting the Digital Product Passport.

Such a measure would require, in the case of the first option, substantial efforts in the development of the IT infrastructure in ECHA supporting the SCIP database to accommodate information on many more substances and would require substantial modification of the

[495] COM(2022) 142 final.
[496] Persistent, bioaccumulative and toxic substances
[497] Very persistent and very bioaccumulative substances
[498] Endocrine-disrupting chemicals
[499] Substances of concern, as defined, are a (priority) subset of all hazardous substances listed in Annex VI to the CLP Regulation.

database itself, storage capacities and the software enabling notification by dutyholders and data dissemination and exploitation. In the second option, relying on national EPR systems, these efforts would seem even greater as they would have to be implemented *de novo*, in 27 Member States and then provided with an additional layer to enable coordination and data pooling, so as to provide aggregated information at EU level.

The third option relies on the envisaged Digital Product Passport (DPP), an instrument conceived to electronically register, process, and share product-related information amongst supply chain businesses, authorities, and consumers. Article 10 of the Commission's proposal for a regulation on eco-design for sustainable products envisages the adoption of implementing act establishing the detailed technical rules for the design and operation of the product passport. Given the developments pending in this area it is not possible, and premature, to assess the impacts that relying on such a system could have, but the impact assessment supporting the referred proposal and the financial statement accompanying it, clearly indicate that substantial efforts and investment are also needed to put such a system in place.

Under all sub-options for practical implementation, measure 32b entails substantial implementation efforts to both national and European administrations. Important additional efforts would also be imposed on dutyholders placing packaging on the market, both in terms of enhancing supply chain communication (discussed under measure 31) and, more importantly, in obtaining and implementing the necessary means for reporting (including, for instance system-to-system notifications under the SCIP notification system developed by ECHA or into the infrastructure supporting the future digital product passport).

9.23.4 Administrative burden

Additional administrative burden will be imposed on suppliers of packaging due to the increased scope in terms of substances to be reported, as compared to the current baseline, defined by reporting obligations to the SCIP database. Additional supply-chain investigation and due-diligence efforts are discussed under measure 31 and, although not insignificant, are understood to only be an additional burden, as compared to current obligations.

The increase in scope and the focus on packaging would however likely increase the number of dutyholders, potentially including many SMEs, that would have to use the IT reporting tools set by ECHA, under the future DPP or the national EPR systems. This will require significant manpower and investment in terms of data management, adapting in-house IT systems and performing notifications to these systems (either manually or via system-to-system IT tools).

Significant burdens can also be envisaged for public administrations, particularly the European Commission and ECHA (in case a centralised option based on SCIP is chosen). These would materialise in terms of coordination, IT development and project management to implement the necessary changes in the IT infrastructure and software, as well as to support IT and helpdesk assistance to a whole new set of users.

9.23.5 Economic impacts

Although precise estimations of these costs are not possible without a detailed scoping IT project specification, experience in the setting of the SCIP database indicates potential one-off adaptation costs running into the several million Euros over several years, and permanent increase in the fixed maintenance and operational costs of the database.

In the case on a system developed to work under national EPR schemes such cost is likely to be higher due to the need to develop the required IT infrastructure from zero, the multiplicity of systems and national implementations (including language versions) and the need for subsequent aggregation and integration. No cost estimation has been possible at this stage but it could be envisaged to be significantly higher, and of a more complex and risky execution, than that of a centralised system.

Significant costs are expected to be incurred also by duty-holders having to carry-out additional notifications of substances of concern in packaging (beyond those incurred by those already notifying to SCIP). This involves personnel costs and IT software adaptation costs, required to carry-out the notifications. Potentially, additional costs would be incurred in analytical testing for specific substances in packaging, especially in the case of importers which are unable to obtain required information and reassurance as regards the presence of substances of concern, via enhanced supply chain communication. A quantification of these impacts was not possible under this impact assessment but is expected to be similar to those incurred to comply with current SCIP reporting obligations, by those packaging manufacturers that are already affected.

9.23.6 Social impacts

No significant social impacts are expected. Concerned duty holders will have to dedicate additional resources to enhanced supply chain communication and to notification and (potential) IT adaptation / development. This may have a marginally positive effect upon employment in these areas.

9.23.7 Environmental impacts

No significant environmental impacts are expected. Additional notification and IT development / adaptation tasks involved are expected to have a marginal impact on the environment (e.g. in terms of energy use associated to communication and IT infrastructure).

9.23.8 Stakeholder views

The majority of the stakeholders offered feedback on measures 32a and 32c, but not on 32b. One stakeholder noted that measure 32b should further specify which hazard classifications would define substances in scope, as not all are relevant in this context. He also noted that, as

in SVHC reporting obligations under the Waste Framework Directive, there should also be a concentration threshold for reporting.

Assessment of measure 32c – Notification of all substances in packaging

9.24.1 Description of the measure

This measure is identical to 32b, in terms of requiring dedicated notification of substances to a centralised European database or, alternatively to Member State run EPR packaging schemes. In the case of 32c the scope of the substances to be notified would be far greater and would cover all the substances known to be present in any given packaging or packaging material placed on the market. This concept of "full materials reporting" requires the disclosure of the full chemical composition of packaging and is the most complete form of reporting conceivable.

This system would allow the creation of database of all substances used in packaging, including those with no harmonised classification or with self-assigned hazard classification. It would allow cross checking the risks of substances in packaging whose hazards only become known and assigned in the future, due to technical and scientific progress.

9.24.2 Effectiveness

Measure 32c would enable the creation of a comprehensive database of substances contained in all packaging material placed on the market in the EU, regardless on whether the substance is a substance of concern or not, or if it has any identified hazard properties. As explained for the previous measure, potentially, reporting would not be required if the substance is present in concentrations below 0.1% w/w, for consistency with the current obligations under REACH and WFD. However a lower threshold could be envisaged if there would be a wish to further increase the scope of substances to be reported, so as to cover those present at impurity levels.

This measure would enable the creation of an exhaustive inventory of all substances in packaging that could be permanently cross checked with existing information about the hazard classifications of substances, based both on current and future knowledge, thereby providing a fully comprehensive data-set for subsequent prioritisation and implementation of risk management measures (e.g via imposing specific restrictions, see measure 33).

9.24.3 Ease of implementation

This measure would have the same type of implementation challenges as identified under measure 32b, but with greatly increased difficulty and costs in all its aspects, given the largely increased scope in terms of substances covered.

In addition this measure is likely to raise important concerns in industry in terms of the communication and use of confidential business information and brings about doubts about the proportionality of the measure, given it requires the notification of all substances in packaging, regardless of whether there is any evidence that they may raise concern in terms of their hazard or otherwise, impact on the recycling of materials.

9.24.4 Administrative burden

For reasons similar to those analysed under measure 32b, this measure is expected to have high impacts in terms of administrative burden due to the very large number of substances potentially subject to reporting, control and even analysis. This would have a high impact on suppliers of packaging and on public administrations, including difficulties in the control and enforcement of such a broad scope reporting obligation.

9.24.5 Economic impacts

See measure 32b. Economic impacts are expected to follow a similar patter, but to be higher than for that measure.

9.24.6 Social impacts

See measure 32b.

9.24.7 Environmental impacts

See measure 32b.

9.24.8 Stakeholder views

The majority of consulted stakeholders were in favour of measure 32a and expressed concerns on measure 32c regarding reporting burden, difficulty of implementation and confidentiality of commercial data.

Some stakeholders from the packaging industry interviewed for this study expressed some concern about providing information on the chemical composition of packaging to an EU database as they would consider it confidential business information (CBI).

Summary and conclusion

Although it is acknowledged that data gaps exist regarding the presence and amounts of substances of concern in packaging, especially in non-food contact packaging, multiple publications identify hundreds of chemicals of potential concern used as additives in plastics and other materials that are used in packaging and other applications.

The setting of additional reporting obligations, and their associated data-collection and management systems, beyond those already in place under REACH and the Waste Framework Directive, would increase the knowledge base about hazardous substances in packaging. The two measures analysed to expand this knowledge-base require very substantial efforts and investment for both operators and public authorities which, particularly in the case of measure 32c presents serious doubts about its proportionality.

Considering the broad (albeit incomplete) information already available about substances of concern that could be present in packaging, and the less-onerous options that exist, identified under measure 32a, to complement this information and prioritise actions via dedicated technical support studies, measure 32a is proposed to be conserved.

Consequently the approach defined under measure 32a is proposed as the method chosen towards obtaining information about substances of concern in non-food contact packaging and for the subsequent prioritisation of specific risk-management action, as appropriate. Further action to expand reporting obligations, in view of a more exhaustive "intelligence gathering" can be proposed in the future, once action based on existing information has been taken.

Furthermore, a delay in the decision to implement further reporting obligations for substances in packaging, beyond those currently already in place, will allow the development of the Digital Product Passport under the future regulation on eco-design for sustainable products. Although as currently envisaged, the eco-design regulation would only intervene in a supplementary manner on packaging, it is conceivable that once developed, an instrument such as the DPP could also have a future role in the management of information about chemicals in packaging, thereby contributing to the implementation of the traceability requirements for substances of concern in products defined under the Chemicals Strategy for Sustainability[500].

Measure 33 – Restriction of substances

This measure complements the generic minimisation requirements, defined under measure 31, for substances of concern in packaging. Following the analysis and prioritisation of

[500] The Chemicals Strategy for Sustainability calls for the presence of substances of concern in products to be minimised, and for availability of information on chemical content and safe use to be ensured, by introducing information requirements and tracking the presence of substances of concern throughout the life cycle of materials and products.

information about such substances present in packaging, especially in non-food contact packaging, described under measure 32, measure 33 provides a **specific mechanism to impose restrictions** on the placing on the market and use of specific substances of concern in packaging.

These restrictions should address unacceptable risks to human health and to the environment resulting from the presence of specific substances of concern in packaging. They could be envisaged to range from complete bans to specific limitations (e.g. of use in certain packaging products or materials) or to define risk management measures (addressing containment of substances, limiting emissions, etc).

The problems posed by the adverse effects caused by substances of concern in packaging are further described in section 2 "problem definition" of the body of the Impact Assessment.

The current baseline is defined, on one hand by the existing restriction on certain metals defined under the PPWD and on the other, by restrictions imposed on the use of substances under other legal instruments. More specifically:

- Article 11 of the PPWD establishes specific limits to the presence of four metals (lead, cadmium, mercury and hexavalent chromium) in packaging and packaging components. It also establishes a derogation from the limit for lead for packaging entirely made of lead crystal. The current applicable limit to the sum of these four metals is 100 mg/kg. In addition, Decision 2009/292/EC sets specific derogations from the sum limit for heavy metals for plastic crates and plastic pallets, subject to conditions.
- Title VIII of REACH contains the restriction provisions defined under Europe's general chemicals legislation. Restrictions provide a legal instrument to prohibit or limit the manufacture, placing on the market or use of substances on their own, in mixtures or in articles. Restrictions adopted under REACH are listed in Annex XVII to the Regulation, which lists specific substances or groups of substances and where the text of each entry defines the specific scope of the restriction.

  Article 68(1) of REACH envisages the amendment of Annex XVII of REACH when there is an unacceptable risk to human health or the environment, arising from the manufacture, use or placing on the market of a substance, which needs to be addressed on a Union-wide basis. Articles 69 – 73 of REACH define a procedure according to which, starting from a restriction dossier prepared by the European Chemicals Agency (ECHA) at the request of the Commission, or by a Member State, the Agency assesses and issues an opinion on the content and merits of the restriction proposed. If the requirements for a restriction are fulfilled, Article 73 requires the Commission to prepare an amendment of Annex XVII, which is decided upon via the regulatory procedure with scrutiny (*comitology*).

  REACH establishes no limitation on the possibility to restrict substances in packaging or components of packaging. Packaging or the use of substances in packaging is not listed among the exclusions from the scope of REACH defined in its article 2(1).

Similarly, Article 67(2) of REACH only exempts from the scope of the restriction title the use of substances in cosmetic products, as far as it concerns risks to human health. Annex XVII to REACH already contains restrictions of relevance to packaging, such as that defined for cadmium and its compounds under entry 23, which in its paragraph 1 limits to a maximum of 0.01% by weight the amount of cadmium that can be present in articles made of (certain) plastics. It is not uncommon to find alerts for packaging articles exceeding this limit in the Safety Gate system, the EU rapid alert system for dangerous non-food products[501].

- Additionally, Article 68(2) of REACH provides for a simplified restriction procedure for substances on their own, in a mixture or in an article which meet the criteria for classification in certain the hazard classes (carcinogenicity, germ cell mutagenicity or reproductive toxicity, category 1A or 1B), and could be used by consumers. In such cases a restriction to consumer use can be proposed by the Commission and Annex XVII can be amended by comitology, without the need to follow the process defined in Articles 69 to 73 (i.e. without the intervention of ECHA). Such a procedure has been used to restrict the presence of a large group of substances in clothing and related accessories, other textiles and footwear[502].
- Title VII of REACH provides another instrument to address the risks posed by chemicals by imposing specific authorisation requirements. More specifically, to ensure that risks from substances of very high concern (SVHCs) are properly controlled and that these substances are progressively replaced by suitable alternative substances or technologies where economically and technically viable. Under this instrument, all manufacturers, importers and downstream users applying for authorisations must analyse the availability of alternatives and consider their risks as well as the technical and economic feasibility of substitution.

  A manufacturer, importer or downstream user cannot place a substance on the market for a use, or use it himself, if that substance is included in Annex XIV, unless the use(s) of that substance on its own or in a mixture or the incorporation of the substance into an article, for which the substance is placed on the market or for which he uses the substance himself, has been authorised.

- Regulation (EC) No 1935/2004 provides a harmonised legal EU framework for food contact materials (FCMs). It sets out the general principles of safety and inertness for all FCMs requiring that such materials do not: 1) release their constituents into food at levels harmful to human health and 2) change food composition, taste and odour in an unacceptable way. In addition specific rules apply to ceramic materials, regenerated cellulose film, plastics, recycled plastics, as well as active and intelligent materials, and on specific substances, including BPA, N-nitrosamines, and certain epoxy derivates.

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[501] See for instance Alert No. A12/01521/21: https://ec.europa.eu/safety-gate-alerts/screen/webReport/alertDetail/10004712

[502] Commission Regulation (EU) 2018/1513. https://eur-lex.europa.eu/legal-content/EN/TXT/?toc=OJ:L:2018:256:TOC&uri=uriserv:OJ.L_.2018.256.01.0001.01.ENG

Annex I to Regulation (EU) No 10/2011 on plastic materials and articles intended to come into contact with food provides a positive list of monomers and additives authorised for use in plastic food contact materials. This list does not apply to non-food plastic packaging or to packaging made of other materials. Similar lists for other food contact materials exist under National legislation, and analogous lists are being worked on under the Drinking water legislation.

However, as noted this Regulation is being revised for which the roadmap[503] foresees better prioritisation of substances in all FCMs.

The two measures analysed below intend to address the problems caused by the presence of specific substances of concern in packaging, especially in non-food contact packaging. The objectives are to:

- Eliminate or minimise the risks to human health and the environment, throughout the whole life-cycle of packaging materials, brought about by specific substances of concern; and
- Ensure that recycled materials obtained from packaging are to the greatest extent possible free of toxic substances, safe and fit-for-purpose, thereby increasing the trust of producers and of consumers in secondary materials; and
- Define an efficient, cost effective, evidence-based and reliable mechanism to assess the merits of introducing a restriction on the use or the presence of substances in packaging and to make such restrictions become law.

Assessment of measure 33a – Restrictions of substances under REACH

9.25.1 Description of the measure

Under measure 33a, the restriction of substances in packaging, particularly in non-food contact packaging, would be done under REACH, without establishing any dedicated restriction provisions under the PPWD.

In order to provide clarity on this matter, the following text would be inserted in Article 11 of the PPWD, or in another appropriate place:

When there is an unacceptable risk to human health or the environment, arising from the use of a substance in the manufacture of packaging or packaging components, or from a substance present in packaging or packaging components when they are placed on the market, or during their subsequent life cycle stages, including the waste phase, that needs to be addressed on a Union wide basis, the procedure referred to in Article 133(4) of

503 https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12497-Revision-of-EU-rules-on-food-contact-materials_en

Regulation (EC) No 1907/2006 shall be used in order to adopt new restrictions or amend current restrictions pursuant to Articles 68 to 73 of Regulation (EC) No 1907/2006.

The provision in Article 11(1) of the PPWD on concentration levels of heavy metals present in packaging could remain therein, in a simplified form, given the different transitional periods originally listed have all expired. Consequently the existing restriction would be redrafted as:

Member States shall ensure that the sum of concentration levels of lead, cadmium, mercury and hexavalent chromium present in packaging or packaging components shall not exceed 100 mg/kg by weight.

9.25.2 Effectiveness

This procedure would use the effective and well-tested assessment and regulatory mechanisms under the REACH restriction title to restrict substances in packaging for which there is an unacceptable risk to human health and / or the environment. Restriction dossiers would be prepared by ECHA, at the request of the Commission, or by Member States, which share the right of initiative in proposing restrictions under REACH. Following the assessment by ECHA's committees[504], the Agency would deliver an opinion to the Commission, which would then serve to prepare a proposal to amend Annex XVII of REACH so as to include a specific restriction on a substance, or group of substances, in packaging. Such a decision would be adopted according to the regulatory procedure with scrutiny by the qualified majority of the members of the REACH Committee.

This well-tested approach requires approximately three years to execute, counting from the beginning of drafting a restriction dossier to the adoption of the restriction. REACH restrictions have over the years proven to be an effective and cost-effective approach[505] [506] to protect human health and the environment from the risks posed by hazardous chemicals.

9.25.3 Ease of implementation

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[504] Committee for Risk Assessment and Committee for Socio-economic Analysis

[505] Cost and benefit assessments in the REACH restriction dossiers. ECHA (2016). https://echa.europa.eu/documents/10162/17228/cost_benefit_assessment_en.pdf/b780a657-b4aa-4274-8c74-3a80bae8e883

[506] "*The restriction procedure is generally working, though further improvements in efficiency are needed*". Actions 8 to 10 include proposals to improve the restriction process, further enhance the involvement of Member States and better frame the application of the precautionary principle. Communication from the Commission to the European Parliament, the Council and the European Economic and Social Committee on Commission General Report on the operation of REACH and review of certain elements. Conclusions and Actions. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52018DC0116&from=EN

Ease of implementation of this measure would be very high as no additional legal or procedural instruments need to be put in place. Following the information gathering and prioritisation exercise described under measure 32a, the Commission could request ECHA, under REACH, the restriction of relevant substances in packaging.

From the practical point of view, specific restrictions of substances of concern in packaging would be handled under the same budgetary allocation and as part of the general work-stream and prioritisation flows as all other restrictions under REACH. This means that priority substances flagged for restriction due to packaging-specific concerns would, in a way, compete for resources and "slot allocation" with restrictions backed by other priorities and motivations under REACH. Such coordination work would be ensured by the Commission, in cooperation with Member States, in future reviews of the "Restrictions roadmap"[507] elaborated under REACH.

9.25.4 Administrative burden

No additional administrative burden would be imposed upon the Commission or Member States as compared to the preparation and running of restriction proposals that already happens under REACH.

Additional administrative burden is to be expected for stakeholders that would be affected by the scope of a specific restriction on a substance used in packaging. Such burden would translate into efforts to comply with the proposed restriction, including the implementation of required risk management measures or those to substitute or reduce the use of the restricted substance.

9.25.5 Economic impacts

Economic impacts resulting from restrictions fall to a large extent on the stakeholders that have an economic interest in the manufacture or use of the substance/s that are restricted. These are case-specific and, in the case of substances used in packaging, can impact manufacturers of additives and manufacturers of packaging materials.

These economic impacts can take the form of substitution costs, process adaptation costs, loss of revenue due to decreased sales of the chemicals concerned, etc. An analysis published by ECHA in 2021 of the costs and benefits of restrictions done between 2016 and 2020 indicate that the monetised health benefits to citizens, including reduced risk of cancers, sexual

[507] Proposal for a Restrictions Roadmap under the Chemical Strategy for Sustainability. CA/34/2021. Document presented in the 40th Meeting of Competent Authorities for REACH and CLP (CARACAL) of 29 June 2021. https://circabc.europa.eu/ui/group/a0b483a2-4c05-4058-addf-2a4de71b9a98/information

development disorders, sensitisation and occupational asthma are estimated to be around €2.1 billion per year while the associated costs add up to €0.5 billion[508].

Every restriction adopted under REACH has associated enforcement costs which are borne by the competent authorities of each Member State. By way of illustration of potential enforcement costs for authorities, ECHA has included, in a number of recent opinions[509] on restriction dossiers, an estimate of average enforcement costs across EU Member States which they have determined to be approximately €55,600 per year (as total for all Member States). These costs are reported to be an order-of-magnitude estimate of administrative costs, are not substance specific and do not include testing costs. This same figure is quoted in a recent restriction proposal by France[510].

These costs are not negligible but seem well within the possibilities of national competent authorities, and in line with enforcement costs for purposes other than restriction of substances in packaging, done under REACH.

9.25.6 Social impacts

A quantitative estimate of the health benefits that the restriction of substances of concern in packaging would bring about could not be estimated in the context of this impact assessment and will certainly be very case and substance specific. The referred analysis published by ECHA in 2021 on the costs and benefits of restrictions[511] does however provide a clear indication of average benefits of restrictions.

Health benefits, for instance, in terms of reduced risk of cancers, disorders in sexual development, sensitisation and occupational asthma were equivalent to over €2.1bn per year. These health benefits or reduced risks relate to all observed adverse health effects for more than 7 million consumers and workers per year. Since 2010, there have been 12 cases where the benefits of restriction could be monetised. For these cases, the annual benefits amounted to €2.1 billion – four times higher than the associated costs of €0.5 billion.

9.25.7 Environmental impacts

Similarly to social / health impacts, a quantitative estimate of the environmental benefits that the restriction of substances of concern in packaging would bring about could not be

[508] Costs and benefits of REACH restrictions proposed between 2016-2020. ECHA (2021). https://echa.europa.eu/documents/10162/17228/costs_benefits_reach_restrictions_2020_en.pdf/a96dafc1-42bc-cb8c-8960-60af21808e2e?t=1613386316829

[509] Opinion on PFHxS restriction (June 2020). https://echa.europa.eu/documents/10162/fdaed5b0-b6e4-9a21-b45d-ca607c05f845 ; Opinion on PFNA, PFDA, PFUnDA, PFDoDA, PFTrDA, PFTDA; their salts and Precursors (September 2018) - https://echa.europa.eu/documents/10162/3336e40c-b52c-d9f6-3745-3b4caf61599e

[510] Annex XV restriction dossier for (certain) substances in single-use baby diapers (15 December 2020). https://echa.europa.eu/documents/10162/99f020fd-e8ae-1b66-4fe6-0ec40789db8a

[511] Ibid.

estimated in the context of this impact assessment, and will certainly be very case and substance specific. The referred ECHA cost-benefit study indicated however a reduction of 95,000 tonnes of environmental emissions of substances of concern per year. This also leads to potential health benefits through a cleaner environment and reduced exposure to hazardous chemicals in water, food and air.

A restriction of a substance adopted under REACH is capable of imposing prohibitions and risk management measures on all aspects related to the placing on the market and use of a substance during the product life-stage of packaging. By addressing the use of a substance of concern in the manufacture of packaging it can also have a profound effect on the waste generated by such packaging, at the end of its service life.

However, given that waste is not a substance, a mixture or an article (as per Article 2(2)), REACH is not the appropriate instrument to implement specific risk management measures on activities dealing with packaging waste (i.e. specific exposure control or emissions reduction measures during recycling or disposal).

9.25.8 Stakeholder views

According to the consultation done in support of this impact assessment, several stakeholders considered that the PPWD is not the appropriate instrument for restricting chemicals and that this should be left to REACH and the Food Contact Material (FCM) regulation.

Although unrelated to the current impact assessment, a recent position paper by several industry associations[512], issued in the context of the discussions in co-decision of the Commission's proposal for a regulation on Batteries and Waste batteries[513], a clear preference was stated, in relation to procedures to restrict hazardous substances in batteries, to "*refer to the already existing REACH, OSH and IED processes and therefore benefit from existing horizontal legislation rather than to create additional product specific requirements*".

Assessment of measure 33b – Restrictions of substances under the reviewed PPWD

9.26.1 Description of the measure

This measure is conceptually similar to measure 33a. It provides a mechanism for restricting substances used in packaging and packaging components, relying on an assessment by the European Chemicals Agency of the restriction dossiers presented. This measure differs from measure 33a in that the procedure to make these restrictions into law would be carried out under the revised PPWD itself, via delegated acts and by introducing the list of restricted

[512] Chemicals management in batteries. Position paper by EUROBAT, Eurometaux and RECHARGE. January 2022. https://www.eurobat.org/news-publications/position-papers/510-chemicals-management-in-batteries
[513] COM(2020) 798 final

substances in an annex, to be created for this purpose in the Regulation. The text of the Directive would also have to be modified in order to clearly assign to ECHA this task under the PPWD, together with the required budgetary allocation, indicated in its financial fiche.

Consequently, under this measure, the restriction procedure for substances in packaging would be contained, as a self-standing process under the PPWD, and would have to be specified via articles to be introduced in the amended legal proposal. This approach would mimic that followed in the Commission proposal for a Regulation concerning batteries and waste batteries[514] and, more specifically that contained in its Articles 6 and 71. As a modification to this approach, this measure would also grant Member States the right of initiative to propose restrictions. This change takes into account the discussions in Council that led to an agreement of a "general approach"[515] towards the negotiation of the batteries proposal with the European Parliament.

9.26.2 Effectiveness

For the purpose of restricting substances in packaging and packaging components, this measure would have a similar effectiveness to that of measure 33a. This results from the fact that this measure mimics the dossier preparation and evaluation processes under REACH, where the merits of a proposed restriction are assessed by ECHA which then delivers an opinion to the Commission. In terms of procedure, the difference lies in that decision-making would in this case be done with the advice of a dedicated expert group established under the PPWD and enacted via delegated acts under the PPWD (instead of under REACH).

From the point of view of the scope, and as indicated under measure 33a, the stand-alone mechanism proposed could overcome the limitation of REACH that excludes the possibility of imposing specific risk management measures on the handling of packaging, once it has become waste. This aspect, which was highly relevant and debated in the negotiations of the Commission's proposal for a Batteries Regulation, seems however less important in the case of packaging (see further analysis under *Conclusions*, below).

9.26.3 Ease of implementation

Similarly to measure 33a, implementation of this measure would be simple as the approach relies largely on procedures already put in place and functioning under the REACH Regulation. In this case a separate decision-making procedure would take place under the PPWD, which would require the drafting and adoption of a Commission delegated act, with the support of a dedicated waste expert group dealing with packaging. Given that this expert group already exists and that the efforts to discuss and negotiate a measure therein would be similar to those when done under REACH, in the REACH Committee, no additional workload or difficulties in implementation are envisaged, beyond those to ensure the

[514] COM(2020) 798 final. https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A52020PC0798

[515] General approach. 17.03.2022. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CONSIL:ST_7317_2022_INIT&from=EN

availability of adequate chemicals risk management expertise in the responsible Commission service.

Furthermore, from the practical point of view, and as a result of the distribution of responsibilities in the Commission, the procedure under such a dedicated instrument would most likely be lighter and potentially somewhat faster, given the absence of co-responsibility of DG ENV and DG GROW in the procedure, as established under REACH. It is also likely that, under the specific instrument described in this measure, the prioritisation of restrictions of substances in packaging, with respect to other substances, could be dealt with advantageously, benefiting from a dedicated budgetary allocation and legal mandate to ECHA (as opposed to dealing with all restriction priorities under the general REACH workflow and budget).

9.26.4 Administrative burden

No additional administrative burden would be imposed upon the Commission or Member States as compared to the preparation and running of restriction proposals that already happens under REACH. As described above the only differences would be internal, in terms of the services responsible for overseeing the restriction process, ensuring coordination with ECHA and drafting and negotiating the draft proposals.

Additional administrative burden is to be expected for stakeholders that would be affected by the scope of a specific restriction on a substance used in packaging. Such burden would translate into efforts to comply with the proposed restriction, including the implementation of required risk management measures or those required to substitute or reduce the use of the restricted substance.

9.26.5 Economic impacts

See measure 33a. Impacts are expected to be the same for both measures.

9.26.6 Social impacts

See measure 33a. Impacts are expected to be similar in the case of both measures. As mentioned above, under measure 33b it would be possible to overcome the limitation in REACH which impedes imposing specific risk-management measures on activities which take place once a material becomes waste. From this point of view, measure 33b could be seen to provide a somewhat more effective tool to ensure protection of the human health, especially workers, from the substances of concern in packaging, also during waste management operations.

9.26.7 Environmental impacts

See measure 33a. Impacts are expected to be similar in the case of both measures. As mentioned above, under measure 33b it would be possible to overcome the limitation in REACH which impedes imposing specific risk-management measures on activities which take place once a material becomes waste. From this point of view measure 33b could be seen to provide a somewhat more effective tool to ensure protection of the environment from the substances of concern in packaging, also during waste management operations.

9.26.8 Stakeholder views

See measure 33a. Several stakeholders considered that the PPWD is not the appropriate instrument for restricting chemicals and that this should be left to REACH and the Food Contact Material (FCM) regulation.

Summary and conclusion

As can be seen from the analysis above, measures 33a and 33b are largely very similar, both providing an effective and well-tested instrument to analyse and enact restrictions, both on which rely on the experience of the European Chemicals Agency and on processes designed under REACH. They differ in two aspects:

a. <u>Practical implementation aspects</u>

Measure 33a has the advantage of greater implementation simplicity, given it relies completely on REACH and its associated assessment and law-making mechanisms to carry-out restrictions on substances in packaging. Effectively under this option the reviewed PPWD would delegate upon REACH the task of restricting substances of concern relevant to packaging.

This approach would seem to fit best the approach, also followed under the proposal of the Commission for a Regulation on Ecodesign for Sustainable Products, to entrust all aspects[516] related to the management of chemical safety resulting from the presence of substances of concern in products, to relevant Union legislation (in particular, REACH). This position is also in line with the views expressed by industry stakeholders and, in the context of recent discussions in Council of the proposal for a Regulation concerning Batteries and Waste batteries, also by many Member States. In these negotiations, many Member States expressed great reticence to having a dedicated instrument for enacting chemical restrictions under the Batteries Regulation, and only exceptionally agreed, for the specific case of batteries, to do

[516] Recital 22 of the COM(2022) 142 final states: "*This Regulation should not enable the restriction of substances based on chemical safety, as done under other Union legislation. Similarly, this Regulation should not enable the restriction of substances for reasons related to food safety. Union law on chemicals and food, however, does not allow addressing, through restrictions on certain substances, impacts on sustainability that are unrelated to chemical safety or food safety. To overcome this limitation, this Regulation should allow, under certain conditions, for the restriction ,primarily for reasons other than chemical or food safety, of substances present in products or used in their manufacturing processes which negatively affect products' sustainability.*."

so. The consensus views of Member States, on this matter are clearly reflected in recital 17c, introduced in the "general approach" agreed on 17 March 2022:

(17c) The use of hazardous substances in batteries should be restricted in order to protect human health and the environment during the whole life-cycle of batteries and to manage the presence of such substances in waste. Taking into account the specific nature of batteries and waste batteries as well as the fast growing innovation and product development in this area, prioritisation and diligent examination of restriction dossiers are key to ensure the protection of health and environment as well as providing transparency for economic operators. While relying on Regulation (EC) No 1907/2006 to ensure the restriction of substances in batteries would have been a possible approach, the need to take account of the specific nature of waste batteries, resulted in the choice of a dedicated procedure for restrictions on substances in batteries, at all stages of their life cycle, in this Regulation. This choice is without prejudice to the approach that may be decided upon in respect of other product legislations. In addition, the Commission is expected to propose a revision of Regulation (EC) No 1907/2006 during the current legislative term. In this context, it will be necessary to assess whether or not the approach in this Regulation should be maintained, on the basis of a specific evaluation by the Commission to be included in its report on the application of this Regulation.

In contrast to this, there are also some practical arguments in favour of measure 33b, which reflects the approach taken under the Commission's proposal on batteries. This includes the advantages of having a dedicated process and an expert group, specialised in packaging and packaging waste, to analyse packaging-relevant restrictions, which would ensure a more specialised and holistic approach (as opposed to having such packaging-specific discussions addressed together with all other restrictions and other REACH related aspects that are dealt with under the REACH Committee).

In addition, as explained above, there are practical advantages in terms of prioritisation and allocation of restriction work to ECHA, and in the ease of running the actual law-making part of the process, that would potentially benefit from a dedicated process, with its own expert group, legal mandate to ECHA and budgetary allocation.

b. <u>Coverage of the waste phase</u>

As indicated above, restrictions carried-out under REACH are limited in the sense that they cannot specifically address the waste phase, given waste is excluded from the scope of REACH. This does not mean that REACH restrictions cannot have an impact on the safety of waste management, given restrictions on the product phase can have a profound impact on what chemicals are ultimately present in waste (i.e. if a ban or a content limitation in products is imposed).

There are however some limitations, in particular as regards the possibility to impose specific risk-management measures during waste management operations. The existence of this limitation under REACH is not only confirmed by the Commission services, but also

coincides with the view expressed by the Legal Service of the Council, during the negotiations on Batteries.

Consequently, in this sense, it would seem clear that measure 33b would offer greater flexibility in terms of the tools that would be available under the PPWD to address the risks posed by substances in packaging, once they become waste.

Conclusion

The analysis above shows that both measures 33a and 33b, although largely equivalent, each have their own strengths and weaknesses. The major difference lies in the enhanced capacity under measure 33b to deal with imposing risk management measures in the waste phase. This consideration, which was very relevant for batteries, does not seem however so important in the case of substances in packaging and in packaging waste. This is explained by the fact that, whereas on batteries the focus is placed on the recycling of hazardous substances which are major constituents of the battery (lithium, cobalt, lead, cadmium and nickel compounds), in the case of packaging, substances of concern are additives, generally found at low concentrations, and not themselves the target of recovery.

Therefore, for the case of packaging, it would seem that addressing substances in the product phase, possible both under measure 33a and 33b, would be a sufficiently powerful instrument to deal with risks of these substances of concern in packaging, once they become waste (notably, by promoting their substitution). As indicated by stakeholders, any remaining concerns relative to worker exposure or emissions to the environment during waste management, could be sufficiently addressed under the general and specific provisions in place under the EU's horizontal legislation on worker protection[517] [518] [519] and Industrial Emissions[520] [521].

In all other aspects, the differences between measure 33a and 33b are small and of a rather internal and practical nature. Measure 33a would address in a more consistent manner the position, clearly expressed my Member States, stakeholders, and by the Commission itself in its Regulation on Ecodesign for Sustainable Products, of concentrating the restriction of substances, for chemical safety concerns, under REACH. Specific considerations, which played a role in the discussion on batteries, justified by the crucial role of hazardous

[517] Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work. https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A31989L0391

[518] Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A31998L0024

[519] Directive 2004/37/EC on the protection of workers from the risks related to exposure to carcinogens or mutagens at work. EUR-Lex - 02004L0037-20140325 - EN - EUR-Lex (europa.eu)

[520] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32010L0075

[521] Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU. https://eur-lex.europa.eu/legal-content/EN/TXT/?toc=OJ:L:2018:208:TOC&uri=uriserv:OJ.L_.2018.208.01.0038.01.ENG

substances in the existence of batteries as a product and their strategic relevance to Europe's climate and energy policies, which advised to manage such restriction under the Batteries Regulation, do not seem to apply, to dealing with substances of concern in packaging.

Taking all the above into account, measure 33a is proposed to be taken forward as the preferred measure to promote the restriction of substances of concern in packaging.

INTERVENTION AREA ON ENABLING MEASURES - DEPOSIT AND RETURN SYSTEMS (DRS) AND COLLECTION TARGETS

Introduction

Under this intervention area, we considered several measures which are enabling measures for achieving high quality recycling, high recycling rates and ensuring that enough recycled materials of sufficient quality are available to producers bound by recycled content targets. The measures focus on the introduction of deposit and return systems (DRS) as a well-recognised means for achieving high collection rates

Measures discarded and not analysed in depth

- Measure 26c: Introduction of collection targets / requirements for deposit return systems for specific materials/ applications

Measures analysed in depth and included in the options table

- Measure a&b: Mandatory DRS and Minimum Requirements for DRS
- Mc: Prioritized use of recycled packaging from DRS
- Measure 26cc: Waste collection schemes alternative to DRS

Measures analysed in depth and included in the options table

9.27 Measure Ma&b: Mandatory DRS and Minimum Requirements for DRS

9.27.1 Description of the measure

This measure will require Member States to have a DRS for metal cans and plastic bottles used as single-use beverage containers by the end of 2027. Member states would be free to include additional materials (Measure a). In addition, this measure would also set out minimum requirements for DRS provision in all Member States (Measure b).

The objectives of this measure are to:

- Support achievement of existing Commission separate collection targets for plastic drinks bottles under the SUP Directive,[522]
- Drive high collection rates of drinks containers made from other materials (specifically cans, though glass is also formally considered)
- Increase the supply of good quality recyclable material suitable for closed loop recycling across all Member States through a system that is convenient for consumers to use
- Reduce drinks container litter

A mandatory DRS requirement will help to deliver greater consistency across Member States to improve consumer and economic operator familiarity with DRS behaviours and requirements. This DRS measure solely targets and captures single-use containers. Some Member States may not have a refillable bottle market justifying national provision; in Member States where one exists, practice to date has sometimes seen it continue parallel to a single-use DRS, and sometimes be incorporated in the same legislation. This would remain a decision for Member States. Existing DRS within the EU cover both these container types (plastic bottles and aluminium cans), and this measure is not expected to require changes to existing systems

Single-use glass beverage bottles were also considered during development of this measure, but are not included in this final proposal, as a mandatory packaging format.

Measure Mb - minimum requirements - would significantly enhance the consistency and familiarity benefits outlined. As Measure Ma is proposed to be applied alongside Measure Mb – minimum requirements for DRS – for the purpose of this assessment, both measures have been combined into a single measure M a&b. The minimum requirements will be designed so they allow for innovation and DRS designs that are suitable to local

[522] Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment

circumstances. There are many possible combinations of requirements that could be looked at as options, but the minimum requirements reflect a core proposition based on stakeholder views and expert analysis.

Setting minimum requirements across all Member States will alleviate the decision-making burden during DRS design, and may facilitate faster implementation. Minimum requirements will be designed to include best practice features and bring together lessons learned from existing DRSs.

As with measure Ma, measure Mb primarily targets single-use containers. However, in addition to the design principles for the DRS itself (outlined below) a minimum requirement to consider the interaction between refillable bottles and single-use containers, to ensure the former is not disadvantaged by the introduction of a DRS, is also recommended. This would avoid unintended negative consequences for container types (reusables) that wider policy needs to see grow.

One minimum requirement relates to material coverage and specifies both plastic beverage bottles and beverage cans should be in scope for any DRS that is introduced. This requirement may be unnecessary if this measure is adopted alongside measure Ma. Nothing restricts Member States going over and above this minimum level of material coverage; in such a case all other minimum requirements would apply to any additional material types Member States chose to include in a DRS.

Careful consideration should be given to how any minimum standards relate to existing DRS provision. It would not be desirable to require:

- changes to existing schemes that are already high performing; or
- changes to schemes that have recently launched and have made recent large infrastructure investments, and where performance and consumer behaviours are still settling in.

Potential mitigations to avoid unintended consequences in this regard would include:

- a requirement to harmonise existing schemes only when those schemes update themselves;
- some requirements could be applied on different timelines; and
- exemptions to the harmonisation requirement might be considered for existing schemes achieving over 90% capture.

The priority would be to avoid disrupting effective schemes, even if some aspects of delivery were not fully aligned. The biggest risk around non-alignment with existing practice was identified as relating to single-use glass. This material is not included as a minimum requirement under the proposed measure. Beverage cans and plastic bottles are a common feature in all existing EU schemes. However, other areas of non-alignment will exist, and the principles and mitigations above remain relevant to measure design.

The proposed minimum requirements for this policy measure have been based on existing schemes achieving 90% or over.

Table 71. Minimum DRS requirements

Minimum Requirement	**Sub Objective**	**Rationale**
Material scope to include cans and plastic bottles *(note: this requirement may not be necessary as the measure will be delivered alongside measure Ma)*	Target high value and easy to collect and recycle material	Material value for cans and plastic bottles is relatively high (compared to glass and Liquid Paper Board (LPB) cartons) and when collected through a DRS, the high-quality materials are suitable for closed-loop container-to-container recycling (see also measure Mc). Cans and plastic bottles are easily collected through RVMs and have much lower transport costs when compared to glass. Cans and plastic bottles are typically in scope for all existing DRSs and can be collected with identical system infrastructure, and already have well-established end markets. Glass and LPB cartons have not been included as a minimum requirement due to the more complicated logistics and RVM requirements of these container types, and more limited recyclability of LPB cartons. LPB cartons have a lower market share than the other materials Single use glass does however obtain high collection rates when included in DRS, albeit at a higher cost. The method of collection and handling however impacts whether collected material is suitable for closed-loop recycling.

Minimum Requirement	Sub Objective	Rationale
Require all beverage types excluding wines, spirits[523] and milk, and all containers up to 3 litres[524]	Target easy to collect and recycle material	A high percentage of the wines and spirits market is imported and containers rarely have a national barcode. There are lots of small producers and container designs are not always as suitable for the collection infrastructure and reprocessing. There are hygiene and odour concerns with including milk/dairy and milk/dairy substitutes which could spoil material, reduce material value, and increase collection point maintenance costs. It may be possible to overcome these issues, but this is perhaps too demanding for a "minimum" requirement
Target of 90% separately collected return rate for all DRS materials, with an incentive to encourage performance over 90%	Maximise supply of material collected	A high return rate supports the objective to develop the recycling industry by boosting supply and quality of materials. 90% return rate is achieved by many existing DRS's and is a realistic objective. Supportive policy or governance can ensure that performance continues to be optimised beyond 90%; specifying how this can be done might be beyond the scope of the minimum requirements as financial incentive mechanisms can vary.
Separately charged and	Incentivise	The deposit amount must be clearly communicated and consumers must be refunded the full

[523] The intention here is to exclude large spirit bottles not premixed drinks in more common container formats

[524] A minimum size threshold is usually also selected, though with slightly less consistency than the upper limit of 3 litres; we recommend the final specification clarifies both.

Minimum Requirement	Sub Objective	Rationale
fully refundable deposit	consumers to return containers	deposit value on redemption. The deposit must exclude VAT. Deviations from this approach can confuse or demotivate consumers, and may also impact system costs (e.g. if VAT is paid on deposits, either the consumer or the system lose money on every deposit paid in).
Obligate retailers to be involved through return-to-retail model, but allow exemptions for small retailers depending on local circumstances	Convenient for consumers to participate	Return-to-retail is associated with the highest return rates globally which provides a large network of high density return locations that are convenient to consumers. Return-to-retail supports an efficient DRS with shared infrastructure and staff. The return-to-retail model may be supported by bulk redemption depots, food and beverage areas, public and community spaces, and nothing in this requirement should stifle innovation. This measure could specify a store size above which retailers are obligated to take-back, or leave this to member state discretion.
Clearly mark containers to show eligibility	Convenient DRS for consumers	Deposit bearing containers must be marked such that it is clear to consumers which containers will receive a deposit refund when returned to encourage consumers to participate in returning used containers.
Spend minimum of 1% of turnover on communications campaigns	Maximise public participation	Public communications are essential to engage the consumers and motivate participation in the DRS. A budget of 1% of net costs of the DRS is typical for DRSs with 90% and over return rates.

Minimum Requirement	Sub Objective	Rationale
DRS must be a not-for-profit system	Producers only fund necessary costs of DRS	Unredeemed deposits and material revenue must be reinvested in the DRS to maintain a high performing system with producers only funding the necessary costs.
Centralised DRS	Delivery of efficient DRS	The benefits of a centralised DRS over competing schemes include; • avoiding duplicated infrastructure, staff, admin and logistics; • optimising material revenues • reduced confusion for consumers; • less work and costs to retailers; • lower risk of fraud; and • reduced regulatory costs to government.
Government oversight (and enforcement if schemes underperform)	To ensure compliance	Penalties for poor performance

Minimum Requirement	Sub Objective	Rationale
Reporting transparency		The scheme operator must provide regular transparent reports on performance and financial accounts to government, retailers, producers and the public.
Industry-led and owned DRS funded by the producers in line with producer responsibility principles		The beverage industry must be responsible for the environmental impact of their products. The industry can utilise their expertise of logistics and communications to deliver a successful DRS.

9.27.1 Effectiveness

Modelling for this measure is based on an optimised DRS with wide coverage of container types; this would be achieved as this measure is combined with measure Mb on mandatory minimum requirements.

Table 72 shows the following improvements from this measure in 2030 compared to a business-as-usual approach for the same year. **Note that this shows the increase in material actually recycled after process losses are accounted for**, not the increase in material collected.

Collection rates in excess of 90% are modelled as the DRS needs to perform at this rate to deliver overall collection levels of 90% once DRS-exempt containers are accounted for (a specific consideration for plastic bottles in light of the collection target set in the Single Use Plastics Directive). The recycling rate for plastic bottles is less 90% due to process losses for this material.

Table 72. Increased recycling from Mandatory DRS for plastic and cans

Material		**Tonnage recycled (thousand tonnes) (DRS & other routes combined)** **2030 (with measure)**	**Recycling rate achieved**	**Percentage point increase in recycling rate against baseline**
Plastic Beverage Containers		2,720	81.6%	+2.0pp
Metal Cans	Aluminium	489	93.9%	+9.9pp
	Steel	206	93.3%	+1.9pp

This analysis understates the potential impact of DRS, as the 2030 baseline assumes the SUPD target of 90% collection for plastic drinks bottles is already met (there is a small uplift in performance nonetheless). In practice, this target is likely to be met only by implementation of a DRS, which includes plastic bottles, so the current measure may be a key supporting policy for SUPD, and not simply for PPWD, with this measure contributing to much greater improvements for plastic bottle recycling than shown.

A well designed DRS is a proven means to achieve 90%+ capture for plastic and cans used as single-use beverage containers, and is already being chosen as an approach by many EU Member States in relation to achieving the plastic bottle target set out in the SUP Directive.[525] While official data on recycling rates for PET and aluminium beverage containers specifically is not widely available, the maximum recycling rate for plastic bottles, without using a DRS, is thought to be around 70%.[526] Cans can achieve higher recycling rates without a DRS, but a study for the European Commission in 2011 showed six out of eight of the top can recycling countries had a DRS.[527] Lithuania's introduction of a DRS raised can recycling from around 38% (estimated in 2011) to 93%.[528]

Materials collected through a DRS provide high quality and exceptionally low contaminations material streams[529], achieve a higher material income, and are more suited to closed-loop container-to-container recycling. Collecting plastic bottles via a DRS is likely to be essential to meet the recycled content target set out in the SUP directive[530].

Based on existing DRS-es, the evidence shows introducing a DRS can reduce littering of deposit-bearing items by at least 85%.[531]

If there was no alignment with measure Mb, it would be possible that elements of system design might not be optimised, resulting in somewhat lower performance than identified here. In the worst case, Member States could introduce poor quality provision, which would be neither economically efficient, nor deliver environmental gains. This is why it is proposed to combine this measure with measure Mb into a single measure Ma&b.

As both measure Ma and Mb will be combined into a single measure Ma&b, this will significantly increase the chances that the performance levels modelled will in fact be achieved, by ensuring both broad coverage of beverage product types, and design principles that should optimise performance.

In addition to scheme performance benefits, introducing minimum requirements will deliver a more consistent approach to DRS across all Member States, potentially leading to less confusion for consumers using the DRS and therefore increasing participation.

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[525] SUP Directive (2019) EUR-Lex - 32019L0904 - EN - EUR-Lex (europa.eu)

[526] ICF & Eunomia (2018) *Plastics: Reuse, recycling and marine litter – Impact assessment of measures to reduce litter from single use plastics*. Report for the European Commission, DG Environment. 30 May 2018

[527] Eunomia et al. (2011) *Options and Feasibility of a European Refund System for Metal Beverage Cans*. Final Report for the European Commission, DG Environment. 16th November 2011.

[528] Reloop, and CM Consulting (2018) *Deposit Systems for One Way Beverage Containers: A Global Overview*, 2018, https://reloopplatform.eu/wp-content/uploads/2018/05/BOOK-Deposit-Global-27-APR2018.pdf

[529] The loss of material in a subsequent recycling process is reported to be lower than 5 %

[530] SUP Directive (2019) EUR-Lex - 32019L0904 - EN - EUR-Lex (europa.eu)

[531] Eunomia (2017*) Impacts of a Deposit Refund System for One-way Beverage Packaging on Local Authority Waste Services*, 11th October 2017

9.27.2 Ease of implementation

Mandatory DRS is an established policy option that has been introduced by a number of European countries. Implementation will be eased by alignment with measure Mb (which will simplify the range of policy choices to be considered at national level).

The implementation timeline required to contribute to targets for 2030 is realistic. Figure 54 shows some standard timelines for preparation (legislation and planning), and implementation, plus a launch year. Schemes may take a couple of years to reach peak performance thereafter. We propose 2027 or 2028 is the latest launch date to reach 90% collections by 2030.

a) *Phase 1* - DRS preparation (4 – 9 months)
b) *Phase 2* - DRS Implementation (14 – 24 months)
c) *Phase 3* - Go-live and Support (12 months)

Figure 54. Typical DRS implementation timescale



Setting minimum requirements based on existing good practice DRSs will provide a framework from which Member States can work and help to simplify and expedite implementation.

Table 73 below gives an overview of the DRS systems already established in the different Member States, including the materials in scope. For these MS it is thus assumed that there is no implementation burden.

Table 73. Implemented DRS in the EU for single use beverage containers

MS	Date implemented	Materials in scope
Croatia	2006	Plastic, metal, glass
Denmark	2002	Plastic, metal, glass

Estonia	2005	Plastic, metal, glass
Finland	1996	Plastic, metal, glass
Germany	2003	Plastic and metal
Latvia	2022	Plastic, metal, glass
Lithuania	2016	Plastic, metal, glass
Netherlands	2005	Plastic
Slovakia	2022	Plastic and metal
Sweden	1984	Plastic and metal

9.27.3 Administrative burden

Costs to the scheme operator for ongoing administration are included in the scheme modelling described under economic costs.

Additional administrative costs may be incurred as follows:

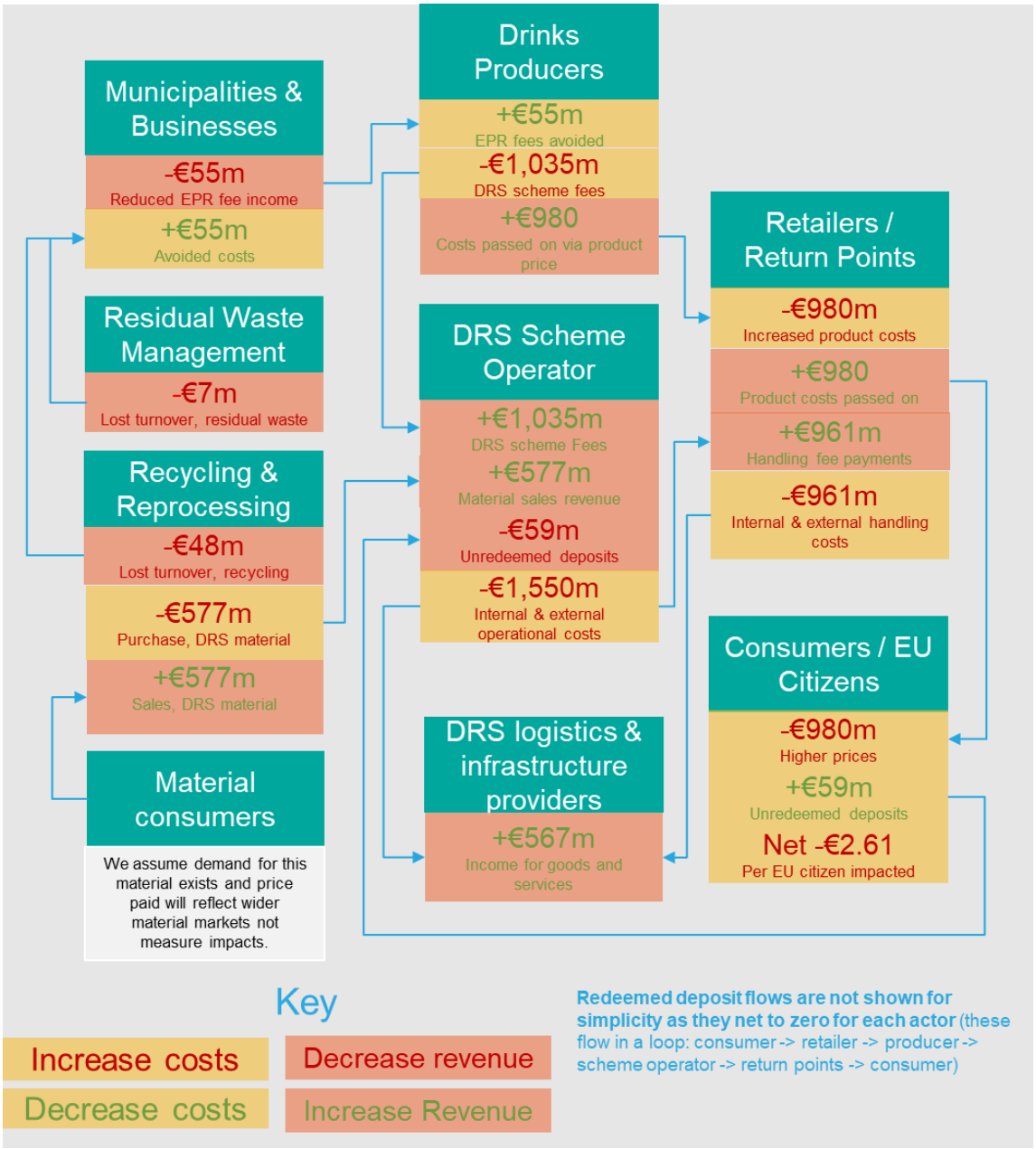
- Member States will pass most system responsibilities to the system operator once initial legislation is passed; however they may incur additional one-off costs if they choose to remain involved in further elements of scheme design or set up. They may also incur small ongoing costs for monitoring scheme performance.
- Producers will incur one-off costs for labelling and product line changes prior to system launch. They may incur ongoing costs to manage product destined for different DRS jurisdictions thereafter.

Defining minimum requirements might be expected to additionally reduce administrative costs. It is likely to streamline the legislative process for DRS introduction for Member States that do not currently have one (though any alignment requirements for existing schemes might increase their administrative burden). Greater consistency should also facilitate economic operators providing products into multiple DRS schemes.

9.27.4 Economic impacts

Modelling shows the net annualised costs of DRS in 2030 are €980m, comprising of costs of €1,035m for the DRS and a saving of €55m for other waste management activity. These costs will be picked up via producer fees in line with the minimum requirements outlined. They may be passed to consumers or absorbed by producers. Producers may benefit from increased material availability for closed loop recycling (see measure Mc).

The following Figure summarises the annual economic impacts and revenue transfers of a mandatory DRS for plastic bottles and beverage cans:



As introductory of mandatory DRS will be combined with minimum requirements, it is likely to mean wider beverage products coverage than some Member States might otherwise choose (maintaining costs close to the modelled level) but performance gains might offset this somewhat.

9.27.5 Environmental impacts

Modelling shows the net annualised impacts as follows (Table 74). Combining both measures makes it more likely that the environmental impacts modelled are in fact achieved in full, due to both a likely wider beverage product coverage and optimised collection rates from governance and design choices.

Table 74. Environmental impacts from Mandatory DRS for plastic and cans

Summary of Environmental Impacts, change in 2030 relative to baseline	
Change in GHGs, thousand tonnes CO_2e	-1,136
Change in water use, thousand m^3	-14
Change in GHG/AQ externalities, € million	-353

9.27.6 Social impacts

Modelling identified a net annualised employment impact of 15,079 additional FTEs in 2030 relative to the baseline. Jobs are created throughout the DRS process, from machine installation and maintenance, through to logistics. There is also additional material available for reprocessing or recycling.

As identified in the section on effectiveness, litter impacts for items in scope should be significant, with falls in littered items similar to the collection rate for the DRS. This may impact wider measures of local environmental quality and wellbeing, as well as contributing to a cleaner environment [532]. As an indication of the potential scale of benefit, though not one directly transferable to an EU-wide context, a recent study in England (population 56 million) monetised the potential disamenity benefit of a DRS covering plastic, cans, and glass, and achieving an 85% reduction in litter, as between €877 million and €2,326 million[533].

DRS provides a very visible recycling system that may assist in creating powerful pro-environmental norms. If containers are destined for closed loop recycling, and this is clearly communicated to consumers, it may also improve understanding of the circular economy more generally.

Combining measures Ma&b, makes it more likely the social impacts modelled are in fact achieved in full, due to both a likely wider beverage product coverage and optimised collection rates from governance and design choices.

[532] Zero Waste Scotland, *Scotland's Litter Problem*, https://www.zerowastescotland.org.uk/sites/default/files/Scotland%27s%20Litter%20Problem%20-%20Full%20Final%20Report.pdf, summarises the potential cost areas for society in detail; more recent studies have tended to be assign higher values when quantifying disamenity.

[533] Eftec, 2020, *Amenity Value Benefits of a Deposit Return Scheme for Drinks Containers*.

High performance and user friendly design are key features driving the minimum requirements and this might be expected to reinforce behaviour change norms, as would greater consistency across the EU.

9.27.7 Stakeholder views

A dedicated survey of selected stakeholders was conducted by the contractor under the impact assessment support study. It focused on views on minimum requirements. The survey was sent to 25 stakeholders. 17 stakeholders gave responses, ranging from packaging associations and producers to EPR schemes and NGOs.

The majority agreed with the inclusion of metal cans (10/17) and plastic bottles (12/17) in the minimum scope. A minority felt that glass bottles (7/17) and beverage cartons (5/17) should be included in scope for minimum requirements (again, with cross-over relevance).

11 out of 17 stakeholders directly supported the introduction of a mandatory requirement for DRS provision for certain packaging (with views on materials to mandate more varied). However, 9 out of 17 stakeholders also supported the consideration of a national exemption option from a mandatory DRS requirement, if the country is already capturing a high rate of targeted containers through alternative means. This was particularly popular with the glass industry due to the existence of existing EPR schemes and kerbside collection and bottle banks for glass. Multiple packaging associations supported an opt-out option for Member States if they can provide evidence detailing their national strategies to meet the high collection target.

In terms of product coverage, between 10 to 12 stakeholders out of 17 supported the inclusion of beer, concentrate/squash/cordial, fruit juice, soft drinks and water in the minimum requirements. Only 6 to 7 stakeholders out of 17 supported the inclusion of milk and dairy, non-dairy alternatives and spirits and wine. Stakeholders did voice concern over items being given a competitive advantage if not included in the DRS.

The consideration of the economic impact on lower income consumers was raised, particularly for multi-packs of essentials such as bottled water where the value of the deposit results in a high outlay. These impacts would be exacerbated if there was a delay in low-income consumers receiving back the deposit.

In terms of deposit amount, 9 out of 17 stakeholders disagreed that the deposit amount should be set out in the minimum requirements, with stakeholders suggesting it should be decided at the national level taking into consideration socio-economic criteria of consumers to ensure high return rates. An absolute minimum of €0.10 adjusted for purchasing power parity and inflation over time was suggested. 5 out of 17 of stakeholders surveyed agreed that the minimum requirements should standardise the deposit amount across all in scope containers and 7 out of 17 stakeholders surveyed said that the deposit amount should vary by size of container, to minimise the risk of market distortion. Stakeholders highlighted that the net cost principle should be applied to producer fees for a DRS, and cross-subsidisation of materials should be avoided.

There was strong support amongst stakeholders for the minimum requirements setting out the nature of locations which should accept returns (14/17). 11 out of the 17 stakeholders that responded agreed that large retailers should be obligated to take-back, while 9 and 8 out of 17 agreed that small and online retailers should be obligated to take-back, respectively. Consumer convenience was highlighted by multiple stakeholders as the central consideration for return points.

12 out of the 17 stakeholders who responded supported a specific return rate target being set centrally by the Commission in the minimum requirements. Only 5 out of 17 supported the decision on return rate targets being left to individual Member States.

There was strong support for the minimum requirements covering governance structure (14/17). All stakeholders agreed the System Operator should be industry led and owned in line with Extended Producer Responsibility Principles. 14 out of the 17 stakeholders who responded agreed that the System Operator should be centralised so there is a single operator for any given national market. All stakeholders agreed that the System Operator should be non-profit and funded by material revenues, unredeemed deposits and producer contributions.

Plastic beverage packaging associations highlighted that most Member States would not be able to meet the 90% collection target of PET bottles without a DRS. Nevertheless, they mentioned that necessary leeway should be given to Member States which can prove they are meeting the collection targets through alternative means such as EPR schemes. This is a higher burden of proof than that identified by packaging associations above (which is based on national strategies, not actual performance).

Two environmental NGOs responded to the survey. They were both in favour of a mandatory DRS with all material and beverage types in scope of the minimum requirements, to achieve an EU-wide return rate of 90%. They also supported the harmonisation of the deposit level and producers obligated to take-back to reduce consumer confusion and prevent market distortions, in case, retailers and consumers turn to packaging not in scope. However, it was pointed out that if refillable packaging were to be included in a mandatory DRS, it makes sense for refillables to have a lower deposit than one-way packaging, to encourage reuse.

One environmental NGO stated their support for a mandatory DRS sharing their view that its implementation has become almost inevitable, to meet the EU Green Deal and Circular Economy goals. They pointed out that a DRS for one-way beverage packaging should be the bare minimum and used as a starting point, but a DRS should be encouraged for refillables as well as the inclusion of other packaging types beyond beverage packaging. This would encourage reuse and a move away from recycling in line with the EU's waste hierarchy.

An EPR scheme highlighted in their position paper that they are not in favour of a generalised and mandatory DRS for all beverage packaging types. This is because some materials, such as glass, already have existing systems in place to reach high recycling rates. They mentioned that instead, they would be in

support of Member States being able to choose to set a DRS for certain types of packaging, if this is the best option. In this case they would be in favour of minimum criteria, including collection targets, set at the EU level that Member States and brand owners will have to follow.

Support for the inclusion of glass and beverage cartons in a DRS was weaker than for plastic bottles and cans. Nevertheless, the beverage carton industry voiced support for a mandatory 90% collection target for beverage cartons, and support for a DRS with beverage cartons in scope of the minimum requirements to achieve this, though they do not necessarily favour mandatory DRS. A packaging association also supported a mandatory 90% collection target for beverage cartons, recommending this target as a more effective way to increase the recycling of beverage cartons than a mandatory DRS.

The glass beverage packaging industry voiced their support for a 90% collection target for glass packaging (without separating beverage and non-beverage packaging), instead of the inclusion of glass in a mandatory DRS (to which they are opposed for single-use glass). They reasoned that glass is already successfully collected in kerbside and bottle bank collections and the quality of recyclate can be improved through existing systems, such as EPR schemes. The glass packaging industry had concerns that the inclusion of glass in a mandatory DRS could jeopardise the quantity and quality of glass collected through existing systems. Many non-glass stakeholders in contrast favoured inclusion of glass beverage bottles in a mandatory DRS. Reasons given to include glass in a mandatory DRS were that a DRS is the only approach evidenced to reach 90% collection targets, as well as to avoid market distortions and improve recyclate quality.

Previous stakeholder feedback provided for the previous PPWD Impact Assessment study was also considered (see Annex 2). Stakeholders spoke of the need for harmonisation of collection systems which would increase collection rates and recyclate quality across the EU. Several argued that a DRS was the most effective way to do this, as long as there was guidance to ensure effective implementation, which could be in the form of minimum requirements.

9.28 Measure Mc: Right to priority access for material collected via DRS

9.28.1 Description of the measure

This measure would be an addition to measure Ma/Mb, if taken forward, and is intended to deliver greater closed loop recycling than measure Ma/Mb alone. It would also better align with EPR principles, by leaving producers more directly in control of their packaging material at end of life.

A DRS collects high quality recyclate with very little contamination. For plastic especially this can provide rPET at high quality much more efficiently than alternative collection routes, and suitable for closed loop bottle-to-bottle recycling into food contact materials, with associated environmental benefits. **The EU has set a 30% target for recycled content in plastic beverage bottles by 2030, and 25% for PET bottles**

specifically by 2025[534], and Member States and economic operators can and have set higher targets. However, rPET is expected to be in increasingly high demand from other packaging and product sectors. This may make rPET too expensive for beverage producers to obtain or result in a situation where there is too little rPET to meet targets for bottle-to-bottle recycling. Even within the bottle market, there can already be fierce competition for limited amounts of rPET, potentially disadvantaging smaller producers.

Losing rPET from bottle-to-bottle applications may also see downcycling in material use, whereby material is lost to a circular economy much faster than would otherwise be the case (e.g. by incorporation in products that cannot in turn be recycled).

Many beverage producers therefore want "priority access" to the recyclate collected by a DRS to maximise the level of recycled content in their products, and the extent of closed loop recycling that takes place.

The case for priority access for beverage cans is similar to that for PET from a producer perspective, although less well studied, and currently without widespread recycled content targets as a driver of concern for producers. This case may increase in salience over time, especially with high material prices. **The case for priority access for glass (if single-use glass is included in a DRS) is weaker.** Glass for bottle production already commands a premium price, meaning bottle-to-bottle demand is supported without priority access; the suitability of glass from a DRS for use in closed loop recycling also depends on the collection method employed by a DRS[535]. **If beverage cartons were incorporated in a DRS, there would be no benefit currently in a right to priority access**, as this material is not currently suitable for closed loop recycling (beverage cartons use longer virgin fibres, and the board component of recycled cartons is used in other downcycled applications). **However, for glass, beverage cartons, or any other container material, there is no need to specify limitations to the priority access right as set out here. "Priority access" can also be thought of as a "right to first refusal" – a producer is free to exercise this right if it is advantageous but is under no obligation to do so if it is not.**

A right to first refusal aligns with the original intention of EPR:

[534] Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment

[535] Only systems that preserve bottles for colour separation, or break bottles into a small number of large fragments suitable for optical sorting, will produce glass suitable for closed loop recycling.

"a policy principle to promote total life cycle environmental improvements of product systems by extending the responsibilities of the manufacturer of the product to various parts of the entire life cycle of the product, and especially to the take-back, recycling and final disposal of the product"[536]

Proposed EPR requirements around net cost recovery for waste management in the EU support this whole life intention, with EPR policy features, such as modulated fees, to incentivise eco-design and consideration of impacts across the product lifecycle[537]. A right to first refusal supports the same principle.

The standard drinks containers in scope for a DRS (plastic bottles and cans) are highly recyclable in design, and the industry will be paying, via the DRS, to deliver very high collection rates in practice. If there is an economic or compliance advantage to be obtained from the design and capture of these containers, it is appropriate that the producers that have created this, are the ones to benefit. Conversely, producers of products or packaging that are less recyclable, and less recycled, can currently compete for recycled content at no disadvantage. **A right to first refusal aligns with a potential future where packaging producers generally take more explicit physical or legal "ownership" of their material throughout the lifecycle.**

The mechanism proposed to ensure priority access via a right to first refusal is by an addition to the "minimum requirements" for a DRS[538]. The minimum requirements already specify an independent non-profit and producer-led system operator, and that the system operator should own the material collected by the system. **This measure would add the following additional features:**

- **Decisions on material sales by the system operator are agreed by the producers,** even if other actors (e.g. retailers) are part of governance and ownership for the system operator as a whole
- The system operator must make provision to offer material on a "right to first refusal" basis to economic operators placing containers into scheme scope
- Material offered to individual economic operators on a "right to first refusal" basis must be offered proportionally to the amounts and types of the material they place into the scheme. In the event of a surplus (more material availability than accepted at first pass), the scheme operator, guided by the producers, should continue to allocate material proportionally to satisfy producers that would like a greater allocation, before considering the wider market.
- Material taken by economic operators on a "right to first refusal" basis should only be sold or passed on for closed loop (container-to-container) recycling, though this might be challenging to guarantee

[536] Lindhqvist, T (2000) *Extended Producer Responsibility in Cleaner Production: Policy Principle to Promote Environmental Improvements of Product Systems*, PhD, The International Institute for Industrial Environmental Economics, Lund University.
[537] Eunomia 2020*, Study to support preparation of the Commission's guidance for extended producer responsibility scheme*, European Commission

[538] An alternative approach was considered but not progressed. Theoretically, the Commission could alternatively specify in detail the mechanism and process whereby producers could obtain recyclate from the system operator. However there seems little benefit to this approach, which could be overly restrictive and limit opportunities for tailored national solutions. As system operators will remain national in scope, so too will claims for material (with economic operators working in multiple markets having to make multiple claims in any case). This limits the value of a uniform approach - a cross-border economic operator would still be completing multiple claims to different systems.

- **Priority access must not be overly burdensome for SMEs.** Specific thought should be given in drafting the directive to whether SME would need to be defined uniquely for this purpose (e.g. by market share).

The system operator (or the producers within it if non-producers are also part of governance) would be free to decide the appropriate price and precise mechanism by which it provided a right to first refusal within these parameters. If the system operator (controlled by producers) decides to offer material for sale very cheaply in this scenario (advantaging producers), it is the same producers that would have to pick up any financial implications for the system operator (via their producer fees), so this approach should not disadvantage the system operator or impact scheme economics for consumers.

It might be considered desirable that any high-quality food grade material not taken by producers for immediate closed loop recycling is preferentially offered to other food packagers (minimising downcycling). However, this is hard to regulate for, and is therefore not an explicit feature of this measure[539].

Small producers that export products via a third-party economic operator could potentially be disadvantaged without additional features being added to this measure. Their material could then arise in a national scheme where they were not represented, while the importer (who introduced the material to the market and is therefore entitled to reclaim it) might have little interest in reclaiming material. There are also some areas (e.g., the Danish/German border), where significant container transfer happens via private consumers.

This material leakage could be balanced out (in a case where all EU countries have a DRS) by giving small exporters a right to claim an equivalent amount of material from their "home" DRS (at a small marginal cost to large producers in the event of a shortfall), but this might become difficult for different national schemes to coordinate. Overall, **interviews with drinks industry representatives suggested both that these problems would be limited, and that SMEs would be better off in a world with the right to first refusal than they are currently in respect to their ability to obtain food grade rPET.** We have therefore not articulated additional detail around treatment of SMEs here, but this should be considered further in designing actual right to first refusal mechanisms.

Nothing prevents a scheme operator (who typically legally owns the material in a DRS) choosing to distribute material in a selective way currently. This measure would standardise the approach to be taken; rejecting this measure would not preclude priority access approaches being pursued by national schemes.

[539] For bottle-to-bottle closed loop recycling the producer pool is defined by inclusion in the DRS, and the beneficiaries of the measure are the producers that have invested in recyclability and collection of the product, in line with EPR principles. This is not the case once an effort is made to preferentially benefit selected third parties.

9.28.2 Effectiveness

This measure is likely to be **highly effective** in giving priority access to producers, though some may find it easier than others to take advantage of that right.

This measure supports the DRS objective identified in measures Ma and Mb to increase closed loop recycling (see environmental impacts below). **This measure may be essential for drinks producers to meet EU recycled content targets** if these increase in ambition over time. It may already be essential to meet targets set by specific economic operators for their own operations. **This measure aligns with the original intention of EPR, and a more circular future where producers take more direct physical responsibility for material they put on the market** (see measure description above). Currently recycled content is available to the highest bidder, irrespective of any investment they have made in ensuring its supply. Efficiency in allocation and use of material for closed loop systems in this measure would be improved by arrangements between economic operators, including DRS schemes themselves, to facilitate material allocation and collection in more geographically efficient ways.

This measure may however cause tensions around the following areas:

- It does change market conditions for some economic operators. Non-priority economic operators are left with fewer choices in rPET supply (especially for food grade applications) and could see higher prices driven either by supply and demand imbalances for rPET, or by tighter market conditions for PET as a whole. The rationale for allowing this effect is the additional investment made by drinks producers in providing and collecting rPET via a DRS and their strict obligations to meet both food grade material requirements and, for plastic, recycled content targets.
- DRS is national in scope. Any producer registered in a scheme can act on their right to priority access, regardless of their place of origin, but this may be less efficient for small operators, where the original product producer may not be the "producer" legally registered in the scheme[540], or where material crosses border due to consumer purchase. This may also cause efficiency challenges overall, with entitlements to recycled content arising in a geographically or temporally distributed way, or with incentives or ability to reclaim material not completely equal at all points in the supply chain. Notwithstanding this challenge drinks producers are still likely to be better placed to access food grade rPET with a right to priority access than they can currently.

9.28.3 Ease of implementation

Implementation will be the responsibility of scheme operators. This may increase scheme costs marginally, but this cost would be borne by the producers that benefit from the measure itself. Scheme operators and producers have a clear interest in optimising implementation as much as possible as they are the beneficiaries and will pay any associated costs.

[540] DRS defines importers as "producers" for product from beyond the scheme jurisdiction, and these importers may be a distinct economic operator with no direct interest in product or packaging manufacture in some supply chains.

Challenges around material traceability are not anticipated to be significant by stakeholders: production of food grade packaging is tightly regulated and highly optimised already, due to the requirements of food safety regulations[541]. Nonetheless, mechanisms to support more efficient allocation and reallocation of material arising in diverse geographical locations would seem highly desirable to overall efficiency of this measure.

9.28.4 Administrative burden

There will be an extra administrative cost for **DRS scheme administrators** who would need to provide both a process to enable right to first refusal, and may also need to facilitate this process physically (e.g. providing material from the DRS to multiple economic operators, rather than being able to optimise this for their own operational requirements). This is estimated to be small relative to the cost of running a DRS. Ultimately this would be passed to producers as part of DRS producer fees.

If there is a net cost to **producers** in directly exercising their right to first refusal, they would be highly unlikely to exercise that right. They will only do so if they think the benefits (legal compliance, marketing benefits, differential material costs) exceed the administrative burden.

Costs to **national authorities** should only occur in the event of a legal challenge or non-compliance from a scheme administrator. There is no reason to think this measure offers additional compliance checks to those implied in measure Da or Db.

9.28.5 Economic impacts

This measure will reallocate costs and benefits across economic actors, and this has been qualitatively mapped as part of this project. The resulting effect will be that the costs - and also benefits - of end-of-life management resulting from design and collection choices accrue to the producers that have made those efforts. However, it may disrupt access to rPET for other actors, and change market dynamics in the plastics supply chain.

Trends in PET prices overall are extremely hard to predict, as PET is a global commodity whose price is linked to oil prices. Future plastic or virgin material taxes may also impact vPET prices by 2030. The interplay between vPET and rPET prices is not straightforward; these products can be in direct competition (if both are equally suitable for an application and the economic operator does not care which they use). However, this is not the case for drinks packaging producers, who must have food grade material for their product, and will increasingly need rPET to meet EU, national, and corporate recycled content targets. In contrast, many competitors for this material are not similarly constrained. High demand and limited supply

[541] In discussions with drinks producers (Unesda and NMWE) they emphasised that food and drink regulations mean food grade material is closely tracked at all stages of packaging production, and that in plants filling multiple products for different producers, systems are cleaned and supplied with appropriate source material between product runs. Where preformed bottles are ordered, the specification is also highly detailed.

are likely to support food grade rPET prices in future, and they are also limited in a downwards direction by collection and reprocessing costs.

- **Drinks producers** will benefit from an ability to more easily obtain food grade rPET, and may pay a lower price for it (though any resulting reduction in material revenue to the system operator would be compensated for by those same producers via increased DRS producer fees). **Smaller producers** may not be so well positioned to take advantage of the right to first refusal. They will probably have less influence on the precise design of the mechanism by which the right to first refusal is facilitated, and will have smaller volumes of material arising, which may limit efficient logistics options for them. **Bottlers and preform suppliers** are typically well integrated into the supply chain, and already coordinate carefully with product producers on material and packaging flows and requirements, however, the relationship dynamics are likely to change with widespread DRS adoption, and especially with a right to first refusal. Any downsides may still be less severe than the likely outcomes in a scenario with no right to first refusal.
- **Other food packaging producers** will find access to food grade rPET is harder and could have to pay higher prices for rPET (due to restricted supply) or purchase vPET (with a possible price differential – this being most likely if PET supply is tight overall).
- **Other packaging producers, and other users of recycled plastic (e.g. textiles)** will find access to rPET is harder and could have to pay higher prices for rPET (due to restricted supply) or purchase vPET (with a possible price differential – this being most likely if PET supply is tight overall).
- **Waste and recycling plant operators** will be impacted by the introduction of a DRS even without the right to first refusal, which will significantly shift where material arises, and the contracting arrangements for managing it, which could create specific winners and losers. Priority access may additionally give additional control to drinks producers over material flows, though overall there would be more material needing reprocessing.
- **DRS operators** may see an increase in running costs. Any loss in material revenue should be balanced by an increase in producer fees, and material quality may improve further if design for recyclability is further encouraged by this measure.

Any reallocation in costs from differential prices between sectors would be expected to pass through to consumers. No issues were identified for national authorities as management is in the hands of the system operator (though see also administrative costs).

It should be noted that even without this measure, scheme operators will typically "own" the material in the scheme and may choose to dispose of it via some equivalent of right to first refusal. Some of these impacts may therefore arise without this measure. In addition, some Member States have already put in place similar measures (e.g. SK, IT)

9.28.6 Environmental impacts

This measure should have positive impacts on closed loop recycling and result in decreased use of vPET in the targeted sector of drinks packaging producers. The material in one PET bottle can, if captured repeatedly for bottle-to-bottle recycling, be recycled multiple times into new bottles before process losses eventually mean the material is lost to the circular economy. At each cycle, vPET demand is

displaced. In contrast, if the material is downcycled into a one-way application (such as textile fibres) it will serve only one further use.

There are studies suggesting that in a fully closed-loop system (with no collection losses), PET from PET bottles can be recycled up to 11 times, without compromising quality[542]. This means that a tonne of PET entering closed-loop recycling could theoretically substitute up to 11 tonnes of vPET production.

In a DRS collecting 90% of plastic bottles and directing all of them to bottle-to-bottle recycling, 1 tonne of PET collected could therefore substitute for 9.9 tonnes of vPET inputs to packaging over repeated collection and recycling cycles. Currently around 31% of PET goes into bottle-to-bottle recycling[543], and 1 tonne of PET collected and recycled therefore displaces just 3.4 tonnes of vPET inputs to packaging over time.

This shift may not in itself reduce demand for vPET overall, as the impact depends on exactly how other sectors respond, and which applications of rPET are substituted for. The same applies to calculating carbon impacts. Expanding the closed loop recycling of PET bottles will also generate a need for other industries (trays, fibres, other packaging, strapping) to push for enhanced PET collection for their own products and packaging, so there are likely to be significant dynamic effects to this measure.

9.28.7 Social impacts

There are no significant social impacts expected.

9.28.8 Stakeholder views

Views expressed were divided, with drinks industry stakeholders strongly in favour, but other sectors that would be impacted strongly opposed. More time was spent exploring detailed issues with the drinks sector to understand potential differential impacts in that sector and so inform measure design; this focus should not detract from the strength of the high-level objections of stakeholders opposed to the measure.

Drinks producers using PET are strongly in favour of this measure[544] [545], which they see as critical to their ability to reach recycled content targets, and a fair reflection of the investments they have made in

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[542] Pinter, Elisabeth, Frank Welle, Elisa Mayrhofer, Andreas Pechhacker, Lukas Motloch, Vera Lahme, Andy Grant, and Manfred Tacker. 2021. "Circularity Study on PET Bottle-To-Bottle Recycling" Sustainability 13, no. 13: 7370. https://doi.org/10.3390/su13137370

[543] Zero Waste Europe/Eunomia, 2022, *How Circular is PET*, https://zerowasteeurope.eu/wp-content/uploads/2022/02/HCIP_V13-1.pdf

[544] Unesda, NMWE, Zero Waste Europe, *It's time to acknowledge the role of Deposit Refund Systems (DRS) in achieving a Circular Economy for beverage packaging in the EU*, https://www.unesda.eu/its-time-to-acknowledge-the-role-of-deposit-refund-systems-drs-in-achieving-a-circular-economy-for-beverage-packaging-in-the-eu/

recyclability of their packaging and in collecting that packaging via a DRS[546]. This measure was also mentioned as desirable – without prompting – from these sector stakeholders as part of responses to measure Ma/Mb. Feedback focused overwhelmingly on PET, but stakeholders supported this being a general measure for all material collected by a DRS.

Potential differential impacts within the drinks sector were tested in stakeholder conversations and are summarised under economic impacts. Stakeholders suggested small producers (of both products and packaging) would be better off than under the status quo, where they have to compete both with larger drinks producers and other sectors. Concerns were specifically expressed about "island solutions" where a single rPET user could sign long term or exclusive contracts to access material from a DRS, ensuring their own targets are met, but closing out other players. SMEs do not necessarily have the market power to compete on either price or access priority in such a market. These stakeholders were also explicitly asked about impacts on bottling plants and preform suppliers, with similar rationales given in response on the likely effects. It was stressed that the already highly regulated nature of the food packaging chain for product and packaging means traceability and manageability of different sources of PET should be easy for different economic operators to track.

It was further highlighted in this conversation that the right to priority access could and should be extended beyond DRS to other EPR schemes in future. The idea that an economic operator should be directly responsible for their product or packaging material at end of life – for better or worse – was expressed. There was concern that sectors that were not seen as having invested in recyclability or collection to the same extent were free riding by being able to then compete for recycled content from PET bottles. The desirability of keeping food grade rPET material for other food packaging applications was also highlighted as a desirable feature of a priority access measure.

In sharp contrast, **stakeholders who would not have a right to first refusal** are extremely concerned at the potential loss of access to rPET derived from drinks bottles, and believe that this measure would be anti-competitive[547]. They believe it will jeopardise single market rules and damage their ability to innovate. A wide range of actors expressed concern, including non-food products (AISE, Cosmetics Europe, CIRFS); plastic recyclers (EuPC, PRE); and recycling and waste management more generally (EuRIC, FEAD).

9.29 Measure 26cc: Waste collection schemes alternative to DRS

9.29.1. Description of the measure

[545] Unesda, NMWE, AIJN, *Beverage industry needs priority access to its recycled plastic material to close the bottle loop and accelerate the transition to a more circular economy*, https://www.unesda.eu/wp-content/uploads/2021/07/PRESS-RELEASE-Beverage-industry-needs-priority-access-to-its-recycled-plastic-material.pdf

[546] Stakeholder discussion, and email follow up, with Unesda, NMWE, Zero Waste Europe.

[547] Letter to the Commission 21/03/2022, from AISE, CIRFS, Cosmetics Europe, EuPC, EuRIC, FEAD, PRE

This measure focusses on the separate collection via EPR schemes for certain packaging, which have proven to be efficient and effective in terms of the amount of separately collected waste and its high purity. Ma&b ensures that a 90% collection target is reached in a cost-efficient way by means of mandatory DRS for aluminium beverage cans and plastic bottles. M26cc however, refers to the possibility of setting up efficient and effective EPR based actions for beverage containers. The data analysis shows that in some Member States and for certain beverage containers, well designed and well operated EPR schemes can achieve high collection rates without DRS in place

Considering that by entry into force of the new Regulation, all Member States will have EPR schemes in place, it is expected that the costs to close the gap to a 90% collection target via specific measures within the EPR schemes would not exceed the costs of mandatory DRS for beverage containers. However, separate waste collection via EPR schemes may not be so efficient to reach high collection rates than DRS.

The environmental savings of this measure is similar to Ma/b, and could be slightly higher because also other containers of the same packaging type could be included into the separate collection scheme.

9.29.2 Effectiveness

The effectiveness of this measure is similar to Ma&b, as it focusses on the achievement of high collection rates for beverage containers. In the following sections, the effectiveness of this measure is discussed for beverage containers, such as beverage cans, glass bottles and beverage cartons.

Beverage cans

EU recycling rates for beverage cans was at an average of 76% in 2019, which ranged from 99% in countries such as Germany (which has a DRS) to 30% in countries such as Cyprus[548]. DRS are proven to achieve capture rates of 90% and over when well designed and well operated. Beverage cans are included in almost all DRS schemes around the world, due to their high recyclability, ease of transportation and significant market share[26] (although not as large as glass and plastic). Beverage cans collected via a DRS provide high quality recyclate that can be easily put into closed loop recycling (see also measure Mc). However, the literature and interviews with stakeholders[549] e.g. EPR and PRO schemes indicated that well-designed EPR based actions can deliver high collection rates. When these actions are coupled with awareness raising campaigns, which are also needed in the case of the implementation of DRS, then the collection rates can be increased. Therefore, this measure considers that EPR based actions for beverage containers can be considered as an efficient way to achieve high collection rates. Nevertheless, separate waste collection via EPR schemes may not be so efficient to reach high collection rates than DRS. This is

[548] Metal Packaging Europe, and European Aluminium (2021) Aluminium beverage can recycling remains at a high 76% in 2019

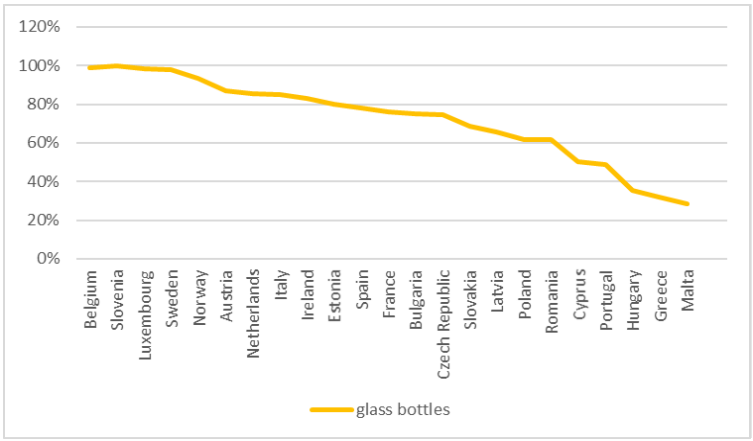
[549] Among others: Metal packaging Europe (2021), Recycling rates of aluminium beverage cans in the EU in 2019; Eurostat (2019), steel beverage packaging collection; FEVE (2022), close the glass loop, exchange of information with Fost Plus 12 July 2022; Reloop target 90 (2022), Target 90: The dual-action approach for circular drinks packaging in Europe

also concluded by the data analysis where for aluminium beverage cans, in 2019, the Netherlands, Luxembourg, Lithuania and Ireland, achieved collection rates for recycling of 82%, 94%, 89% and 89% respectively. Therefore, in terms of environmental benefits, it is assumed that the improvement in recycling will match that shown for measure Ma&Mb, and in fact could be slightly higher because also other containers of the same packaging type might be included into the separate collection schemes.

Glass bottles

The data analysis of countries with/without DRS indicates that a 90% capture rate for glass bottles is achievable via DRS or EPR based actions. The industry has already set a 90% capture target by 2030 through the multi-stakeholder partnership, Close the Glass Loop[550]. EU capture rates for glass was at an average of 78% in 2019, which ranged from over 90% in Scandinavian countries to below 50% in countries such as Greece, Cyprus and Malta[551]. Glass has a significant market share of packaging waste in the EU by weight, of which a significant proportion is bottles[552]. Figure 56 below presents some collection rates for recycling for glass bottles for member states without DRS in place. For comparison, the collection rates for member states with DRS in place, including in their scope glass bottles, range from 85% to 90%[553].

Figure 56. Collection rates for glass bottles in member states without DRS in place in 2019 (FEVE 2022)



Therefore, the improvement in recycling will match that shown for measure Ma&Mb.

Beverage cartons

550 (2022) Close the Glass Loop, accessed 17 March 2022, https://closetheglassloop.eu/
551 Close the Glass Loop (2021) Record collection of glass containers for recycling hits 78% in the EU
552 Eurostat (2022) Packaging waste statistics, accessed 17 March 2022, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Packaging_waste_statistics
553 FEVE (2022), close the glass loop

The collection of beverage cartons is considered more challenging compared to aluminium (and steel) cans and glass bottles and typically it is not covered by DRS. Beverage cartons are not 100% recyclable and are not suitable for closed-loop recycling, due to the multi-layered material (i.e. ~75% board, ~20% plastic and ~5% aluminium and its separability is very limited in the EU as limited facilities exist in Europe). Nevertheless, the sector has set a 2030 goal[554]; 90% collection target for 2030, and 70% of material recycling.

Current situation in Germany regarding beverage cartons collection

Germany collects an estimated 87.5% of cartons (not just beverage cartons) based on weight via predominantly kerbside collection as part of a wider packaging EPR scheme, though research indicates a significant amount of this reported weight (estimated to be 15%) is product and moisture contamination[555]. Further process losses can occur thereafter, but even for a collection target rather than a recycling one, this example indicates that both EPR based actions and DRS for beverage cartons are very challenging and achievement of high capture rates and recycling rates require substantial effort.

9.29.3 Ease of implementation

EPRs are already established in 25 member states for packaging[556]. However, it is considered that by the entry into force of the Regulation, all Member States will have in place EPR schemes. Therefore the implementation of this measure is not considered challenging.

For specific packaging items, such as glass bottles, which is not necessarily within the scope of the mandatory DRS as discussed in Ma&b, Member States can implement EPR based actions (since some Member States achieve already high collection rates without DRS in place), assessing probably its economic performance against the DRS solution. Even when recycling rates under existing schemes are relatively high (78% for glass across the EU as a whole as highlighted above), the marginal cost of closing the gap to 90% through existing EPR schemes may not be significant (it is essential though to couple these actions with awareness raising campaigns).

9.29.4. Administrative burden

[554] ACE (2021), *The Beverage Carton Routemap to 2030 and beyond*, https://www.beveragecarton.eu/wp-content/uploads/2021/03/The-Beverage-Carton-Roadmap-to-2030-and-Beyond.pdf

[555] Eunomia (2020) *Recycling of Multilayer Composite Packaging: the Beverage Carton. A Report on the Recycling Rates of Beverage Cartons in Germany, Spain, Sweden and the UK*. Report for Zero Waste Europe. December 2020

[556] https://www.europen-packaging.eu/wp-content/uploads/2021/03/EUROPEN-factsheet-on-EPR-for-used-packaging.pdf

It is not expected that this measure will create additional administrative burden. Some administrative (one-off) costs may be incurred associated with: i. the implementation of new separate waste collection schemes or extending the scope of existing separate waste collection schemes and ii. monitoring scheme performance (small costs). However, these costs may be compensated to a large extend by the additional revenues from the recycling processes.

9.29.5. Economic impacts

This measure was not fully assessed because 25 member states have already in place EPR schemes for packaging. It is expected that some investments, coupled with additional awareness raising campaigns would be needed, in order to reap the full benefits of this measure.

9.29.6. Environmental impacts

If a Member State decides to implement EPR based actions, the environmental impacts would be similar to Ma&b, because the largest environmental benefits come from the additional materials collected sent for recycling.

However, the maximum benefits will arise from the combined implementation of this measure and Ma&b.

9.29.7. Social impacts

When EPR based actions are designed to ensure high performance (i.e. high collection rates of high purity) and are user-friendly (i.e. come with clear sorting instructions), it is expected to be widely accepted by the citizens. This can lead to reinforce behaviour change norms, as would greater consistency across the EU. This will definitely increase recycling rates but also reduce at the same time littering.

The design and implementation of EPR based actions may result in slight job increase in the EU. Low skills jobs are expected to be created, which will be associated with the improvement of waste collection infrastructure and the sorting and reprocessing because of the additional amount of collected materials.

9.29.8. Stakeholder views

A short survey was conducted amongst targeted stakeholders, as discussed under Measure Ma&b. In addition, position papers from packaging industry representatives were considered in the development of this measure.

Some EPR schemes representatives stated that the DRS is a very expensive solution, which does not ensure 90% collection target for plastic bottles and eventually contributes very little to the overall recycling rate. Moreover, they also mentioned that well designed EPR actions such as door to door waste collection, coupled with educational campaigns to promote sorting can remain a simple and effective way to sort waste. They also mentioned that glass is a material, which already has high collection rates via EPR schemes.

Measures discarded and not analysed in depth

The measures that are included in this Impact Assessment are the result of an extensive screening process. Based on a preliminary assessment some measures were discarded in early stage because they were considered to not meet one of the core criteria related to effectiveness, efficiency, fairness, policy coherence,

Measure 26c: Introduction of collection targets / requirements for deposit return systems for specific materials/ applications

This measure was about the potential introduction of collection targets for specific packaging waste streams with the introduction of mandatory introduction of deposit return systems (DRS) for some packaging streams. This measure was initially proposed and discarded, but has now been split into two distinct proposals: measures Ma/Mb, covering minimum requirements and mandatory DRS, and Measure 26cc, covering the collection target. The collection target (Measure 26cc) is limited to beverage containers, whereas in measure 26c it also considered films. Reasons for rejection of 26c included limited evidence about the added value of collection targets in addition to direct recycling targets, especially in light of Implementing Decision (EU) 2019/665, on how recycling rates should be calculated. However, as this revision will not include revision of recycling targets (see recyclability, section 9.16), it made sense to consider these measures in depth.

INTERVENTION AREA ON ENABLING MEASURES - LABELLING

Introduction

Research has shown that consumer confusion regarding the recycling of packaging (particularly plastic packaging) is currently widespread, and results in increased contamination in the recycling stream and a poorer resulting quality of outputs. There are no existing harmonised requirements on information to consumers about the collection or recycling disposal routes available to them for packaging.

Article 8 of the PPWD states that *"packaging shall indicate for the purposes of its identification and classification by the industry concerned the nature of the packaging material(s) used on the basis of Commission Decision 97/129/EC"*. Commission Decision 97/129 establishing the identification system for packaging materials[557] sets out a proposed system for uniform numbering and abbreviations to be used on packaging made of different materials, but **this information is directed to waste operators, not to consumers,** and - while being harmonised - the use of the symbols is **voluntary for the economic operators and not currently widespread**. Despite the voluntary nature of the measure, some Member States have adopted legislation requiring economic operators to label their packaging with these harmonised symbols indicating material used in packaging.

Article 13 in the PPWD requires Member States to provide packaging users with various information relating to the return, collection and recovery systems available to them, but the exact information and the specific type and format for this **information is not harmonised**. This reflects the current lack of harmonisation of separate waste collection systems across member states as well.

The clearest sorting guidance to citizens consists of two matching labels, one on the (packaging) waste item and one on the waste receptacle. This is the only way to achieve the full benefits of such a labelling system. However, the uncoordinated introduction of such systems risks undermining the integrity of the single market and may cause an unnecessary cost burden on business. Furthermore, the clear and consistent labelling of sorting and recycling instructions is associated with a high potential for improved packaging waste collection quality and quantities, however, such a labelling scheme is currently not harmonised.

Efficient municipal separate waste collection systems rely on correct waste sorting at source by households and businesses that use municipal waste systems. The importance of citizens' cooperation is widely acknowledged by the scientific literature, Currently, observed capture rates (i.e. how much of all separately collected waste is deposited in the appropriate separate collection receptacle) and misthrow rates vary considerably between different collection[558,559] systems, suggesting that significant efficiency gains are possible if best practices (such as waste sorting instructions, and matching labelling on packaging and waste bins helping citizens correctly sort their waste) are adopted more widely throughout the EU.

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[557] European Commission, *Commission Decision of 28 January 1997 establishing the identification system for packaging materials pursuant to European Parliament and Council Directive 94/62/EC on packaging and packaging waste,* https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31997D0129
(OJ L 50, 20.2.1997, p. 28–31)

558 Seyring, N., Dollhofer, M., Weißenbacher, J., Herczeg, M., McKinnon, D., & Bakas, I. (2015). Assessment of separate collection schemes in the 28 capitals of the EU. In BiPRO/CRI (Issue November), https://doi.org/10.2779/49194

[559] OLLECTORS. (2020c). Work package 3 - Quantification of costs and benefits. ASSESSMENT OF SOCIO ECONOMIC AND FINANCIAL PERFORMANCE OF 12 SELECTED CASE STUDIES

A quantitative assessment has been carried out in order to estimate the impacts on packaging waste collection rates and quality (purity of collected waste), and eventually, recycling rates. To assess this impact, stakeholder engagement was undertaken to inform the qualitative assessment below.

Measures not carried forward to the options table

- Measure 27a: Labelling of "recyclable" packaging (in line with selected definition)

- Measure 27e. Incentives for digital watermarking/ other tracer technologies

Measures analysed in depth and included in the options table:

- Measure 27c-y: Harmonised labelling of products and waste receptacles to facilitate consumers´ sorting (advanced Nordic pictograms system)

- Mk: Restrictions on use of confusing labels

- Measure 38-j: Labelling criteria for recycled content

- Measure 12-u: Harmonised labelling for reusable packaging

- Mx “Update of current material-based labelling”: Removal of alphanumeric codes for waste sorters

Measures analysed in depth and included in the options table

9.30 Measure 27c-y: Harmonised labelling of products and waste receptacles to facilitate consumers' sorting (advanced Nordic pictograms system)

9.30.1. Description of the measure

Article 6 of the PPWD states that a minimum of 65% (by weight) of packaging waste shall be recycled no later than 31 December 2025 and a minimum of 70% (by weight) no later than 31 December 2030[560]. These increases in recycling rates will require significant improvements in sorting, collection, and recycling systems, and a key contributing factor will be high levels of consumer participation in sorting packaging waste for recycling. Consumers will need clear and accurate information to facilitate correct sorting of packaging waste as their confusion regarding the recycling of packaging (particularly plastic packaging) is currently widespread and results in increased contamination in the recycling stream and a poorer resulting quality of outputs[561].

As was stated in section (1.1), Articles 8 and 13 of the PPWD contain provisions on labelling. However, the problem analysis shows that they do not deliver sufficiently against the requirements for consumer labelling.

Currently, there is an increasing trend for mandatory labelling requirements to achieve the correct sorting of packaging waste at Member State level. However, this poses significant challenge to the integrity of the single market, irrespective of the value of such labels to consumers. Some Member States, such as Portugal and Bulgaria, are introducing their own mandatory requirements for the marking of packaging materials, which includes mandatory use of the classification system set out in Decision 97/129. Similarly, France has instituted mandatory on-pack labelling of recyclable packaging with its 'Triman' logo. Italy came up in 2017 not only with harmonised colours for the different waste streams, but introduced a labelling system on waste bins, with voluntary matching symbols on packages[562]. Since then, Denmark, Finland, Iceland, Norway and Sweden have introduced a comprehensive labelling system based on harmonised pictograms (with primarily symbols and, optionally, colours and text). These pictograms can be placed voluntarily on the packaging and the same pictogram is mandatorily to be displayed on the waste receptacles, i.e. container, bin or bag. This creates a strong visual link that is helping households to correctly sort their waste[563].

Divergent approaches to this labelling problem across the EU risks undermining the single market and impose significant barriers and costs on economic operators. A fragmented approach may improve consumer understanding in specific national or local settings but does not facilitate clear communication and understanding across the EU.

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[560] European Commission, *Consolidated text: European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste*, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A01994L0062-20180704

[561] Amir Kavei, F. and Savoldi, L., 2021. *Recycling Behaviour of Italian Citizens in Connection with the Clarity of On-Pack Labels. A Bottom-Up Survey*. Sustainability, 13(19), p.10846.

[562] UNI (2017). UNI 11686 (2017). Waste management – waste visual elements – visual elements for waste containers.

[563] Dansk Affaldsforening. (2022). User Guide. Danish pictogram system for waste sorting, collection services & recycling centres

Labels for products and waste bins help to identify the right bin for each type of waste, thereby making sorting more convenient (other information might also be present, e.g., on how to prepare recyclables). To the extent that citizens misthrow or do not sort waste because they do not know how to identify the correct bin for disposal, or it takes them more time than they are willing to spend, such a measure can lead to improved sorting by increasing citizens' capabilities and opportunities[564]. The literature generally associates positive impacts on waste sorting with labelling[565]. However, the effectiveness of labelling rests, in the first place, on citizens' general willingness to sort their waste. For this reason, new labelling systems are typically implemented in conjunction with consumer awareness campaigns and possibly other reforms of the collection systems. Thus, it is not possible to have an isolated estimate of the effect of labelling on sorting performance and recycling rates.

The literature on waste sorting behavioural change shows that improved written instructions improves recycling behaviours with clear instructions such as labelling at the point of collection[566]. Given that most citizens might sort waste and packaging several times per week as they empty consumables, it is plausible that the matched pictograms on packaging and bins would save citizens' time; thereby, increasing convenience (unquantified) which reduces a common barrier to recycling behaviour[567,568].

The clearest sorting guidance to citizens consists of two matching labels, one on the waste item and one the waste receptacle. This approach is implemented already in several MS, including Denmark, Sweden, and Finland[569]. However, the uncoordinated introduction of such systems risks undermining the integrity of the Single Market and to cause an unnecessary cost burden on business. Thus, an EU harmonised labelling of packaging is currently considered as part of this revision of the PPWD.

This measure will therefore require packaging to have labelling indicating its material composition readily visible and in a manner accessible to the consumer, to facilitate end-of-life sorting and disposal decisions by consumers. It will also require labelling waste collection containers to carry the same symbols as packaging, in order to allow consumers a straightforward identification of the correct waste container for the corresponding packaging and an overall improvement to separate waste collection. Therefore, the measure will help address consumer confusion as to where to dispose of their waste packaging and will enable further harmonisation of consumer sorting across the Member States.

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[564] Ölander, F. & Thøgersen, J. (1995). Understanding of consumer behaviour as a prerequisite for environmental protection. *Journal of Consumer Policy*, *18(4)*, 345–385

[565] Amir Kavei, F., & Savoldi, L. (2021). Recycling {Behaviour} of {Italian} {Citizens} in {Connection} with the {Clarity} of {On}-{Pack} {Labels}. {A} {Bottom}-{Up} {Survey}. *Sustainability*, *13*(19), 10846. https://doi.org/10.3390/su131910846

[566] Austin, J. (1993). Increasing recycling in office environments: The effects of specific, informative cues. *Journal of Applied Behavior Analysis*, *26.2*, 247–253.

[567] Bernstad, A. (2014). Household food waste separation behavior and the importance of convenience. *Waste Management*, *34.7*, 1317–1323.

[568] Di Giacomo, A. (2018). Convenience improves composting and recycling rates in high-density residential buildings. *Journal of Environmental Planning and Management*, *34.7*, 309–331.

[569] Nordic Council of Ministers. (2021). *Common waste sorting symbols in Nordic countries*. https://www.diva-portal.org/smash/get/diva2:1603260/FULLTEXT01.pdf

In conjunction with measure Mk on confusing packaging it will also prevent Member States from mandating their own labelling systems for packaging for either material composition or recyclability, to preserve the integrity of the single market.

This system of approved symbols will be an on-pack requirement, and as such readily visible as a direct prompt to the consumer at point of disposal. This would be similar in approach to the current "**Nordic pictogram" system** (see example below), but would avoid the use of written words in principle, and the measure has been costed on this basis. The labelling requirement will cover **primary and secondary packaging** (i.e., all packaging that might come into contact with a consumer) and **waste receptacles.**

Labelling of waste receptacles refers to a visual sign or pictogram, which may include complementary text elements and/or colours, displayed on or in close vicinity to the waste receptacle. Dedicated bags used in door-to-door collection schemes may be differentiated by colour and may include text and symbol labels.

Currently, the common pictogram system used by Nordic countries consists of a number of symbols that are used in connection with waste sorting – making it easier for citizens and business to sort their waste better. The aim for the system is to guide people in the same way visually on how to sort and place (packaging) waste everywhere: at home, the workplace, in holiday homes, at the recycling stations, in public and urban spaces, on packaging, at events – concerts, festivals, cinemas etc. The symbols for waste sorting can also be used on packaging. A symbol on a packaging design ensures a visual link between the empty packaging and the waste container. The same symbols are placed on the waste receptacles. This aids the consumer sorting their packaging waste correctly (Figure 57).

Figure 57. Examples of the Nordic Pictogram System, (a) symbols that are used on packaging and (b) symbols that are used on waste receptacles[570]



(a) (b)

Selected Nordic pictogram icons for packaging materials (a), an approach to labelling that is matched to local recycling provision (b)

[570] Dansk Affaldsforening. 2022. *User Guide: Danish Pictogram System for Waste Sorting Collection Services & Recycling Centres.* Available online at: https://danskaffaldsforening.dk/sites/danskaffaldsforening.dk/files/media/document/UserManual-DanishWastePictograms-Jan2022-english.pdf Accessed: 18 March 2022

Labels will be introduced on packaging products, which can correspond to all packaging waste fractions.

The pictograms to be applied on waste containers and bins shall include a clear and harmonised symbol representing the waste fraction to be deposited in the bin. Labels shall be designed in a way that flexibility towards future changes in the waste management system, for instance regarding commingling rules, can be ensured.

On the product side, there are more limitations when it comes to integrating the label, considering that the packaging is already designed with specific characteristics (e.g. size and colour). Hence labels shall be designed in a way that they can be easily accommodated to existing packaging design (e.g. mono-chromatic symbol of the waste fraction).

Nonetheless, the labelling system will have to be compatible with finer distinctions of sub-fractions within these categories, e.g. different glass colours for glass or paper separate from cardboard.

Two scenarios were modelled for the labelling of receptacles in measure 27c-y: Scenarios 1 and 2 assume that municipalities begin placing the new harmonised labels on all receptacles for packaging waste fractions, such as glass and plastic, as well as for residual waste in the subsequent year. Pictograms are assumed to be used for all mainstream waste fractions because packaging materials can belong to all of these broad material categories (recyclables i.e. paper/metal/glass/plastic, biowaste and residual waste). Scenario 1 assumes the full transition to take four years in total and it assumes that it takes municipalities three years to replace existing labels or add the new harmonised pictogram labels to all existing waste containers for packaging materials and residual waste. Under this scenario, municipalities label approximately one-third of total containers per year.

Scenario 2 assumes the full transition takes five years in total, and it assumes that it takes municipalities four years to replace existing labels or add the new harmonised pictogram labels to all existing waste containers/bins for packaging materials and residual waste. Under scenario 2, municipalities label approximately one-fourth of containers/bins per year.

Exemptions to the use of the symbols on-pack will be allowed where this requirement would have adverse environmental consequences (e.g., labelling of material composition should not increase overall packaging size[571], nor the complexity of material composition), with provision of information digitally as a possible alternative in these cases.

Economic operators may wish to provide identical or additional information on waste receptacles, packaging or product sustainability digitally even if there are no restrictions imposed by packaging size in any case.

[571] In this respect, food labelling regulations might be a useful guide to align with e.g. the EU Regulation on Food Information to Consumers 1169/2011

This measure would not restrict this and would therefore be compatible with medium-term trends for greater provision of harmonised sustainability information online. At this stage it is not recommended that the Commission should specify the form that this digital labelling should take[572]. A fully digital approach is not recommended due to the very direct value of the behavioural "nudge" a visible on-pack label can provide at the precise moment of disposal without the need for additional consumer action, and concerns over digital access[573].

Three other cases for exemption to material labelling could be considered during implementation:

- for items labelled as part of a deposit return system (DRS) where the DRS instruction is the critical consumer prompt;
- in items with reuse scheme information (with return to the reuse scheme being the critical consumer prompt); and
- for items whose material type is self-evident and where labelling is challenging (e.g., unlabelled glass bottles).

In the former two cases, it is true that material type information would only relate to a suboptimal disposal choice (though it might still be relevant); the latter case might be covered by the requirement to avoid adverse environmental consequences from a label adding material complexity. These potential exemptions will not materially change the scale of cost estimates presented for this measure and should be tested directly for consumer-friendliness during formal development of the labelling and symbol system.

Material composition (rather than "recyclability") will be shown, as material composition is universal. This will indicate the correct sorting of the packaging item, since the same labelling scheme will be used in the waste receptacles. The extent to which harmonisation of collection occurs may also reduce the range of material labels needed for consumers (e.g., the relative value of specifically labelling "plastic" or labelling "plastic bottles" or labelling "PET", "HDPE" etc.), with fewer labels highly desirable from a consumer understanding point of view.

Beyond the measure proposed here which focusses on packaging, a potential revision of the Waste Framework Directive may additionally propose material composition labelling for non-packaging items (a feature of the pictogram system in Denmark), and it will be highly desirable that any product and packaging labelling be aligned. Developing the exact design for the labelling will also require the Commission to undertake work with consumers to design and test labelling symbols. The specifications to be developed will include the actual design and features of the labels taking into account the generic features established in the

[572] There is a long-term trend towards providing much more sustainability and supply chain information than can be displayed on pack across a wide range of issues areas, and discussions are ongoing about "product passports" at EU level. Even without this, more consistent consumer facing information in digital format seems likely. By not specifying formats for transmitting or presenting digital information in this Regulation, the measure can be future-proofed to be easily harmonised with future developments for online provision of information.

[573] 92% of households in the EU had internet access in 2021 (Eurostat, *Digital Economy and Society Statistics*, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Digital_economy_and_society_statistics_-_households_and_individuals#Internet_access) but there are differences between member states and also urban and rural areas. A bigger barrier is likely to be extent of internet use (somewhat lower in the Eurostat data), and familiarity with use of QR codes or similar.

PPWD and minimum requirements for labelling such as, pictures/logos/symbols shape and outline, size specifications, colour specifications, possibility of using of complementary text, abbreviations and language-specific elements, location on the packaging and waste receptacles and visibility.

The specifications to be developed shall include the actual design and features of the labels, taking into account the generic features established in the PPWD and the minimum requirements for labelling, and including elements such as:

- pictures / logos / symbols shape and outline
- size specifications (e.g., minimum size for each medium)
- colour specifications and contrast
- use of complementary text, abbreviations and language-specific elements
- location on the medium (packaging and waste receptacles) and visibility (e.g., on the lid, on the front of the container…).

The respective act will also establish the fineness of the distinctions between waste fractions and the nomenclature to be used to designate (packaging) waste fractions. For instance, it is anticipated that the high-level distinction used here (dry recyclables i.e. paper / metal / plastics / glass) will be refined to accommodate sorting and collection systems which distinguish further within fractions (e.g., clear glass / coloured glass or clear glass / brown glass / green glass…).

Preserving the integrity of the single market is a key reason for considering this measure. National governments are acting on a perceived need for labelling for sorting, but in doing so, they are fragmenting the regulatory environment for packaging. Provision of a common system might reduce this trend but active restrictions on alternative systems are discussed as measure Mk; they are needed to maintain the single market. Note that if measure Mk is not progressed, there is a case for including elements of that measure (i.e. restricting mandatory alternative labelling of sorting or recyclability instructions) here.

9.30.1. Effectiveness

This measure will support the implementation of all measures under the intervention areas waste reduction and recyclability, by enabling consumers to match packaging items to local recycling collections.

A simplification of “recyclability” labelling will help address consumer confusion and enable packaging to send clear and consistent signals on the material composition of packaging to prompt consumer behaviour.

Harmonisation across the member states will enable packaging to communicate clear and consistent information, rather than designing packaging that complies with labelling requirements in each Member State, which may lead to additional symbols of limited relevance to all consumers. Overall, a positive impact associated with the provision of consistent, transparent information regarding packaging materials and components is anticipated.

To realise the potential benefits from this measure in terms of preserving the single market, it would need to be introduced in conjunction with measure Mk.

Overall, 15 Member States will have to enforce the EU harmonised labels with pictograms on waste receptacles and packaging products for the first time. These Member States will reap the largest share of the waste management efficiency gains. However, all Member States will experience reductions in environmental externalities.

9.30.2. Ease of implementation

This measure represents the pillar of the new labelling rules and should be jointly taken forward with measures M12-u, Mk, M38-j and Mx.

Implementation will involve developing a clear, consistent labelling system for consumers, inclusive of all commonly used packaging materials and illustrated in the waste containers and that is not confused with other environmental symbols.

The effective design and consultation to develop a clear, comprehensive labelling system that has the support of stakeholders is a significant undertaking. At the member state level implementing a harmonised labelling system may pose specific challenges (including to consumer understanding) where alternative mandatory labelling currently exists.

The status quo evaluation shows that Member States, in order to achieve recycling targets, are implementing labelling schemes on packaging (on-pack labelling) and waste receptacles in different and uncoordinated ways. From the two mandatory schemes in France and Italy, it can be concluded that certain features of the developed labels are common, yet they are far from being harmonised, and the match between labels on products and waste receptacles is mostly done by means of colour coding and textual waste collection guidelines. The waste management and packaging sector, anticipating the possibility of mandatory schemes, has come up with voluntary schemes that differ from country to country. This leads to fragmented, suboptimal national labelling systems across the EU, resulting in confusion on the citizens, lower recycling rates and -most importantly- a considerable Single Market barrier with additional cost burdens for operators and, eventually, citizens. So far, the only system covering more than one Member State and proposing a direct visual link between the packaging and the waste receptacle is the Nordic Pictogram system.

In sum, the analysis of the current situation suggests that without an EU regulatory intervention, Member States will continue to develop their own waste receptacle and product labelling schemes, without convergence towards a potentially more efficient harmonised system. The only scheme with such an objective is the Nordic Pictogram system embraced by several northern EU countries. Another factor for a smooth implementation would be ensuring an appropriate transition period, so that packaging producers and labellers are able to make changes to packaging alongside regular design updates. This is discussed in more detail under economic impacts below.

It is also suggested that the harmonised labelling of waste containers starts before product harmonised packaging labels are rolled out, in order to prepare waste management systems and citizens for the change. This is the case because the adaptation time and effort needed for waste management entities to change labels on containers is estimated to be lower than that needed for the packaging industry. In any case, the transition should be accompanied by appropriate sorting instructions and awareness campaigns to maximise the benefits of the measure, as regularly emphasised in stakeholder consultations and in the scientific literature.

Against this background, an appropriately timed and coordinated introduction with other labelling measures adopted, should mean that the challenges of implementation of all labelling measures are minimised for economic operators.

9.30.3. Administrative burden

This analysis considers the administrative costs of the labelling of packaging itself and the administrative costs of the labelling of waste receptacles. There will be a one-off **cost to the Commission** of developing a new labelling system (design, testing, and rollout of the EU set of labels). Based on the cost of the Danish/Nordic pictogram development and allowing for the different scale of the task at EU level, this cost might be in the order of €675,000 - €810,000 to cover external development and testing alone[574].

Given that labelling waste containers for proper separate collection of recyclables is a core function of waste collection services, there are only two recurring administrative costs that are additional to the baseline. First, waste collectors will conduct annual inspections to ensure that the new EU labels are in use (approximately €15 million each year). This data will have to be reported via the MS to the Commission. Also, the competent authorities and Commission would have to spend approximately €500k each year for the designing and submitting of information material providing training materials to users. There will also be a one-off impact on stakeholder time as part of consultation and development of the system, as their views and expertise will be important. We do not consider that the ongoing enforcement burden for Member States will

[574] This figure is based on the implementation costs of the Nordic Pictograms System in Denmark, and we have doubled the cost to arrive at this estimate. While the pictogram development covered a wider range of materials, not just packaging, the requirement to create a system that will work in all 27 member states and commands stakeholder consensus means developing an EU system will pose unique challenges. The estimated costs include fees paid to outside consultants for design, stakeholder consultation and consumer research.

be greater than for current packaging compliance; indeed, it could be less, if harmonisation means higher levels of compliance.

There may be one-off **familiarisation costs for economic operators** at the point the directive or resulting national legislation is introduced, but we do not separate this out for this measure alone. However, for this, as it was stated previously, it is suggested to start with the roll out of the labelling on waste receptacles and then continue with the implementation of labelling on packaging.

We have classified the costs of introducing new labelling through packaging redesign as an economic cost. While information provision is often classified as an administrative cost, the intention here is to help shape consumer behaviour and not simply to provide compliant information – i.e. it is the cost of intervention, not the cost of administration[575].

9.30.4. Economic impacts

The economic impacts of the new labelling rules, including the combined impacts on the EU waste management of both sub-measures are reported as:

i. all costs additional to those reported in the administrative burden section associated with the activities required to setup and implement the new labelling system in the waste receptacles in the EU,

ii. internal costs due to the change of waste flows throughout the EU waste management system e.g. more separate collection, less mixed waste collection, less incineration and landfill,

iii. revenue changes due to the changes of waste flows throughout the EU waste management system, e.g. less energy recovery via incineration, more material recycling, and

iv. the redesign of impacted labels in packaging products.

The estimated total (cumulative) cost to businesses, citizens and public administrations of implementing the **new EU harmonised labelling system for the labelling of the receptacles** (i-iii above) is estimated at around **330 m€** over the implementation period, whether implemented over 3 or 4 years.

The implementation of the harmonised EU labelling system will increase material capture rates (appx. 2%) and purity of collected waste (appx. 12%), resulting in more separate collection and thus more high quality

[575] The analysis was based on Albizzati P. F., Cristóbal J., Antonopoulos I.S., Egle L., Foster G., Gaudillat P.F., Marschinski R., Pierri E., Tonini D. (2022), Harmonised labelling of waste receptacles matching product labels, Potential policy measures and assessment of impacts, JRC Science for Policy report, publication pending.

recycling and eventually lower amounts of waste that sent to incineration and/or landfill. This will result in changes in material flows throughout waste treatment facilities and processes; in fact it will result in a decrease in internal costs for the EU27 waste management sector of appx. 372 m€ for the implementation of the measure over the phase-in period for scenario 1 and 335 m€ for scenario 2 for the phase-in period. In the same phase-in period, revenues of the EU waste management sector will decrease[576] by around 242 and 217 m€ for scenario 1 and 2 respectively.

Notwithstanding the decrease in internal costs of the waste management sector, the sum of the effects due to: i. labelling, ii. other (than labelling) internal costs and iii. revenues, indicates that an overall net economic burden for the EU27 equal to around 198 m€ and 213 m€ for scenario 1 and 2 respectively during the phase-in period of the pictograms (Table 75). Landfilling/incineration, transport and other processes is not sufficient to compensate for labelling costs and decreased revenues from energy recovery.

Table 75. Effects on internal costs - Annual estimated internal costs and revenues of new EU label scheme with €1.49 labels for all containers/bins. Positive values represent a net increase in costs, negative values net decrease in costs, relative to the baseline. Similarly, for consistency "Foregone revenues" are a cost when a positive number is reported, and a gain (i.e. additional revenues as compared to baseline) with a minus (-). The mathematical sum of the elements in the "Cost breakdown" makes "Total". Values are in million EUR2020 (M€) and rounded.

Measure	**Cost breakdown**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Cumulative (2024-2030)**
Sub-measure 1 (labelling over 3 years)	Labelling	0.45	93.2	93.2	93.2	15.9	15.9	15.9	328
	Other internal costs[2]	0	-25	-50	-75	-74	-74	-74	-372
	Foregone revenues	0	16	32	48	48	49	49	242
	Total	**0.45**	**84**	**75**	**66**	**-10**	**-9.1**	**-9.1**	**198**
Sub-measure 2 (labelling over 4 years)	Labelling	0.45	74.8	74.8	74.8	74.8	15.9	15.9	331
	Other internal costs[2]	0	-19	-37	-56	-75	-74	-74	-335
	Foregone revenues	0	12	24	36	48	48	49	217

576 this corresponds to changes to the revenue structure of the waste management system as a whole and should not be interpreted as benefits to the citizen / consumer

	Total	**0.45**	**68**	**62**	**55**	**48**	**-10**	**-9.1**	**213**

iv. The redesign of impacted **labels of packaging products**:

Costs of transition was based on the number of consumer-facing stock-keeping units (SKUs) in the EU, multiplied by the redesign costs per SKU. At EU level there is no central record of SKUs, however, based on data from multiple sources it was possible to estimate the related cost (approximately 51.6 million), albeit with a high level of uncertainty. A range of costs for redesign were obtained from stakeholders and the literature, with the preferred estimate for this analysis towards the lower end of the range (around €1000)[577].

As discussed above, many of the labelling changes required will be incorporated in regular labelling updates, an efficiency that can be increased by providing for a longer transition period. Assumptions about savings over time are more pessimistic than previous studies which focused solely on the food and drink sector, where the background redesign rate for packaging is relatively fast compared to some other sectors. The literature[578] estimated that over a 2 year period, 55-63% of companies would introduce labelling changes as a normal part of their business operation. This percentage raises to 80% of companies over a 3 year period. Therefore, the additional incurred costs due to labelling changes brought on by regulatory requirements can be significantly reduced if there is time to incorporate them (also considering that updates on labelling would have occurred anyway). Against this background, it is assumed that the majority of the costs would be avoided if an adequate period is granted for businesses to adapt to the new labelling requirements. The literature findings were also validated by the stakeholders who advised to set some turnover times (Table 76) in order to define better the costs to economic operators for implementation of the labelling changes.

Table 76. Costs to economic operators, depending on the sped of the implementation

Years for implementation	**1**	**2**	**3**	**4**
Costs reduction	25%	45%	65%	80%

[577] This low end estimate is in common with Commission. 2008. IMPACT ASSESSMENT REPORT ON GENERAL FOOD LABELLING ISSUES.

[578] A representative one is: Campden BRI, *Developing a Framework for Assessing the Costs of Labelling Changes in the UK,* https://webarchive.nationalarchives.gov.uk/ukgwa/20130402151656/http:/archive.defra.gov.uk/evidence/economics/foodfarm/reports/documents/labelling-changes.pdf

Cost of implementation (billion EUR	38,7	28,4	18,08	10,3

With three years allowed for implementation, and a cautious approach taken to assumed regular labelling redesign frequency, the cost of this measure would be **€18.1 billion[579].** The cost burden of this measure for the sector would be spread over the entire implementation period rather than falling in a single year (so €6.0 billion per year for three years). **To put these figures into context:** The value of the European retail sector was estimated at €2.6 trillion in 2011[580], and will have significantly grown since. All economic operators strongly ask for this measure as they are convinced that the additional costs for the new product labelling are by far overcompensated by the advantages of a harmonised packaging labelling (see also measures Mx and Mk).

Costs could be significantly reduced by allowing four years for transition (cost falls to €10.3 billion in total, equivalent to €2.6 billion per year for four years).

If there are relabelling economies of scale to be gained from changing a large number of labels at the same time, costs for economic operators would fall further. The lowest estimate obtained for labelling changes for this project were €500 per SKU; if achieved at large scale this would **halve the cost estimates above**.

Cost impacts on citizens and consumers

The literature on waste sorting behavioural change shows that improved instructions improves waste separation behaviour, with clear and unconfusing instructions such as labelling at the point of waste collection. Given that most citizens might sort waste and packaging several times per week as they empty consumer products, it is plausible that the matched pictograms on packaging and bins would save citizens' time; thereby, increasing convenience (unquantified) which reduces a common barrier to recycling behaviour.

[579] Less than two years risks incurring disproportionate costs as pre-existing packaging (and in extreme cases product that cannot be repackaged) may have to be amended or disposed of. Requiring economic operators to change all labels in a very short period may also unduly overburden their design and packaging teams.
Beyond the minimum requirement, longer transition periods reduce costs by allowing economic operators to incorporate design changes on labels in scheduled redesigns, which are a regular occurrence with or without changing regulation. A Commission working document from 2008 summarised available information and indicated that over a three-year period 80% of companies in the food and drink sector would introduce labelling changes as a normal part of their business activities , though research for this project suggests this is likely to be slower for other sectors .

[580] Institute of retail management and Said Business School, RETAIL & WHOLESALE: KEY SECTORS FOR THE EUROPEAN ECONOMY, https://www.eurocommerce.eu/media/87967/eurocommerce_study_v2_hd.pdf

The cost to individual citizens of the harmonised label on waste containers, cumulatively to 2030, is about € 0.74. The analysis assumes that citizens do not incur any additional costs for familiarizing themselves with the new labels.

9.30.5. Environmental impacts

This measure contributes to environmental outcomes as follows:

- Clearer information on the material composition of packaging, which facilitates consumer correct sorting of packaging waste and lead to positive environmental benefits. The environmental benefits are reaped from additional material being recycled and improved sorting leading to less contamination of recycling streams.
- The labelling requirement may prompt packaging redesign from some producers, who will not want their product perceived as hard to recycle[581].
- Harmonised labelling could reduce instances of repackaging for different markets and simplify transport between markets.

An isolated assessment of this measure showed the following increase of environmental benefits relative to the baseline scenario: Cumulative savings of 5 Mt CO_2e over the phase-in period (appx. 1.2 Mt CO2e p.a.)[582].

9.30.6. Social impacts

Greater clarity and consistency in on-pack labelling should contribute to consumer confidence and reinforce pro-environmental citizen messages, and social norms around recycling (see measure description). Higher levels of recycling might have greater social impacts, but this measure supports rather than causes such a transition.

A very small increase in employment is estimated for the municipal solid waste management sector, which is associated with the increase in separate collection of material and subsequent recycling. This takes into account some reduced employment in the collection of residual (mixed) municipal solid waste and

[581] The Danish Waste Association said during interview that this is one of the queries they receive from producers; see also comments from media reports in Sweden (WEKA Industrie Medien, 10/02/2022, *Harmonised Waste Symbols*, https://waste-management-world.com/collection-and-handling/law-and-order-at-the-waste-collection-point/)

582 The savings on resource use were estimated to be approx. -34 billion MJ for energy and –20 t Sb^{eq} (antimony depletion) for materials. The latter LCA metric refers to the depletion of natural resources, in particular abiotic (non-living) resources, in a characterisation factor known as Abiotic Depletion Potential (ADP). and is typically expressed in tonnes of Antimony equivalent. Antimony (symbol Sb), which is a relatively rare mineral used in various technological applications.

associated landfilling and incineration. It was estimated that a total of around 210 annual FTE, or 44 new jobs annually in the municipal solid waste management sector will be created, from the moment the labelling system is in place.

9.30.7. Stakeholder views

Many respondents in the previous PPWD Impact Assessment study highlighted the need for accurate and harmonised labelling cross the EU. This view was echoed by EUROCITIES and UNESDA, with the European Snack Association adding that mandatory labelling could help increase collection and sorting. Respondents also raised the point that the efficiency of national and local waste management differs across member states and that although harmonisation of labelling might increase the efficiency of sorting and collection, recycling may not increase alongside this.

Industry and consumer stakeholders noted the desirability of providing consumers with sorting instructions, and the challenge that this posed with locally available collection and sorting infrastructure differing across the EU. Industry and consumer stakeholders suggested that development of harmonised labelling alongside the harmonisation of sorting and collection across the EU was desirable. Consumer organisations suggested that material composition information should be accompanied by information on separation and sorting and the presence of any recycling disruptors in the packaging (which was also supported by an industry stakeholder in the previous consultation). One environmental NGO stakeholder did not support labelling of material composition or harmonisation throughout the EU as they felt it was important for labelling to reflect local sorting and collection infrastructure.

Industry stakeholders also highlighted the need for additional communication efforts around new labelling. Some stakeholders suggested that sorting instructions could be provided alongside EU harmonised collections or through a digital label linking to local instructions. Consumer organisations also raised the issue of composite materials that may not be easily assigned a single material composition, and that different collection and recycling systems have different tolerances for how much of a package must consist of the primary material to be successfully recycled. Digital solutions were mentioned by a number of stakeholders, in regard to providing locally relevant information, and to ensure that all relevant information could be available on smaller packaging.

There was relative stakeholder consensus among industry that suggested that symbols would be preferable to words due the translation requirements. Reliance on written words was not favoured by almost all industry stakeholders for an EU-wide system, some also suggested colour might be problematic (or at least labels would need black and white versions for some packaging).

Stakeholders also requested that any new labelling be subject to consumer testing. Industry stakeholders were keen to be actively involved in symbol and labelling development, given their customer experience. It was emphasised by many stakeholders that labels should be minimalist and as simple as possible to reduce the cognitive burden for consumers.

Stakeholders also supported the implementation of labels on receptacles, in combination with labels on packaging as the most appropriate identification approach for citizens. In comparison, the disproportionate effort and cost of changing the colour of the collection receptacle was mentioned by stakeholders several times. However, the harmonised labelling in combination with the harmonised colouring of receptacles was also supported by some stakeholders. It is worth mentioning that the Danish pictogram approach was explicitly mentioned as a suitable approach for EU wide labelling.

Harmonised labelling was viewed as supportive of the single market, as it reduced the burden on producers designing packaging for multiple markets and addressed the perceived risk of proliferating national standards on packaging among Member States, with the example of Member States that have already mandated packaging requirements that are penalised in other Member States. Overall, stakeholders were concerned that in the absence of a harmonised EU approach there will be more and more unique national approaches, ultimately requiring up to 27 different labelling approaches (see also measure Mk).

Separate packaging requirements in different Member States were also discussed in terms of negative environmental impacts. One stakeholder noted the environmental and economic costs of relabelling packaging and additional shipping costs as products cannot always be directly transported to the desired territory but need to be shipped to a facility for relabelling first (again, greater detail is provided in measure Mk).

9.31 Measure Mk - Restrictions on use of confusing labels

9.31.1. Description of the measure

A necessary condition for consumers to be able to practice pro-environmental behaviours is that they understand what the correct thing to do is, and how to do it as described for Measure 27c-y. Overall, there is significant divergence in practice across Member States, with some countries having legislated already on national labelling systems for different aspects of packaging labelling and others considering action[583]. Non-national PRO symbols may also cause confusion for consumers. Confusion of the consumers may also arise due to unclear environmental labelling.[584]

This measure would reduce confusion for consumers by simplifying information on packaging, to facilitate end of life sorting, recycling, and disposal decisions by the consumer, in conjunction with other

[583] The following Member States have introduced or are considering the introduction of specific labelling measures: Bulgaria, mandatory use of alphanumerical codes (as set out in Decision 97/129/EC) within the three arrows mobius loop symbol and requirement to use the 'tidyman' symbol; France, obligation to use the 'Triman' logo and include waste sorting instructions, use of the 'green dot' logo is penalised; Italy, mandatory use of alphanumerical codes (as set out in Decision 97/129/EC), mandatory waste sorting instructions for consumer packaging, though measures suspended until January 2023; Portugal, mandatory use of alphanumerical codes (as set out in Decision 97/129/EC), mandatory waste sorting instructions for consumer packaging including colour of bin, ban on the use of 'tidyman' symbol for recyclable and reusable packaging, though legislation currently paused; Spain, mandatory use of the 'green dot' logo.

[584] Fitzgerald, M.P., Russo Donovan, K., Kees, J. and Kozup, J. (2019), "How confusion impacts product labeling perceptions", Journal of Consumer Marketing, Vol. 36 No. 2, pp. 306-316. https://doi.org/10.1108/JCM-08-2017-2307

consumer-facing labelling measures proposed. **Simplifying packaging labelling removes a potential barrier to action for consumers. However, large-scale behaviour change is dependent on other developments** as described for Measure 27c-y, and we thus classify this measure too as a supporting or enabling measure for wider policy changes in terms of consumer behaviour.

As importantly, divergent national labelling requirements can constitute a barrier to the single market, by requiring different packaging (and thus product lines) in different Member States. Not only is there significant divergence in national requirements, but some elements of national requirements are directly contradictory with other Members States. Economic operators need to be informed on and comply with multiple requirements in different markets, imposing costs and disrupting the workings of the single market. This was a primary concern from industry across all the labelling measures. Non-national PRO symbols are not a barrier to the working of the single market in themselves (though they may be relevant to consideration of consumer confusion), but these do constitute a barrier to the single market if they are mandated (or banned) by Member States.

This measure will therefore:

- **Restrict the ways in which information on the subjects covered by associated labelling measures in envisaged packaging legislation (material composition and sorting information; reusability; recycled content) can be communicated**, to reduce consumer confusion. Restrictions in relation to reusability for economic operators (both producers and reuse scheme operators) are proposed to be less restrictive (see also measure Mj[585]). Economic operators could additionally be required to only use approved labelling and symbols covered in this revised directive to communicate on these subjects, and not create or use bespoke symbols for this purpose, though they would be free to provide additional detail on-pack or digitally (where this aligned with wider requirements on Green Claims, see below).
- **Prevent Member States from mandating their own labelling systems in the areas covered by this legislative proposal**, to maintain the integrity of the single market. One exception to this might be the case of DRS labelling for beverage containers. **If this measure is selected, there is a strong case for advancing this element of the labelling measures rapidly**, to prevent further fragmentation of labelling requirements between adoption of the revised directive and harmonisation and the introduction of new labelling requirements via an Implementing Act and transition period. This would both prevent fragmentation of the market in the interim, and also avoid repeated shifts in labelling for consumers, which is likely to harm understanding and habit formation.
- **Limit packaging EPR schemes and PROs from proposing their own labelling systems in the areas covered by this legislative proposal,** to reduce consumer confusion and maintain the integrity of the single market. As EPR schemes for packaging become universal, such labelling has little value. Caution would be needed in the framing of this requirement around DRS and reuse schemes, where bespoke iconography is important to scheme operations and consumer understanding.

[585] Reuse schemes need to communicate additional information on how and where to reuse, and as a nascent sector we wish to encourage, we do not wish to overly constrain their options; however information like this should be functional (i.e. of direct value to the consumer) not regulatory. More detail on considerations is in measure Mj.

These elements may be either incorporated in articles relating to the other labelling measures proposed or presented as a standalone article in the revised legislation; this decision will not change the impacts. It is also the case that those other labelling measures help the objective of this measure: increasing consistency in labelling of material composition for example, should reduce the risks other symbols are misinterpreted.

This measure is complementary to wider Commission policy on false and misleading Green Claims. It is focused on reducing "confusion" on specific issue areas over and above the safeguards being put in place elsewhere.

The proposed directive to tackle unfair commercial practices in relation to Green Claims[586] will ban "displaying a sustainability label which is not based on a certification scheme or not established by public authorities". However, this measure (Mk) goes further to account for the fact that some of the confusion arising around packaging is a result of a multiplicity of schemes, some of which are in fact mandated by Member States, and that this divergent approach additionally threatens the single market.

This measure also complements the proposed regulation of Green Claims by the Commission[587]. All the wording related to validating green claims would still apply[588]. However, this measure would additionally constrain the way in which specific claims (on material composition and sorting instructions, reusability, and recycled content) could be communicated in the context of packaging, by restricting the symbols that can be used. The proposed Green Claims regulation, on the other hand, will reduce confusion resulting from wider environmental labelling or brand and design choices (factors beyond the scope of PPWD).

This measure will not restrict the use of labelling beyond the remit of the revised Packaging and Packaging Waste Directive's topics covered by the labelling measures (e.g., other environmental labelling, or unrelated branding decisions) even if these may confuse some consumers. This is both due to the scope of the revised directive, and the parallel development of the Green Claims regulations described above. This lack of restriction would extend to labelling of "composite" environmental labels[589], where packaging is part of the scoring criteria, though again, such initiatives could be held to account on accuracy by other regulation.

Biodegradability, compostability, bioplastics, and labelling for eligibility in national deposit return systems or other reuse schemes, are out of scope of this measure.

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[586] Directive of the European Parliament and of the Council amending Directives 2005/29/EC and 2011/83/EU as regards empowering consumers for the green transition through better information and protection against unfair practices

[587] Regulation of the European Parliament and of the Council on substantiation of green claims

[588] E.g. proposed text in Article 3, 3a "*The environmental claims shall be truthful, not contain false information and be presented in a clear, specific, accurate and unambiguous manner*" and 3c "*Where environmental claims are made on the product, on the packaging of products and/or other communication channels which have limited space for specifications, the location of the environmental claim, and supplementary information about the claim, including the link to the information to which the substantiation of the claim is based, shall enable an average consumer or recipient of the information to understand the link between them. In all cases, the link to the substantiation of the claims shall be placed close to the claim itself*" directly target misleading claims and will also help reduce confusion.

[589] E.g., see Foundation Earth, which is piloting integrated sustainability metrics in conjunction with a number of large producers: https://www.foundation-earth.org/pilot-launch/

This measure was rejected in earlier assessments for PPWD revision (as measure 27d). The reasons for rejection were difficulties of defining "confusing" in general terms and the potential need for ongoing regulatory attention to police new symbols on this basis. It was also felt that provision of consistent labelling, which was taken forward, might naturally reduce the use of unnecessary alternatives over time without additional restriction. The reasons for reconsideration are the evident desirability of simplification from the perspective of both consumers and (especially) economic operators (who face additional operating costs if alternative mandatory labels proliferate across Member States), if the challenges identified in previous assessments can be overcome. This reconsidered measure has therefore focused on a narrower and more specific remit.

With regard to the impact on consumers of the harmonised labelling on sorting instructions for consumers (see M27c-u), it is likely to be proposed to follow the Nordic pictogram model, which was developed based on a study on consumer behaviour conducted in Denmark as well as other countries before they have later adopted it (Sweden, Norway, Iceland and piloting in Lithuania). The Commission also intends to carry out consumer behavioural testing as part of the development of the harmonised label to ensure that the labels are understandable, functional and effective in engaging consumers and fit in the national collection systems.

9.31.2. Effectiveness

This measure would contribute to preserving the integrity of the single market by removing barriers imposed by national mandatory labelling systems in the areas of PPWD coverage. These barriers are particularly acute in cases where different member states impose directly contradictory requirements. This will also have significant economic benefits for economic operators.

This is an enabling measure for consumers that supports the other labelling measures proposed here, with a similar rationale to Measure 27c-y.

9.31.3. Ease of implementation

It is proposed that all labelling measures that are taken forward are subject to a single implementing act, scheduled for 2024, after completion of the Waste Framework Directive, as described for Measure 27c-y. However, **for this measure specifically, it would be desirable to restrict the proliferation of national labels in advance of the introduction of harmonised labelling, to prevent further fragmentation of the single market.** This might have specific implications for member states that have or are developing divergent requirements already. The scope of this measure has been kept relatively narrow, to avoid ambiguity and interpretation challenges in implementation.

9.31.4. Administrative burden

If this measure is introduced alongside other labelling measures, the additional costs of this measure alone would be minimal, with all packaging being redesigned over the course of the transition period for Measure 27c-y in any case. Enforcement costs for Member States would be minimally affected, in line with Measure 27c-y. There are no design or development costs for the Commission for this measure.

Economic operators may see significant savings from the removal of divergent national requirements. All stakeholders spoken to in this research believe long term savings from avoiding divergent regulatory requirements across the EU will outweigh the costs of new labelling discussed in Measure 27c-y. This implies savings greater than €18 billion over time if the higher cost estimate for Measure 27c-y is used as a reference. Example costs[590] of an un-harmonized approach include:

- **Labelling changes to meet divergent market requirements**; labelling costs per SKU will be comparable to those in Measure 27c-y at SKU level, but could be repeated across multiple member states, on less efficient and conflicting timelines. This could easily meet and would very likely exceed the costs of measure Measure 27c-y if all member states acted independently on labelling measures between now and 2030.
- **More complex stock control and management to ensure otherwise identical packaging is legally compliant for the end market**. This would be most common in non-food sectors, where distribution is more centralised, and national product lines are rarer. Costs can include placing specific stickers on to products manually to ensure compliance in diverse destination markets (with costs of €1–€2 for smaller items and as much as €5 for larger items)[591]. A single (non-food) company with around 1,000 SKUs in total estimated compliance with one Member State's unique requirements via the use of market-specific stickers would cost them around €1.5 million per year. Challenges were felt to be particularly acute for items despatched via third party retailers.
- **Contracting legal support to remain informed of compliance requirements across all member states**, and the risk of large enforcement penalties if mistakes are made
- **There is an opportunity cost to packaging experts** focusing on divergent labelling requirements and compliance, rather than more strategic challenges around sustainability.

9.31.5. Economic impacts

Most of the benefits of this measure have been identified as administrative savings as above. There will also be a significant but unquantified benefit from the smoother functioning of the single market. Some specific economic operators may be adversely affected if elements of their business model depend directly or indirectly on activity that makes use of labels that would now be restricted. However, several symbols that might be affected are free-to-use (e.g. Mobius loop, Tidyman) and thus no one loses out if they are impacted. EPR schemes using symbols may have commercial IP invested in specific symbols (e.g.

[590] These examples come from stakeholder interviews and email communications. Firms were reluctant or unable to give overall costs in many cases

[591] Interviews and evidence submissions from non-food producers

Greendot)[592] likewise economic operators using symbols as part of their business model might be impacted by this legislation if applied broadly (e.g. Terracycle).[593]

9.31.6. Environmental impacts

Consumer behavioural benefits from this measure alone will be minimal, and as described in Measure 27c-y. Greater efficiency in labelling and logistics resulting from smoother functioning of the single market may also provide some marginal benefits but these are not quantifiable[594].

9.31.7. Social impacts

Social benefits will be similar to those discussed in measure Measure 27c-y.

9.31.8. Stakeholder views

There is extremely broad support for both harmonisation and the elimination of confusing labels[595]. All industry representativeness consulted would prefer to accept the one-off costs of harmonisation than to pay ongoing and potentially increasing costs resulting from regulatory divergence. These stakeholders were keen to see fragmentation ended as soon as possible due to the costs incurred (summarised in the administrative costs section above), and the risk of further divergence if additional Member States choose to act unilaterally.

During stakeholder interviews for this measure, and as email correspondence, there was very little divergence in views. Non-food and drink sectors were even more concerned by the status quo as longer product shelf lives, greater prevalence of cross-border sales, distribution and reliance on third party distributors, and slower label replacement cycles, all make it harder to respond to divergent national changes.

Stakeholders were also keen to see strong alignment between PPWD, the revision of the Waste Framework Directive, and other legislation of relevance including Green Claims and REACH.

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[592] The Greendot logo demonstrates an EPR fee has been paid; however it does not represent that a product is recyclable, and is potentially set to become subject to directly contradictory legislation between members states (it is mandatory in Spain, and potentially will be banned in France). Stakeholders in the packaging industry are neutral on Greendot, but do not want a world on opposed regulation, which imposes a cost burden.
[593] Terracycle collect hard-to-recycle items, but also have a logo that can be used to communicate support for the scheme on packaging.
[594] Several stakeholders confirmed in consultation or via evidence submission specific examples of process changes, but these are not quantifiable.

[595] Industry Position Paper, December 2021, *Establishing an EU harmonised system to provide consumers with understandable and clear sorting instructions for packaging waste*

Stakeholders emphasised the importance of simplicity for consumers and the potential for more complex information to be provided digitally if wanted. Stakeholders were keen legislation was future-proofed for longer term trends such as digital product passports.

Consumer orientated stakeholder groups supported limiting packaging labels that made misleading claims. Examples of this included labels that only communicated compliance with legal obligations, general claims such as 'climate friendly' and confusing symbols such as the 'green dot' which were felt to give a false impression of recyclability. One stakeholder held the view that enforced minimum environmental standards for packaging would reduce the burden of evaluating environmental claims from the consumer.

Concerning the Nordic system, while quantitative results are too early to draw, the qualitative feedback from consumers, industry and municipalities are positive. Consumers indicate that the pictogram on a packaging design ensures a visual link between the empty packaging and the correct waste container. This aids the consumer sorting their packaging waste correctly, ultimately leading to high volumes of quality sorted waste and a higher recycling rate. Harmonised and clear instructions across all packaging have the potential to improve the quality (purity) and capture rate of separately collected waste and ultimately recycling yields as cross contamination is reduced upstream.

9.32 Measure 38-j: Labelling criteria for recycled content

9.32.1 Description of the measure

This measure will **prevent Member States setting unique national labelling requirements**, and so preserve the integrity of the single market. Standardising provision of this information may additionally inform consumer purchasing preferences or encourage competition between economic operators against this sustainability metric, if demonstrating "recycled content" provides them with a marketing or reputational advantage.

ISO14021[596] does set a standard for recycled content claims and presentation, though it is notable this includes use of the Mobius symbol, which is also sometimes cited as confusing for consumers (see measure Mk). However, this should be considered, as should EU standards on recycled content in other proposed labelling measures, in designing the final labelling symbol for this measure.

Whether to communicate recycled content on packaging would be a choice for the economic operator, but **if economic operators choose to communicate this information, then they must use the standardised symbol, rather than producing their own**. This would not restrict providing additional detail on-pack, or online. This measure would be compatible with medium-term trends for greater provision of harmonised sustainability information online.

[596] ISO14021:2016, https://www.iso.org/obp/ui#iso:std:iso:14021:ed-2:v1:en

The considerations around the design of this symbol on pack are similar to those for Measure 27c-y. Formal exemptions may be redundant (as this symbol is voluntary) but it would still be appropriate to mandate against unwanted consequences from labelling (e.g., growth in package size or material complexity that hinders recyclability)

Developing the exact design for the labelling will also require the Commission to undertake work with consumers to design and test precise labelling symbols. **The timeline for this measure would be aligned with the implementing act required for Measure 27c-y, and thus scheduled for 2024/2025.** This will also ensure development work can test that material composition and recycled content labels do not confuse consumers when placed together on pack.

This is not a certification scheme *for* recycled content, it is regulating how recycled content claims can be shared with consumers, and that is the basis of impact assessment for this measure (certification schemes do not *require* consumer communication to work, so this reflects the additionality requirement of this measure alone). However, economic operators will find it easier if this aligns with any certification, or distinct reporting requirements (e.g., Greece has set a higher recycled content target for 2030 than the EU as a whole). Facilitating this alignment could be considered further as part of implementation.

As a voluntary label, costs for economic operators would only be incurred where existing labels must have symbols removed, as we anticipate economic operators will only choose the new symbols if they believe it is worth it. **However, we note that economic operators are keen to see this measure aligned with measure Mk, to avoid fragmentation of the market in relation to how recycled content is labelled.**

Labelling recycled content was considered in previous impact assessments (as measure 38) but was not progressed at that time. Reasons for not progressing it were primarily concerns about applicability across multiple sectors, a desire not to overburden packaging and consumers with labels, and the risk recycled content and recyclability may always be potentially confused by consumers, no matter how well-designed different symbols are. The reason for reconsideration is that there is high producer demand in some sectors, and it is possible multiple industry or national schemes evolve in the absence of a harmonised approach. It is presented as a voluntary measure for economic operators on this occasion.

9.32.2. Effectiveness

This label does not serve a purpose at point of disposal. However, some economic actors wish to present this information (specifically drinks producers using plastic bottles), and clearly believe it may influence purchase behaviour. There is also a possibility Member States might wish to legislate in future, and so **a harmonised EU approach would minimise any confusion for consumers or fragmentation of the single market**. Effectiveness in preserving the single market would rely on alignment with measure Mk. There is a risk that recycled content symbols may confuse consumers in relation to recyclability, and this would need careful testing during any label development.

9.32.3. Ease of implementation

This measure would be dependent on clear recycled content standards being defined, to ensure that the symbol was not misused. It is proposed that all labelling measures in this directive are taken forward are subject to a single implementing act, scheduled for 2024, after completion of the Waste Framework Directive, as described in Measure 27c-y. This alignment should mean that the *additional* challenges of implementation of this measure specifically are minimal for economic operators but does not reduce the challenge of developing a clear, consistent system for consumers that is not confused with other environmental symbols.

9.32.4. Administrative burden

If this measure is introduced alongside other labelling measures, the additional costs of this measure alone would be minimal, with all packaging being redesigned over the course of the transition period for Measure 27c-y in any case. Enforcement costs for Member States would be minimally affected, in line with Measure 27c-y. **There could be some small increased costs for the Commission compared to progressing Measure 27c-y alone.** This measure may make relabelling requirements overall marginally more complex to develop and test than Measure 27c-y alone, but if delivered together, the additional cost burden might be an additional 5-10% on the costs for developing and testing symbols for Measure 27c-y. Information provision on labels is treated as an economic cost for similar reasons to Measure 27c-y.

9.32.5. Economic impacts

The primary potential cost of this measure is the redesign of impacted labels. However, the proposal for a single implementing act across all labelling measures, carried out after conclusion of the Waste Framework Directive revision means that cost implication of *this measure alone* should be extremely small. Additionally, as a voluntary measure, actors who thought it was not beneficial could choose not to act, and it is likely changes to include any symbol would be made as part of natural labelling change cycles as a result, in contrast to Measure 27c-y, which would have an external deadline. The cost benefits from greater market harmonisation from restricting nationally mandated alternatives are discussed under measure Mk, but might be relevant here if parts of that measure are incorporated.

9.32.6. Environmental impacts

This measure does not have an impact on recycling or disposal behaviour. It may have a marginal impact on purchase behaviour. Otherwise, the considerations of impact are similar to measures Measure 27c-y and Mk, and this should be seen as e measure enabling wider change rather than generating change directly.

9.32.7. Social impacts

Considerations are similar to those for Measure 27c-y and Mk. In terms of consumer signalling, showing recycled content may aid consumer understanding of the circular economy and help show that material collected for recycling does in fact get recycled.

9.32.8. Stakeholder views

Most packaging industry stakeholders spoken to were more concerned about divergent labelling than a need for a recycled content label in interviews conducted for this study, but are supportive of a harmonised recycled content label if it supports this end.

The main stakeholder group specifically in favour of the recycled content label is users of PET and plastic packaging (particularly in the drinks industry) who wish to demonstrate environmental credentials and potentially compete on the levels of recycled content in their packaging. They believe this information is of interest to at least some of their consumers. For this group of stakeholders, the ability to show the proportion of recycled content is very important.

Some stakeholders were keen that alignment with ISO14021 was carefully considered, and there was also a desire for clear alignment with the Green Claims regulations, and recycled content standards in PPWD. Some stakeholders in industry expressed concern recycled content symbols could be easily confused with recyclability symbols, and cause consumer confusion. Designing effective symbols will be very challenging in their view.

Consumer orientated stakeholders supported harmonisation of labelling for recycled content, if a clear and consistent methodology were used to calculate levels of content, with some stakeholders suggesting that third party certification would be required for the label to be credible. This was seen as combatting 'greenwashing' or ambiguous claims regarding the amount of recycled content. Groups also suggested that labels should only indicate recycled content when this was in excess of the legal requirement for recycled content or, where no legal requirement exists, the recycled content exceeds the average amount of recycled material in that packaging type. One group emphasised that consumer pressure was not sufficient to drive increases in recycled content, and mandatory targets were also required.

9.33 Measure 12-u: Harmonised labelling of reusable packaging

9.33.1 Description of the measure

A necessary condition for consumers to be able to practice pro-environmental behaviours is that they understand what the correct thing to do is, and how to do it. Clear and consistent information provision is one way in which this can be facilitated and is also frequently identified as a barrier.[29] Reuse is mentioned but labelling for reuse is not addressed in detail in articles 8 and 13 of the PPWD. Labelling for reuse would

be best aligned with other labelling measures via amendments to either or both of these articles (though it could also be an addition to article 5, which is specifically on reuse).

This measure will introduce a symbol for reusable packaging, in order to increase the reuse uptake in the market and to overcome the fragmentation in reuse labelling schemes at national level. Harmonising the reuse labelling may additionally encourage consumer preferences for reuse and support the upcoming of the reuse market for packaging.

There are some consumer-facing reuse labelling options used in Europe already, but no universal scheme. A trademark-protected sign for reusable packaging and a certification process was developed in Germany and is used in the beverage sector, and recently was approved for use on other reusable packaging in the FMCG sector, as well as outside Germany – in Austria and France. In response to the French Anti-Waste Law (AGEC, Article 17), labelling for reusables is being developed in France in conjunction with Citeo, a PRO. National DRS schemes for refillable bottles may also have specific symbols.

This measure will support consumers to choose to reuse at end-of-use. Consumers need two pieces of information to reuse packaging. They need to know it is potentially reusable (which is unlikely to be their behavioural default currently), and they need to know what to do to ensure that happens. The latter may be complex to communicate on pack, or to standardise across both packaging types and the EU as a whole.

The greatest value of a reuse label or symbol is expected to be for packaging that is part of a formal return for reuse system, rather than packaging consumers might choose to reuse for themselves at home, and that is the basis of this assessment.

The key features of this measure are:

- **Provides for an EU-wide visible-on-pack symbol suitable for consumer-facing packaging, identifying that an item can and should be returned to the retailer or producer for reuse,** as a direct prompt to the consumer at the end-of-use stage. This narrow definition of reusability – i.e. to match to packaging takeback schemes only – will need careful definition in the legislation (see Measure 10 and its variants). This link to a formal producer take-back scheme safeguards this measure against misuse to some extent: the producer will have to deal with the returned packaging, and so have a clear interest in ensuring it is truly reusable. This will also clearly show that items were returned and reused, rather than relying on assumptions about subsequent personal consumer reuse behaviour.
- **Additional detail on how and where to return containers for reuse could be provided on-pack, or digitally, at the discretion of the economic operator**. As reuse becomes more widespread, it is likely digital information will increasingly be preferred as it can be more easily tailored to multiple national or local contexts. **This measure does not restrict economic operators from providing additional information or symbols specific to their unique return arrangements within a reuse system for specific packaging, either on-pack or digitally, as these may be key to making such a system work at a variety of geographic scales.** It is important not to disrupt existing reuse schemes, or stifle innovation in a sector that needs to grow rapidly to meet wider policy objectives.

- **If measure Mk is not progressed, then this measure could still specifically restrict Member States from mandating their own labelling systems for reuse** with the exception of national reuse systems where the information is required to make the system work e.g. labelling containers in a national DRS for refillable containers. It would however be possible to frame the requirement so that Member States still do not have this power, with the scheme administrator for the reuse system holding this discretion as an economic operator.

The consumer does not *need* to know the number of times a piece of packaging is or should be reused, and the standardised symbol does not therefore need to communicate this, to retain simplicity. Such information might be valuable to prove packaging was genuinely and beneficially reusable, but consumers only need confidence this is the case to be encouraged to do the right thing. Additional numbers (e.g. average number of reuses), which may not be directly comparable across different product classes, are unlikely to be of general consumer interest and will not inform choices at end-of-first use (though they might at purchase point). In the worst case they could be directly confusing.[597]

This is not a certification scheme for reusability, it is specifying how reuse information can be shared with consumers, a similar distinction to measure Mj.

The considerations around the design of this symbol on-pack are similar to those for measure M 27c-y.

Timelines for testing and development will be aligned with Measure 27c-y to maximise efficiency and compatibility.

As with measure Mj, a key interest for economic operators in this measure is alignment with Mk and preserving the integrity of the single market by preventing divergence in mandatory labelling requirements.

Mandating the use of the harmonised symbol could complicate life for economic operators seeking to adopt new reuse models, or running successful established schemes, as they will have to adhere to an additional labelling requirement that single use operators do not, regardless of how well their reusable packaging model is already working or understood by their customers. With some exceptions (e.g. DRS for reusable beverage bottles in a number of Member States), the reuse market is very small and often localised, and experimentation is still needed in optimising system approaches. As a mandatory the measure could add a barrier to new reusable packaging pilots, local initiatives, and experimentation, which single use packaging does not face, and for a packaging type where innovation is still frequently required. Labelling requirements should seek to mitigate this with features like: long transition periods, exemptions for legacy packaging that is still in (re)use; and *de minimis* thresholds or similar for smaller more experimental takeback systems, especially at local level.

[597] From a behaviour change point of view, optimising the information for consumers to leverage behavioural outcomes should be the key design driver, a view shared by some stakeholders. Several interviewees emphasised that value to the consumer should be the test for inclusion or exclusion of information directly on the packaging label, with additional information optional and/or provided digitally

9.33.2 Ease of implementation

This is an enabling measure for consumers similarly to Measure 27c-y.

There are unlikely to be significant behavioural improvements from an EU-wide reuse label in the absence of other measures. Reusable packaging is not currently the norm, but this measure will expose consumers to the reuse options on the market.

Reusable packaging is intended to grow significantly by 2030. As schemes multiply, the case for a common symbol indicating reuse is the preferred end-of-first-use choice (rather than disposal), over and above the specific symbols and information for a given reuse scheme, may become much more important in facilitating consumer behaviour and understanding. There is also a case for establishing a symbol now, to both ensure compatibility with other labelling changes proposed and to prevent divergence in national requirements as reuse grows in popularity.

9.33.3. Administrative burden

This measure would be dependent on clear reusability standards being defined, to ensure that the symbol was not misused.

Considerations on timing and design compatibility are largely the same as for measures Measure 27c-y and Mj.

The transition period may need to be longer than for other measures.

There may also be specific issues in gaining high levels of familiarity for this symbol with consumers, as it is likely to be relatively rarely used initially, simply because reusable packaging is relatively rare.

9.33.4. Economic impacts

As with measure Mj, this measure should add very little in costs to economic operators if delivered in conjunction with Measure 27c-y. Additionally, relatively little current packaging is in scope for a reuse label, even if economic operators choose to use it immediately, while any new reusable packaging could incorporate the label from the start.

. Market harmonisation benefits are discussed under measure Mk.

To the extent that the symbol facilitates more reuse behaviour – and thus the efficiency and effectiveness of reuse systems overall – it would have a positive benefit to economic operators. However, this is entirely dependent on the extent of take-up of reusable packaging solutions in future. Current schemes are either very small or very high performing already.

It is critical this measure does not disrupt practice for existing reuse schemes or restrict innovation in an area that needs to grow rapidly.

9.33.5. Environmental impacts

Ultimately, clearer information on reuse should result in fewer cognitive and behavioural barriers to pro-environmental behaviours, with positive behavioural (and thus environmental) benefits arising from greater reuse.

However, the benefits resulting from *this measure alone* are likely to be very small until we see widespread adoption of reusable packaging, and high levels of consumer awareness of the label.

9.33.6. Social impacts

The primary benefit would be from the contribution to the wider effort to normalise reuse, reinforcing pro-environmental citizen messages, and social norms around recycling. Widespread adoption of reusable packaging might have greater impacts, but this measure supports rather than causes such a transition.

9.33.7. Stakeholder views

Stakeholders spoken to were more concerned about preventing the multiplication of divergent national requirements on reuse labelling (with associated barriers to the smooth functioning of the single market) than they are about creating a harmonised standard for reuse. The former is a feature of measure Mk. However, defining an EU label was acknowledged as one way to bypass the perceived need or desire for fragmentation in reuse labelling at the level of national legislation.

Several interviewees stressed the limited nature of reuse provision to date and were keen that this measure did not confuse or complicate existing reuse schemes unnecessarily. One interviewee (a Danish drinks producer) was concerned that changing labels on the existing DRS for refillable packaging was undesirable, given the very high levels of performance and engrained pro-environmental habits already seen. Similarly, some stakeholders in the packaging industry were keen not to restrict innovation in a sector that needs to grow, and where the best systemic solutions may not yet be known and emphasised restrictive rules for economic operators should be avoided.

One stakeholder group emphasised the need to define the scope of this measure in relation to sectors and product types very carefully: they sell products (power tools) where the case is an integral part of the product offer and is expected to be reused by the customer for the lifetime of the product in many cases; they did not believe that items like that should be captured by this measure.

Two consumer-oriented groups stated that a reuse label should be reserved for packaging where an industrial reuse system supported by a DRS system exists that can be accessed by the consumer. It was also suggested that applying reuse labelling to packaging outside of DRS systems could confuse or discourage consumers from reusing this packaging. Concerns were also raised that the development of a label system should take care not to negatively impact local and small-scale reuse systems that already exist. A consumer-oriented group suggested that all single use packaging should be clearly labelled as single use. There was also concern that too open a definition of what constituted reusable packaging could lead to companies exploiting loopholes. The example offered was of describing single use items, or items with no take-back provision from the producer, as reusable simply because a consumer might be able to reuse it for another purpose themselves.

Consumer-oriented groups had mixed views on the likely impacts of labelling reuse. One group emphasised labelling alone was insufficient, and regulation was necessary to increase consumer packaging reuse. In contrast another suggested that reducing greenwashing and ensuring clearly visible labelling of single use and reusable packaging could increase the market share of reusable packaging as consumers choose the more sustainable option.

Views also diverged on the value of providing consumers with additional performance information (such as the number of reuses an item can serve). One consumer-oriented group took the view that this was useful information for the consumer, whereas another thought this could be confusing as it is not readily comparable across packaging, and environmental impacts. It was further suggested that this is outside of the individual consumer's control and that it may even encourage them to retire an item of reusable packaging earlier than it other would have been. The value of digital provision of information was acknowledged, but concerns were also raised about accessibility for all, and whether consumers would be willing to take additional steps to get this information.

9.34 Mx "Update of current material-based labelling": Removal of alphanumeric codes for waste sorters

9.34.1. Description of the measure

Article 8 of Directive 94/62/EC on packaging and packaging waste **provides a marking system for packaging and an identification system for packaging materials**. Article 8 (2) of this Directive provides that "[...] packaging shall indicate [...] the nature of the packaging material(s) used on the basis of Commission Decision 97/129/EC". The material identification system pursuant to Article 8 paragraph 2 of Directive 94/62/EC has a fully harmonizing nature.

The identification system itself is established in Commission Decision 97/129/EC and contains numbers and abbreviations. **Article 3 stipulates that the use of the numbering and abbreviations of the identification system shall be voluntary for the packaging materials mentioned**. It is further stipulated that "a decision whether to introduce on a binding basis the identification system for any material or materials may be adopted in accordance with the procedure laid down in Article 21 of Directive 94/ 62/ EC", but no such decision has been made at EU level.

However, in recent years some EU Member States have included in **their national legislation an obligation to use the EU packaging material symbols**, which is not in line with the directive[598].

A common EU approach to packaging waste labelling is needed to avoid confusion among consumers and to enhance the internal market. This measure would consist of changes to the existing Directive requirements, in support of the changes proposed in measures Measure 27c-y, Mk, Mj, and M12.

Two distinct elements are considered as part of this measure:

1) **Removal of the current alphanumeric labelling system**

There is **no evidence alphanumeric coding was ever significantly used by consumers** and **Measure 27c-y will make such coding wholly redundant** from a consumer perspective in any case. Alphanumeric coding also has limited use to the waste management industry for sorting purposes, with most of the material now sorted using automated optical processes that do not require packaging labelling. Where manual sorting is still used, it is done by visual recognition of the material via physical characteristics other than use of alphanumeric labelling. **There is therefore no evidence alphanumeric coding will serve a useful purpose in the revised PPWD.**

Alphanumeric categorisation of material may still have uses[599], as it does provide a common way to categorise material types. Example use cases may include classification of material as part of management of waste and recycling operations or use in some manufacturing applications. It has also been used at times for more intensive forms of citizen engagement around material types and uses, including recycling education (e.g., young people in schools, community groups). However, **none of these uses benefit from these codes being used as a labelling system on individual packaging items.**

[598] *REFIT Platform Opinion on the EU Packaging material by a Member of the Stakeholder Group (Mr Loosen),* 19/03/2018

[599] For this project we spoke directly to manual sorting operations in Greece, and also received an evidence submission in relation to use in manufacturing. A project team member has past experience using the system for citizen education.

Commission Decision 97/129/EC, Article 3, makes use of alphanumeric labelling voluntary, but the trend to incorrectly incorporate it as mandatory in national legislation is creating problems for packaging labelling in the single market (see measure Mk).

This measure would therefore significantly amend the current article 8 so that alphanumeric labelling will be neither mandated nor encouraged. Under the assumption that producers and waste sorters, do not use alphanumeric labelling, Article 8 of Directive 94/62/EC and Commission Decision 97/129/EC, should be revised accordingly.

Measure Mk on controlling confusing labels would additionally remove the option for national legislation to mandate alphanumeric labelling and might additionally constrain economic operators from choosing to continue to use alphanumeric labelling voluntarily also. To minimise disruption, any requirement to remove alphanumeric labels from packaging should be aligned with the introduction of Measure 27c-y.

There still be merit in the Commission retaining the alphanumeric codes as common guidance to support use cases beyond the remit of PPWD.

2) **Mandating future packaging labelling requirements to facilitate smarter sorting in the waste management industry**

There are now better ways to sort waste and recycling within the waste management industry than can be provided by visual codes or labels. Requirements to improve sorting further (to reduce contamination, improve quality, or to facilitate differentiation of different sector or producer contributions to a material stream) will not rely on human-readable labelling changes.

In the medium-term there is likely to be a need to introduce requirement to use digital labelling to facilitate and harmonise the next generation of sorting technologies at EU level. At least two labelling technologies (digital watermarking[600] and serialisation[601]) have demonstrated technical viability, but not yet their ability to deliver at scale, or the likely costs of doing so. Other alternative future sorting technologies, such as use of artificial intelligence in sorting[602] are also considered potentially viable.

However, the potential roles of these technologies within the wider system remains currently unclear. The nature of harmonised collection systems proposed under the Waste Framework Directive revision, and the level of material or even economic operator specific cost granularity desired under EPR schemes, will be

[600] See https://www.digitalwatermarks.eu/

[601] World Economic Forum, 2019, *Here's how digitization can boost recycling rates,* https://www.weforum.org/agenda/2019/01/here-s-how-digitization-can-boost-recycling-rates/

[602] European Commission, 05/03/2021, *Zenrobotics: applying artificial intelligence to waste sorting,* https://ec.europa.eu/environment/ecoap/about-eco-innovation/good-practices/zenrobotics-applying-artificial-intelligence-waste-sorting_en

key factors in determining the costs and benefits of this much wider labelling and technological shift, which may also have implications for the costs of EPR schemes in turn. After 2025, there is likely to be a need to harmonise sorter-facing labelling requirements for packaging, but it is too early to specify what the best solution would look like, or what it would cost.

The Commission will integrate consideration of this question into the Waste Framework Directive, targeting 2025 as the point by which to have determined the detailed requirements for harmonised smart sorting across the EU, including any label requirements, to support long-term strategic objectives for both WFD and PPWD. Only part one of this measure is assessed in detail for the remainder of this measure.

9.34.2. Effectiveness

Most consumers are unlikely to be influenced by removal of the current alphanumeric labelling system at point of purchase. In addition, sorters, even during extensive manual sorting, do not find any use or benefit of the alphanumerical labelling system.

Removing references to the alphanumeric codes from the revised Directive will have no ill effects, and would allow article 8 to be revised to reflect Measure 27c-y.

Some economic operators do present this information on labelling, and some Member States have already identified in their national legislation an obligation to use the existing alphanumeric codes. There are challenges posed to the operation of the single market by Member State practice in this regard. There is less harm in economic operators using these codes on packaging (though they may add to consumer confusion). Both Member State and economic operator use of these codes could be controlled by the adoption of measure Mk**.**

9.34.3 Ease of implementation

In relation removal of alphanumeric labelling:

- It is proposed that all labelling measures in this legislative proposal that are taken forward are subject to a single implementing act, scheduled for 2024, after completion of the Waste Framework Directive, as described for Measure 27c-y.
- In common with measure Mk, the change proposed here is a removal not an addition but may cause specific issues for Member States that have mandated the system. Additionally, while other labelling measures are focused heavily on consumer-facing packaging, it would be necessary to ensure that changes cover business-to-business tertiary packaging too (an explicit feature of Italian Legislative Decree No. 116/2020 mandating use of alphanumeric codes)
- Unintended impacts on non-labelling applications of the alphanumeric code could be avoided by continuing to provide the classification as guidance for other applications.

9.34.4 Administrative burden

If this measure is introduced alongside other labelling measures, the additional costs of this measure alone would be minimal, with all packaging being redesigned over the course of the transition period for Measure 27c-y in any case.

Enforcement costs for Member States would be minimally affected in line with Measure 27c-y.

There are no design or development costs for the Commission for this measure.

There might be significant cost savings to economic operators if this measure is introduced in conjunction with measure Mk. These impacts are discussed under that measure.

9.34.5 Economic impacts

There are no additional costs or benefits identified relative to Measure 27c-y and Mk, though the inclusion of tertiary packaging might extend the scope of redesign requirements relative to Measure 27c-y in markets where alphanumeric is currently required and might in future be banned.

9.34.6 Environmental impacts

There are no additional costs or benefits identified relative to Measure 27c-y and Mk.

9.34.7 Social impacts

There are no social impacts identified, given the lack of evidence of current use for this coding system.

9.34.8 Stakeholder views

A key objective in relation to this measure was exploring if use cases for alphanumeric labelling identified in earlier PPWD consultations (specifically the potential use by manual waste sorting operations) were in fact reasons to retain the system.

Following a series of questions raised with key stakeholders, including sorters, it became evident, that even during extensive manual sorting (the case of Greece), alphanumeric labelling does not add value to the work they carry out (i.e. speed or identification to place within the right container in the MRF). Alphanumeric labelling is included during the waste sorters training for the identification of material, however if it was to be removed (and provided it was replaced by material component labelling), it would make minimal difference to manual sorters.

According to other stakeholders, the alphanumerical labelling system is sometimes also in production processes, for example for marking cavities in injection moulding. (The mould maker indicates the material the mould is designed for in the cavity, so it can be checked before using).

Overall, the removal of alphanumerical labelling was viewed as supportive of the single market by stakeholders, as it helps reduce the perceived risk of proliferating national standards on packaging among Member States, in line with comments on other labelling measures (especially Mk).

Measures discarded and not analysed in depth

The measures that are included in this Impact Assessment are the result of an extensive screening process. Based on a preliminary assessment some measures were discarded in early stage because they were considered to not meet one of the core criteria related to effectiveness, efficiency, fairness, policy coherence,

Measure 27a. to include information on whether it is "recyclable" or not (in line with selected definition)

The requirement for all packaging to be recyclable by 2030 (see Measure 21 Updates to the Essential Requirements) implies that the **labelling of packaging as 'recyclable'**. However, the use of the "chasing arrows" or other symbols to indicate recyclability of packaging, will become redundant by the year 2030 when all packaging on the EU market will have to be recyclable.

In addition, given the proposal for 'recyclable' to potentially be defined as per Measure 22a, it is noted that what can be considered recyclable "at scale" would vary by Member State depending upon the nature of available waste collection and recycling systems. Therefore, if a harmonised label associated with whether packaging is 'recyclable' across the EU was implemented in the short term, the **packaging would be recyclable in some Member States, but not others, thereby potentially causing further confusion** for consumers. This measure is therefore not considered appropriate for impact assessment.

Measure 27e: incentivise digital watermarking/ other tracer technologies

This measure would provide incentives to digital labels, which would store a large amount of information such as: packaging materials, recycled content, reusability, recycling instructions. The measure already has some support from industry. However, technology seem not available at commercial scale at present.

Digital labels (watermarks, barcodes, QR codes) would require consumers' time to scan the barcode and find the information as opposed to having it readily provided on the package itself. Therefore, whilst "dematerialised" **digital information may be useful for sorters** with automated systems that can easily scan and interpret this information. However, it **is unclear what consumer uptake would be like**, and the impacts this could have on the quantity and quality of packaging waste separated for recycling. In addition, further assessment is required to determine whether digital watermarking technologies are the most appropriate solution in this area, since other approaches to achieve similar outcomes are currently also being

explored (product passports, chemical tracers, etc.). In the absence of clear information regarding these options, it is not suitable to make recommendations requiring everyone to use this same technology.

INTERVENTION AREA ON ENABLING MEASURES - GREEN PUBLIC PROCUREMENT

Introduction

Government expenditure on works, goods and services represents around 14% of EU GDP, accounting for EUR 1.8 trillion annually.[603] GPP constitutes an important tool to promote the use of greener products and services by the public authorities and, therefore, to achieve environmental policy goals relating to climate change, biodiversity loss, resource efficiency and sustainable production and consumption.

Measures discarded at an early stage and not analysed in detail

- Measure 40a: Additional criteria on packaging added to the current (voluntary) GPP measures
- Measure 41: Required use of environmental award criteria

Measures analysed in depth in the Annex and included in the options table

Measure 40: Mandatory minimum packaging criteria

- Measure 40b: Mandatory minimum packaging criteria for priority product and service areas
- Measure 40c: Mandatory minimum GPP criteria for packaging of all products and services

[603] EU. Buying Green, a Handbook of Green Public Procurement, (2016). Available online: https://ec.europa.eu/environment/gpp/pdf/Buying-Green-Handbook-3rd-Edition.pdf (accessed on 16 October 2020).

Measures analysed in depth and included in the options table

9.35 Measure 40: Mandatory minimum packaging criteria for all product and service areas

This measure will **develop packaging criteria for product and service categories**. It will build on the existing GPP criteria for priority goods and services by **introducing additional criteria on packaging.** This will be done with an **implementing act.** This measure will require identification of a competent body (the JRC– for example) responsible for developing and regularly updating the GPP criteria. GPP criteria would need to consistent with the rest of the (selected) measures and it could even set stricter requirements for public procurement or anticipate the date of entry into force of the packaging criteria. Measure 40 has two levels of ambition, increasing in both effort and expected impact. The levels are:

1. **Measure 40b – Mandatory minimum packaging criteria for priority product and service areas representing high potential for impact**. In this measure, mandatory minimum packaging criteria would be developed for high impact products and services procured by the public sector.
2. **Measure 40c – Mandatory minimum packaging criteria for all product and service areas, across all public sector contracts where packaging arises**. In this measure, a general set of packaging criteria would be applied across all public sector contracts where packaging is used and when packaging waste arises.

Assessment of measure 40 b: Mandatory minimum packaging criteria for priority product and service areas representing high potential for impact: Target (to be defined)

9.35.1 Description of the measure

Measure 40b consists in introducing **mandatory minimum packaging criteria for public sector products and services, representing high potential for impact**.

This measure would require Member States and related contracting authorities to apply minimum packaging criteria to relevant contracts above and below OJEU (Office of the Journal of the European Union) financial threshold. Among the criteria, it is expected that there will be incentives for the uptake of reusable packaging.

Prioritisation of product categories can be based on a wide range of factors including:

- EU public sector spend.
- An estimate of the intensity of packaging used.
- An estimate of the environmental impact of packaging types typically associated with that Common Procurement Vocabulary (CPV) division; and
- The potential for public procurement to influence the Division.

Based on stakeholder consultation and other research, the following **product categories** were considered to be a **priority**:

- 3 - Agricultural, farming, fishing, forestry and related products
- 15 - Food, beverages, tobacco and related products
- 18 - Clothing, footwear, luggage articles and accessories
- 22 - Printed matter and related products
- 30 - Office and computing machinery, equipment and supplies except furniture and software packages
- 31- Electrical machinery, apparatus, equipment and consumables; Lighting
- 33 - Medical equipment, pharmaceuticals and personal care products
- 38 - Laboratory, optical and precision equipment (excl. glasses)
- 39 - Furniture (incl. office furniture), furnishings, domestic appliances (excl. lighting) and cleaning products
- 44 - Construction structures and materials; auxiliary products to construction (excepts electric apparatus)
- 45 - Construction work
- 50 - Repair and maintenance services (across a wide range of product groups)
- 60 - Transport services (excluding waste transport).

9.35.2 Effectiveness

If retained, this measure will reduce the demand for lower environmental impact packaging in products and services representing high potential impact.

Since compliance with the set criteria will be mandatory for high potential impact products and services, the uptake of **GPP criteria will be wider and consistent across Member States**.

As the criteria will be defined in a tender as technical specifications and not as mere award criteria, they will constitute minimum compliance requirements that must be met by all tenders. Offers not complying with the technical specifications would have to be rejected.

This measure will also promote the development of circular packaging solutions across supply chains.

9.35.3 Ease of implementation

This measure would require the **appointment of a competent body to identify high potential impact products and services as well as related packaging-specific criteria and thresholds.**

The implementation of the measure will relate to **the development of adequate legal and policy frameworks** as well as monitoring, reporting and enforcing systems both at EU and Member State level.

As the new Circular Economy Action Plan[604] requires that "*the Commission will propose minimum mandatory green public procurement (GPP) criteria and targets in sectoral legislation*", amendment of the Public Procurement Directive[605] was not considered as a vehicle for implementing this measure. Furthermore, this **sector-based approach** has the potential to enhance the internal market by fostering a harmonized approach at EU level.

9.35.4. Administrative burden

The European Commission: A competent body will need to be appointed to identify high potential impact products and services as well as related packaging-specific GPP criteria. On this basis, implementing act will be adopted by the Commission, which will need to detail also reporting obligations.

Member States will be required to ensure that new criteria are implemented, monitored, and reported on. They will be encouraged to update GPP criteria within National Action Plans (NAPs). A NAP is a document created by a Member State detailing how public procurement will be "greened" over the next three-year period. It should contain an assessment of the existing situation, ambitious targets, and the measures needed to achieve them[606]. They are recommended by the European Commission as they can help to raise awareness of more sustainable procurement practices and stimulate further implementation.

Public Bodies will be required to ensure that the tendering processes include the relevant GPP criteria for packaging on products and services representing high potential impact. Furthermore, public bodies will need to ensure that staff is properly trained on mainstreaming GPP criteria for packaging into tender procedures as well as in assessment and verification of those criteria.

Suppliers will be required to provide information and evidence related to the packaging criteria when applying for a public sector contract in the related sectors. For this, they may need to **update their packaging source options** to comply with the new requirements. As the measure is mandatory, requirements will be consistent across Member States, therefore resulting in clearer instructions and potentially lower administrative burden.

[604] https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN

[605] Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC (*OJ L 94, 28.3.2014, p. 65–242)*

[606] EUROPA (2021) *GPP National Action Plans*, https://ec.europa.eu/environment/gpp/action_plan_en.htm

9.35.5. Economic impacts

The **overall economic impacts** of this measure **could not be quantified** given that they are dependent on the GPP packaging criteria that will be selected by an appointed body. A specific economic impact for Suppliers has been identified. **Suppliers may be required to provide verification against additional packaging criteria**. This may involve, for example, certification of recycled content. Achieving this certification or gathering this proof of performance would be at a cost to the supplier.

9.35.6. Environmental impacts

The specific environmental impacts of this measure **could not be quantified**. Considering that this measure will set a clearer legal framework on GPP for packaging, it will lead to **positive environmental impacts**.

This measure could help in prevent and reduce packaging waste, leading to lower levels of leakage, and pollution in waterways and on green spaces, thereby reducing biodiversity losses; Reduce single use packaging waste to landfill and incineration; Stimulate demand for recycled content packaging, and decrease demand for virgin resources, for the sectors identified.

9.35.7. Social impacts

The nature and extent of social impacts will depend on GPP packaging criteria that will be selected. Therefore, social impacts for this measure **could not be quantified.**

Overall, it is expected that these impacts will be **minimal**. Possible uptake of this measure encompasses the creation of jobs as result of increased reuse business model and the reduction of litter in local environments.

9.35.8. Stakeholder views

As part of the stakeholder consultation process[607], 19 Member State representatives and national experts were surveyed for their views on packaging criteria for GPP. The stakeholders identified product and service categories where mandatory packaging requirements would be particularly impactful:

1. Food, beverage, vending, and catering (26%);
2. Furniture (15%);
3. IT equipment (15%); and
4. Cleaning products and services (15%).

[607] *Questionnaire for Member States Regarding Packaging and Green Public Procurement,* issued December 2020

1. Many of the stakeholders who provided feedback following the June Impact Assessment webinars were in favour of mandatory minimum packaging criteria for GPP. Often, there was no definition made between this measure (40b) and measure 40c (mandatory minimum packaging criteria for all product and service areas). However, several stakeholders highlighted that there was a need for some exceptions or additional considerations:
2. Minimum requirements should not restrict the ability of contracting authorities to set more ambitious sustainability requirements where desired.
3. Any mandatory requirements introduced by the PPWD should be aligned with established packaging criteria where they exist (e.g., in catering); and
4. There should be pre-defined procedures to enable exemptions in exceptional circumstances (e.g., disaster relief).

Assessment of measure 40 c: Mandatory minimum packaging criteria for all products and service areas

9.36.1 Description of the measure

This measure would deploy a horizontal approach to mandating the application of a general set of packaging criteria across **all public sector contracts where packaging arises**. This measure would require Member States and related contracting authorities to **apply mandatory minimum packaging criteria** to relevant contracts above and below OJEU (Office of the Journal of the European Union) financial threshold.

9.36.2 Effectiveness

If implemented, this measure would see the existing **GPP criteria widened** to include additional criteria which address packaging impacts. It would **facilitate the application and use of packaging criteria within public contracts** by contracting authorities across Member States and hence allow the ability to be firmer in enforcing the GPP across the Union. This would help moving towards the achievement of Commission target of 50% of EU wide procurement at local, regional, or national level. Furthermore, the measure generates a push and pull mechanism for increasing demand for lower environmental impact packaging, while encouraging the development of circular economy packaging solutions across supply chains.

9.36.3 Ease of implementation

The implementation of this measure would require the appointment of a competent body to update the GPP criteria. **As this measure proposes mandatory requirements, the implementation will depend on the enforcement activities at both EU and Member State level**. Additional supporting legislation, reporting frameworks and enforcing systems will be required. On the other hand, this horizontal approach has the potential to enhance the internal market fostering a harmonized approach at EU wide level.

9.36.4 Administrative burden

This measure, characterized by the creation of a single cross-cutting criteria for packaging. Consequently, for the Commission it may be less burdensome than the creation of individual criteria for priority products and services.

For other stakeholders listed above, the administrative burden is similar to Measure 40b, but higher as it would apply to all sectors.

9.36.5 Economic impacts

The **overall economic impacts** of this measure **could not be quantified** given that they are dependent on the GPP packaging criteria that will be selected by an appointed body. However, additional economic cost will likely to be borne by the stakeholders mentioned above proportional to the administrative burden outlined. Hence the cost for adapting, monitoring and enforcement might be significant in the short-term for governing bodies, but they will balance out in the long-term. In the short-term suppliers might incur additional reporting or certification costs, arising from the need to gather proof of performance, but in the long-term the measure will increase the ease of reporting for suppliers.

9.36.6 Environmental impacts

The specific environmental impacts of this measure **could not be quantified**. It is expected that this measure would set a mandatory and clearer legal framework for economic operators to reduce the use of excessive or unnecessary packaging across all Member States, which will lead to **positive environmental impacts.** Some of the criteria could focus on the reduction of the use of single use packaging; stimulate demand for recycled content packaging, and decrease demand for virgin resources.

9.36.7 Social impacts

The nature and extent of social impacts will depend on GPP packaging criteria that will be selected. Therefore, social impacts for this measure **could not be quantified. Overall,** it is expected that these impacts will be **minimal**. Possible uptake of this measure encompasses the creation of jobs as result of increased reuse business model and the reduction of litter in local environments.

9.36.8 Stakeholder views

The stakeholder feedback provided following the June Impact Assessment webinars that is listed under measure 40b is also applicable to measure 40c.

Measures that were discarded in an early stage

The measures that are included in this Impact Assessment are the result of an extensive screening process. Based on a preliminary assessment measure 40a - additional criteria on packaging added to the current (voluntary) GPP measures - was discarded in early stage because it was considered that it did not meet one of the core criteria related to effectiveness, efficiency, fairness, policy coherence etc.

Measure 40a: Additional criteria on packaging added to the current (voluntary) GPP measures

Measure 41: Environmental award criteria

The aim of this measure is to continue to stimulate supplier innovation in the delivery of high performing packaging solutions, without compromising the ability of certain areas of the market to compete in public tendering processes.

Packaging criteria which are formulated as environmental award criteria are an important mechanism to stimulate additional environmental performance, without being mandatory. Such criteria would help stimulate innovation and technical progress without foreclosing the market in areas that cannot reach the proposed level of performance. This would further incentivise and reward the market for going beyond minimum criteria in certain areas; (e.g., increased packaging prevention options, achieving higher recycled content in packaging). This is one possible method for ensuring a fair market without stunting growth.

Under this option, and beyond minimum mandatory GPP criteria for packaging as described in measure 40, environmental award criteria would be developed and would see higher scores in certain areas awarded to suppliers exceeding the minimum requirements during assessment of a tender submission.

ANNEX 10 MASS FLOWS

The table below presents the mass flows of option 2 that were used in the modelling (masses in ktonnes).

Material	Packaging Type	2030 – baseline	2030 – option 2	Change
Paper / board	T - Corrugated and other board boxes	21,717	16,046	-5,671
Wood	T - Pallets	13,896	9,881	-4,015
Paper / board	T - Corrugated and other board boxes - e-commerce	8,024	6,145	-1,879
Glass	P - Beverage containers	11,992	10,332	-1,659
Plastic	T - Wrapping and strapping	4,412	2,945	-1,467
Paper / board	P - Carton board e.g. cereal boxes etc	6,415	5,269	-1,146
Plastic	P - Rigid food e.g. pots, tubs and trays	4,928	3,884	-1,043
Plastic	P - Other mono/multi polymer/layer flexibles (excl. film)	2,789	1,748	-1,040
Plastic	P - PET bottles (beverage containers)	3,334	2,848	-486
Plastic	P - Bottles (all non-beverage)	2,177	1,693	-484
Glass	P - Non-beverage food	2,685	2,417	-268
Plastic	T - Crates, boxes etc.	557	369	-188
Plastic	P - Films	673	538	-135
Paper / board	P - Non-beverage liquid packaging board e.g. soups	713	608	-104
Plastic	P - Multi-polymer/material stand-up pouches	535	457	-78
Plastic (compostable)	P - Compostable Rigids	78	27	-51
Paper / board	P - Beverage cartons	238	189	-49
Steel	P - Non-beverage food e.g. food cans	1,589	1,542	-47
Aluminium	P - Beverage containers	521	476	-45

Material	Packaging Type	2030 – baseline	2030 – option 2	Change
Aluminium	P - Semi rigids e.g. food trays	219	182	-37
Plastic	P - Other rigids (non beverage, non-food) e.g. blister packs	262	242	-20
Plastic	P - Mono-polymer stand-up pouches	112	96	-16
Steel	P - Other (non-food, non-beverage) e.g. paint tins	857	849	-8
Aluminium	P - Other rigids e.g. aerosol sprays, food cans	166	160	-6
Glass	P - Other (non-food, non-beverage)	42	36	-5
Steel	P - Beverage containers	220	215	-4
Plastic	T - Drums (MU)	37	34	-3
Aluminium	T - Kegs, tanks etc. (MU)	70	69	-1
Aluminium	P - Flexibles e.g. foils	22	22	0
Steel	T - Drums (MU)	8	8	0
Other	P - Miscellaneous (not included elsewhere)	204	204	0
Plastic	P - Non PET (beverage containers)	85	95	10
Plastic	P - Bottles (all non-beverage) (MU)	0	11	11
Plastic	T - Wrapping and strapping (MU)	0	11	11
Plastic	P - Beverage containers (MU)	26	37	12
Glass	P - Beverage containers (MU)	154	184	29
Steel	P - Food refill scheme boxes e.g. Loop (MU)	0	73	73
Plastic	P - Food refill scheme boxes e.g. Loop (MU)	0	103	103
Wood	T - Pallets (MU)	1,031	1,149	118
Plastic (compostable)	P - Compostable Films	206	772	566

Material	Packaging Type	2030 – baseline	2030 – option 2	Change
Paper / board	P - Other paper / board	640	1,318	678
Plastic	T - Crates, boxes etc. (MU)	325	1,016	691

The table below presents the mass flows of option 3 that were used in the modelling (masses in ktonnes).

Material	Packaging Type	2030 – baseline	2030 – option 3	Change
Paper / board	T - Corrugated and other board boxes	21,717	15,452	-6,265
Wood	T - Pallets	13,896	9,312	-4,584
Glass	P - Beverage containers	11,992	8,685	-3,306
Paper / board	T - Corrugated and other board boxes - e-commerce	8,024	5,813	-2,211
Plastic	T - Wrapping and strapping	4,412	2,789	-1,623
Plastic	P - Other mono/multi polymer/layer flexibles (excl. film)	2,789	1,340	-1,448
Plastic	P - Rigid food e.g. pots, tubs and trays	4,928	3,704	-1,224
Paper / board	P - Carton board e.g. cereal boxes etc	6,415	5,207	-1,208
Plastic	P - PET bottles (beverage containers)	3,334	2,665	-669
Glass	P - Non-beverage food	2,685	2,057	-628
Plastic	P - Bottles (all non-beverage)	2,177	1,574	-604
Plastic	T - Crates, boxes etc.	557	348	-209
Plastic	P - Films	673	499	-175
Paper / board	P - Non-beverage liquid packaging board e.g. soups	713	606	-107
Plastic	P - Multi-polymer/material stand-up pouches	535	455	-80

Material	Packaging Type	2030 - baseline	2030 – option 3	Change
Aluminium	P - Beverage containers	521	466	-55
Steel	P - Non-beverage food e.g. food cans	1,589	1,535	-54
Paper / board	P - Beverage cartons	238	185	-53
Aluminium	P - Semi rigids e.g. food trays	219	180	-39
Plastic	P - Other rigids (non beverage, non-food) e.g. blister packs	262	243	-19
Plastic	P - Mono-polymer stand-up pouches	112	96	-16
Steel	P - Beverage containers	220	211	-9
Glass	P - Other (non-food, non-beverage)	42	34	-8
Steel	P - Other (non-food, non-beverage) e.g. paint tins	857	850	-7
Aluminium	P - Other rigids e.g. aerosol sprays, food cans	166	159	-7
Plastic	T - Drums (MU)	37	34	-3
Aluminium	T - Kegs, tanks etc. (MU)	70	69	-1
Aluminium	P - Flexibles e.g. foils	22	22	0
Steel	T - Drums (MU)	8	8	0
Other	P - Miscellaneous (not included elsewhere)	204	204	0
Plastic	P - Non PET (beverage containers)	85	90	5
Plastic	P - Bottles (all non-beverage) (MU)	0	12	12
Plastic	T - Wrapping and strapping (MU)	0	13	13
Plastic	P - Beverage containers (MU)	26	41	15
Glass	P - Beverage containers (MU)	154	193	39
Plastic (compostable)	P - Compostable Rigids	78	125	47
Steel	P - Food refill scheme boxes e.g. Loop	0	87	87

Material	Packaging Type	2030 - baseline	2030 – option 3	Change
	(MU)			
Plastic	P - Food refill scheme boxes e.g. Loop (MU)	0	108	108
Wood	T - Pallets (MU)	1,031	1,168	137
Paper / board	P - Other paper / board	640	1,372	731
Plastic	T - Crates, boxes etc. (MU)	325	1,122	797
Plastic (compostable)	P - Compostable Films	206	1,236	1,030