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IMPACT ASSESSMENT REPORT

Accompanying the document

Proposal for a Regulation of the European Parliament and of the Council

amending Regulation (EU) 2019/631 as regards CO2 emission performance standards for new light duty vehicles and vehicle labelling and repealing Directive 1999/94/EC

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Glossary

Term or acronym	Meaning or definition
ACEA	European Automobile Manufacturers' Association
BCG	Boston Consulting Group
BEV	Battery Electric Vehicle
CCM	Carbon Credit Mechanism
CO_2	Carbon dioxide
ETS2	EU Emission Trading System covering buildings and road transport
EV	Electric Vehicle: covers BEV, FCEV and OVC-HEV
FCEV	Fuel Cell Electric Vehicle
GDP	Gross domestic product
GHG	Greenhouse gas(es)
ICCT	International Council on Clean Transportation
ICE(V)	Internal Combustion Engine (Vehicle(s))
IF	Innovation Fund
LDV	Light-Duty Vehicle(s), i.e. passenger car(s) and light commercial vehicle(s)
NGO	Non-Governmental Organisation
NOVC-HEV	Not Off-Vehicle Charging Hybrid Electric Vehicle(s): hybrid electric vehicle that cannot be charged from an external source
NPV	Net Present Value
OVC-HEV	Off-Vehicle Charging Hybrid Electric Vehicle(s): PHEV and REEV
PHEV	Plug-in Hybrid Electric Vehicle(s)
p.p.	Percentage point
RDE	Real Driving Emissions
RED	Renewable Energy Directive
REEV	Range Extender Electric Vehicle(s)
RFNBO	Renewable Fuels of Non-Biological Origin
SCF	Social Climate Fund
SDG	Sustainable Development Goal
SME	Small and Medium Enterprise(s)
SRF	Sustainable Renewable Fuels
SUV	Sports Utility Vehicle
TCO	Total Cost of Ownership
TEN-T	Trans-European Transport Network
TFEU	Treaty on the Functioning of the European Union
toe (unit)	tonne of oil equivalent
VEEF	Vehicles Exclusively running on the Eligible Fuels
WLTP	Worldwide Harmonised Light Vehicles Test Procedure
ZEV	Zero-Emission Vehicle(s)

1. INTRODUCTION: POLITICAL AND LEGAL CONTEXT

1.1. Overall context

The EU has committed, as enshrined in the **European Climate Law**[1], to reduce its net greenhouse gas (GHG) emissions by at least 55% by 2030 compared to 1990, and to reach climate neutrality by 2050. The Commission also proposed an amendment to the Climate Law setting a 2040 target of 90% reduction[2]. Cutting emissions from road transport is indispensable as in 2023 they represented about 30% of the EU's overall net CO_2 emissions and are still higher than in 1990.

The framework set out by the EU to become a decarbonised economy by 2050 can drive competitiveness if objectives and policies are well aligned, as it gives certainty and predictability to companies and investors alike. Decarbonisation policies are a powerful driver of growth when they are well integrated with industrial, competition, economic and trade policies, as explained in the **Competitiveness Compass**[3] and the **Clean Industrial Deal**[4].

The decarbonisation of road transport will also enhance the EU's strategic independence and energy security. Europe's still too large dependence on imported fossil fuels is one of the main causes of high and volatile energy prices, as highlighted in the Draghi Report[5] and the Clean Industrial Deal, negatively impacting the EU competitiveness. The EU has imported on average EUR 290 billion of oil products per year in the period 2022-2024, most of which were used for road transport (86% of oil consumption in 2023)[6].

The **Regulation setting CO_2 standards for passenger cars and light commercial vehicles (vans)**[7] is an essential element of the basket of EU measures aimed to achieve the decarbonisation of road transport. It drives a gradual transition towards zero-emission vehicles and provides long-term certainty and predictability for investors along the value chain, while allowing for sufficient lead time for a fair transition.

The EU automotive sector accounts for EUR 1 trillion of GDP and a third of private research and development investment in the EU. Its positive trade balance has risen to around EUR 100 billion in 2023. It was lowered to EUR 94 billion in 2024 and is continuing to show a declining trend in the first half of 2025[8]. The sector provides direct and indirect manufacturing employment to three million Europeans. The automotive sector is currently undergoing a global and structural transformation, related to the clean and digital transitions, and is confronted with serious competitiveness challenges. It faces global supply chain risks and dependencies on raw materials and battery imports, fierce competition for talent, cost gaps in key inputs, and an increasingly volatile geopolitical

[1] Regulation - 2021/1119 - EN - EUR-Lex
[2] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025PC0524
[3] EUR-Lex - 52025DC0030 - EN - EUR-Lex
[4] EUR-Lex - 52025DC0378 - EN - EUR-Lex
[5] The Draghi report on EU competitiveness
[6] When comparing monthly averages in the first quarter of 2025 with the averages from 2024, imports of petroleum oils recorded a decrease of 9.4% in value
[7] http://data.europa.eu/eli/reg/2019/631/2025-07-09
[8] ACEA-Pocket-Guide-2025-2026.pdf and Economic_and_Market_Report-First_half_2025.pdf

context. European companies risk falling behind on key strategic technologies such as batteries, software and autonomous driving, and often have less direct control over many raw material inputs, while overseas competitors are often supported by assertive industrial strategies and receive State support in various forms. Overcapacity and reduction of volumes of vehicles sold in the EU and globally hamper the economic success of the sector. In addition, high vehicle production costs (including due to energy and labour costs) are leading to further pressure on the sector's economic profitability and ability to invest. In January 2025, the Commission set up a strategic dialogue[9] with the sector to address those challenges and design concrete strategies and solutions to ensure this key industry has a solid future in Europe. The first dialogue fed into the **Industrial Action Plan for the European automotive sector**[10] that builds on the Competitiveness Compass and the Clean Industrial Deal. It sets out concrete measures to help secure global competitiveness of the European automotive industry and maintain a strong European production base through action in five key areas: 1) innovation and digitalisation, 2) clean mobility, 3) competitiveness and supply chain resilience, 4) skills and social dimension, and 5) level playing field and business environment.

To reach its objectives, the Action Plan introduces around 50 flagship actions, including the review of the CO_2 emission standards for passenger cars and vans and of the Car Labelling Directive[11].

The interaction between the CO_2 emission standards for new cars and vans and other EU legislative instruments and policies in the areas of climate, energy, transport, environment, pricing policy and vehicle demand-side policies was described extensively in the impact assessment supporting the 2021 Commission proposal for amending Regulation (EU) 2019/631[12]. The interface between the CO_2 emission standards Regulation and the Car labelling Directive is further explained in point 3 of Annex 7.

Since then, additional policies and actions to ensure the framework conditions for the transition have been established. Regulation (EU) 2023/1804 on the deployment of alternative fuels infrastructure (AFIR)[13] aims to ensure (i) minimum infrastructure to support the required uptake of alternative fuel vehicles across all transport modes and in all EU Member States, (ii) full interoperability of the infrastructure and (iii) comprehensive user information and adequate payment options at the infrastructure. Financial support for mature investment projects deploying high-power electricity recharging infrastructure is offered via the Alternative Fuels Infrastructure Facility (AFIF), which provides EU grants in combination with financing from financial institutions to achieve a higher impact. The **EU Action Plan for Grids**[14] adopted in 2023 supports the modernisation of the electricity grid for the integration of electromobility. A new Grid Package and Electrification Action Plan is under preparation. The **Affordable Energy Action Plan**[15] will help to reduce

[9] IP_25_299_EN.pdf
[10] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52025DC0095
[11] http://data.europa.eu/eli/dir/1999/94/oj
[12] EUR-Lex - 52021SC0613 - EN - EUR-Lex
[13] Regulation - 2023/1804 - EN - EUR-Lex
[14] EUR-Lex - 52023DC0757 - EN - EUR-Lex
[15] EUR-Lex - 52025DC0079 - EN - EUR-Lex

charging prices and a new legislative proposal to decarbonise corporate fleets will support boosting demand for zero-emission vehicles.

The **Critical Raw Materials (CRM) Regulation**[16] is a key instrument to support the establishment of a sustainable and competitive value chain for batteries and their raw materials. The Commission so far approved 47 strategic projects in the EU and 13 outside the EU that will contribute to ensuring the security of the supply of strategic raw materials and safeguarding the functioning of the internal market[17]. The upcoming Industrial Accelerator Act and the Circular Economy Act will also look at European content requirements on battery cells and components in electric vehicles (EVs) sold in the EU. The upcoming Battery Booster will aim to achieve near-term cost competitiveness of domestically produced cells and components. The ETS2 will improve the business case for the transition to zero-emission vehicles thanks to its carbon price signal.

In this impact assessment, the Commission has also assessed the consistency of the initiative with the European Climate Law's objectives, as required by Article 6(4) of that Regulation. The relevant Sustainable Development Goals (SDGs)[18] for this initiative are SDG 3 (Good Health and Well-being), SDG 9 (Industry, Innovation and Infrastructure), SDG 12 (Responsible Consumption and Production) and SDG 13 (Climate Action). The outcome of the assessment on these SDGs is reported in Annex 3.

1.2. Legal context

Based on Article 192 of the Treaty on the Functioning of the European Union (TFEU) (Title XX on Environment), the EU has adopted legislation setting mandatory CO_2 emission targets for new passenger cars and vans. The currently applicable EU fleet-wide CO_2 targets are set out in Table 1.

Table 1: EU fleet-wide CO_2 targets (% reduction from 2021 baseline) [19]

	2025-2029	2030-2034	2035-
Cars	15% (93,6 g CO_2/km)	55% (49,5 g CO_2/km)	100% (0 g CO_2/km)
Vans	15% (153,9 g CO_2/km)	50% (90,6 g CO_2/km)	100% (0 g CO_2/km)

Each year, a specific emission target is set for each manufacturer on the basis of the applicable EU fleet-wide target and taking into account the average mass of the manufacturer's fleet of new vehicles registered in that year. If the average specific emissions of a manufacturer exceed its specific emission target in a given year, an excess emission premium is imposed. For assessing compliance with the targets, the CO_2 emissions determined according to the Worldwide Harmonised Light Vehicles Test Procedure (WLTP)[20] are considered.

[16] http://data.europa.eu/eli/reg/2024/1252/oj
[17] Selected strategic projects under CRMA
[18] The UN adopted the 2030 Agenda for Sustainable Development (the '2030 Agenda') in 2015, at the heart of which are 17 Sustainable Development Goals (SDGs) and 169 associated targets.
[19] http://data.europa.eu/eli/reg/2019/631/2025-07-09
[20] https://eur-lex.europa.eu/eli/reg/2017/1151/oj/eng

The Car Labelling Directive, adopted in 1999, aims to ensure that information relating to the fuel economy and CO_2 emissions of new passenger cars offered for sale or lease in the EU is made available to consumers in order to enable them to make informed decisions and encourage sustainable choices.

An overview of the main provisions of the legislation is provided in Annex 7.

2. PROBLEM DEFINITION

2.1. What are the problems?

The Regulation setting CO_2 emission standards for new cars and vans drives a gradual transition to zero-emission vehicles over the next decade and provides market certainty for the necessary investments on new value chains with job creation potential, while global markets are evolving, albeit at difference paces, towards zero-emission vehicles.

There is general agreement among stakeholders on the need to stay the course on the EU's decarbonisation efforts and that electrification will be central to the transition and the future of the EU's automotive competitiveness. EU companies have already launched many new electric vehicle models and committed to invest more than EUR 250 billion towards the clean transition by 2030[21]. However, industrial stakeholders have argued that the current EU regulatory framework is too rigid. Such rigidity risks creating problems for vehicle manufacturers, and in turn for consumers and citizens, in the transition. It is therefore appropriate to mitigate these risks.

2.1.1. Problem 1: Vehicle manufacturers risk facing difficulties in meeting progressively stricter CO_2 emission targets in a cost-efficient manner

Compliance with the tightening CO_2 targets requires a growing market uptake of zero-emission vehicles. However, in the short and medium term, the adoption of new powertrain technologies risks being subject to significant year-to-year fluctuations and may fall short of the required trajectory in certain market segments. The current regulatory system imposes a rigid compliance cycle with limited flexibility to cope with such fluctuations. This inflexibility reduces manufacturers' compliance options and risks creating a misalignment between regulatory requirements and actual market behaviour.

The transition towards zero-emission mobility is currently underway and it has financial implications, related also to the cost of restructuring, while manufacturers need to remain profitable to stay competitive. Facing the risk of potential fines for missing future CO_2 targets may worsen their economic outlook, putting at risk investments needed for the transition and creating negative spillover effects for component suppliers who depend on stable production volumes. The responses of the industries concerned to the Public Consultation highlight the perception by stakeholders of such risk. Such perception by itself may contribute to aggravating the problem.

[21] Joint-ACEA-CLEPA-letter-to-President-von-der-Leyen.pdf

This does not mean that manufacturers will necessarily miss their future targets as market deployment of new technologies usually follows an S-shaped curve and the ramp up of zero-emission vehicles is expected to be significant in the years to come. However, this illustrates the challenges ahead and points at a risk of manufacturers missing their targets, which would lead to fines. Such scenario would be particularly detrimental to EU automotive industry and has to be mitigated already now as investment decisions for the next decade are currently being made.

2.1.2. Problem 2: The CO_2 standards risk creating a barrier for the continuous innovation and advancement of technologies other than zero-emission powertrains

The replies to the public consultation highlighted that the current CO_2 emission standards create a barrier for and risk limiting the continued innovation and development of technologies other than zero-emission powertrains, that can be useful for specific use cases or for a transitional phase. The regulatory approach so far focuses on a technological pathway where zero-emission vehicles are the primary option for compliance. It requires only zero-emission vehicles to be put on the market as of 2035, which is already steering most investments and innovations towards those powertrains. While to be globally competitive the European automotive industry must urgently regain a leadership position in such technologies, including battery innovation, in particular next generation battery technologies, the regulatory approach poses risks: (i) possibly preventing, according to the fuel industry, investments in value chains like renewable fuels which can hamper the availability of such technological solutions for the decarbonisation of the existing fleet and other sectors, (ii) possibly limiting the ability for manufacturers to respond flexibly to changing circumstances.

2.1.3. *Problem 3: Manufacturers of light commercial vehicles face particular challenges to deploy ZEV in the market*

On the vans market, despite an offer of BEV across all segments (from smaller to larger vans), BEV uptake is still very limited as they account for less than 9% of all new registrations so far in 2025.

For several models, even when offering lower leasing prices for BEV than for conventional powertrains, manufacturers still observe that customers do not adopt those electric vehicles in large numbers. Many customers are not able to charge at home or at work, thus relying heavily on fast public charging. For instance, Stellantis (the largest EU van manufacturer, responsible for about 30% of all new van registrations) indicates that for its vehicles in France 54% of all recharging energy comes from fast charging, while it is at 42% in Germany and Spain.

As public fast charging prices are much higher (reaching 2-3 times in many countries) than residential charging prices, the total cost of ownership of vans is heavily negatively impacted. Vans are bought in a professional context where Total Cost of Ownership (TCO) is driving the decision by the vehicle buyers, which is why for these specific uses today's preference goes towards traditional powertrains and BEV are not able to reach their full potential to provide for better TCO. While the situation can be expected to evolve in the future with the deployment of more recharging infrastructure and actions on fair electricity prices, the risk remains that van manufacturers may be facing significant issues to reach

compliance. The magnitude of the phenomenon is shown through the 2025 distance-to-target (i.e. actual performance vs CO_2 target). ICCT reports that, while for all major car manufacturers the target gap is below 7% (except Volkswagen at 13%) in Q1-Q3 2025, for all major van manufacturers the target gap is above 18%.

Should manufacturers of vans not being able to sell by 2030 enough ZEV, this could result in significant fines, which could have adverse impacts on manufacturers' ability to continue to invest, in particular in the transition towards zero-emission vehicles.

2.1.4. Problem 4: The insufficient harmonisation of adequate consumer information poses a problem by potentially restricting the demand for zero-emission vehicles

EU consumers do not currently receive appropriate information when purchasing vehicles. Labels prescribed by the 1999 Car Labelling Directive's rules only cover new cars, leaving consumers with no information when buying new vans or second-hand vehicles; these labels do not provide adequate information on zero-emission vehicles. In addition, information does not have to be provided in digital format and comes in forms that are not harmonised at the EU level. These limitations restrict the possibility for consumers to make informed purchase decisions to buy zero-emission vehicles, thus leading to a loss of benefits for consumers and limiting demand for zero-emission vehicles. This in turn risks slowing down the shift to zero-emission mobility and losing opportunities to support manufacturers in meeting their CO_2 targets.

2.2. What are the problem drivers?

2.2.1. Driver 1: The regulatory system is too rigid

The CO_2 standards require manufacturers of cars and vans to ensure that the average CO_2 emissions of all of their new vehicles placed on the EU market in a given calendar year do not exceed the target levels set out in the legislation. Those targets get stricter in five-year periods, with stricter targets starting to apply since 2025 and then again from 2030 and 2035 (see Section 1.2).

To meet their CO_2 targets, vehicle manufacturers are primarily relying on the uptake of zero-emissions vehicles (i.e. battery electric vehicles (BEV), as the uptake of alternative zero-emission vehicles (such as vehicles running on hydrogen) is negligible). The other existing levers for reducing CO_2 emissions (e.g. improvement in combustion engine efficiency, hybridisation of powertrains, etc.) only have a limited impact and are by themselves not sufficient to reach current and future targets. The reliance on BEV uptake for compliance will only increase as the targets get stricter, starting from 2025 onwards.

In parallel, the global economic and regulatory situation has changed, in particular in the US where the Trump administration rolled back on its 2030 electric vehicle targets as well as the CAFE targets, and this is impacting the uptake of BEV at the global level. In China, the world's biggest market, EU manufacturers are rapidly losing market shares, as well as facing overcapacity which is impacting their profitability and risks affecting their ability to keep investing in the transition. High competitive pressure from US and China exists.

On top of that, manufacturers face high production costs in Europe due to higher labour and energy costs – the International Energy Agency reports that producing a small SUV in China is over 30% cheaper than in other advanced economies such as Germany or the US, for both conventional and battery electric powertrains[22].

This has led most key European manufacturers to issue profit warnings in 2025[23], and several manufacturers (Volvo Cars, Ford and Stellantis) that had pledged to only sell BEV in the EU as from 2030 recently have made announcements to delay or abandon this pledge.

Finally, as of 2029, the only flexibility for larger manufacturers to comply is the pooling option, which allows manufacturers to balance their excess emissions with the target overachievement of other manufacturers.

2.2.2. Driver 2: The market uptake of zero-emission vehicles is affected by fluctuating market dynamics

The compliance cycle under the CO_2 standards assumes some level of market stability, since manufacturers are required to comply every year with their targets. However, fluctuations are typical of the adoption phase of new technologies, such as zero-emission vehicles, before they become mainstream. These fluctuations can be driven by market dynamics, such as changes in consumer preferences, support measures including tax incentives, competitive pressure, changes in production structure and supply chains, and other factors.

The risk of fluctuations, which are more difficult to anticipate, has increased in the current volatile geopolitical context, which affects energy prices, the supply chain and international trade. As highlighted in the Industrial Action Plan for the European automotive sector[24], demand in 2024 for battery electric cars has been weaker than anticipated, dropping to 13.6% market share (from 14.6% in 2023). Although the situation is improving in 2025 with a BEV market share of 16,4% in the first ten months of the year, this is still below what would be needed to reach the 2025 CO_2 emission targets – ICCT reports[25] that over this period most manufacturers are still not compliant with the standards (on average, manufacturers exceed their CO_2 targets by 7%), and ACEA argues[26] that a BEV market share of 25% would be needed to meet the cars 2025 target. This 25% is based on a target achievement through mainly electrical vehicles and not efficiency gains.

For vans, the situation is even more challenging as the BEV market share was at 8,7% in the first 10 months of 2025 while ACEA argues[27] that a market share of 15-20% would be needed to reach the CO_2 targets.

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[22] What Next for the Global Car Industry?

[23] Volkswagen AG adjusts 2025 forecast in light of the effects of changes in product planning and the medium-term ambition of Dr. Ing. h.c. F. Porsche AG | Volkswagen Group, BMW Group adjusts outlook for 2025

[24] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52025DC0095

25 ID-523-–-EU-MM-Oct25-Market-Spotlight-A4-70167v2.pdf

26 ACEA-policy-paper-EU-regulatory-framework-for-the-decarbonisation-of-road-transport.pdf

27 ACEA-position-paper_Accelerating-the-transition-of-LCVs-in-Europe.pdf

It is particularly relevant in Member States where the transition is less advanced and the market less mature, or where conducive national frameworks such as appropriate fiscal incentives are lacking or not stable over time. Such market dynamics may make it more difficult for vehicle manufacturers to plan ahead and ensure their portfolio is compliant with their annual target.

Currently, there are still market barriers and failures affecting the deployment of EV that also determine the issues vis-à-vis demand. While regulatory action is expected to address those barriers and failures (see Fit for 55 proposals Impact assessments[28]), there is still a risk of manufacturer non-compliance that should be minimised, without hampering the transition.

An important barrier remains the higher upfront purchase price of EVs relative to that of internal combustion engine vehicles. The cost differential is linked to pricing and marketing choices (preference for larger segment for profit maximisation) but also to not fully realised economies of scale in battery manufacturing and supply-chain constraints. Although total cost of ownership of a BEV is often lower than that of a conventional vehicle (thanks to operating cost savings), consumers frequently assign a higher value to the short-term expenses. Information asymmetries constitute another significant barrier. Many consumers lack accurate or accessible information regarding for example battery longevity. Such asymmetries can contribute to risk aversion towards EV. The CO_2 standards are designed to address such market failures and barriers and therefore their market signal should be maintained, but the current situation creates a risk of future non-compliance for industry.

2.2.3. Driver 3: The automotive sector is facing challenges jeopardising continued investments in zero-emission innovation and technologies

Substantial continued investments need to be directed towards the new value chains, while a range of external and structural pressures start hampering the ability of European industry to continue to invest. This includes: (i) issues on global markets, including trade tensions with increased tariffs in the US and an intensifying competition from overseas players in the European and global markets, risking to negatively impact the overall trade balance, which was still positive in 2024[29]; (ii) sales in the European market that are about 20% lower than in 2019; (iii) high energy costs in the EU that are negatively impacting production costs; (iv) geopolitical risks such as export restrictions of some materials that require the adaptation of supply chains and can significantly disrupt production planning.

The fluctuating consumer demand for EVs, which is lower than what some manufacturers had been expecting, and creating a risk of significant fines stemming from potential non-compliance with the CO_2 standards, or, alternatively, a need to push vehicles into the market at low or even negative profit margins in order to achieve compliance, further exacerbates these challenges.

As a consequence, some European manufacturers have issued profit warnings for 2025[30]. The situation is concerning also for automotive suppliers, whose profitability has dropped

[28] EUR-Lex - 52021SC0613 - EN - EUR-Lex
[29] https://www.acea.auto/publication/the-automobile-industry-pocket-guide-2025-2026/
[30] BMW Group adjusts outlook for 2025, Porsche Newsroom, Volkswagen AG adjusts 2025 forecast

to 5% in 2023[31], and some of them have announced social plans to save costs[32], with a risk of loss of employment in the sector.

While the response to such challenges cannot come from the CO_2 standards alone but rather from the broader implementation of the Automotive Action plan, the rigid approach to compliance in the CO_2 standards does not fully reflect the current market dynamics and industry challenges.

2.2.4. Driver 4: Technology neutrality at tailpipe does not provide enough flexibility to facilitate the transition

The current legal framework is already open to different technologies beyond 2035, since BEV, FCEV and H_2 ICEV allow compliance of manufacturers. However, some stakeholders highlight that the system can create a barrier to the viability and further development of other technologies, such as advanced PHEV and REEV, which can play a role in the transition as bridge technologies and for which there may continue to be demand in the longer term in other global markets or for some specific use cases domestically. Restrictions on the development on the home market of such technologies, on which EU industry has been investing or plans to invest to improve them, risk hampering the ability to export them to those parts of the world where demand continues to exist. Investments in improvements of hybrid technologies may be important for global markets where the transition towards zero-emission powertrain may be slower than in the EU. In addition, it may also be necessary to ensure that such technologies, which will continue to exist at least for a transitional period also in the EU market, meet customers' expectations, such as low energy consumption, and needs of different use cases, such as specific long-distance travels. Some stakeholders, in particular the fuels industry, also highlight that the current legal framework does not sufficiently incentivise the development of sustainable renewable fuels, which may be useful for specific use cases or during a transitional phase or for the existing fleet, and which may provide a beneficial spill-over effect for the decarbonisation of other transport sectors.

Outside Europe, no other countries have committed to have only new zero-emission vehicles put on their markets from a certain point in time. Canada and California have set ambitious targets for zero-emission vehicles, but they will still allow plug-in hybrid and range-extended electric vehicles (meeting certain criteria) in their market with no limit in time. All EU vehicle manufacturers are global companies that export vehicles to multiple locations, leading to a trade surplus of EUR 94 billion (2024)[33]. If there is no market in the EU for technologies such as vehicles equipped with an internal combustion engine, this will hamper the development of those products for EU industry which in turn can damage its competitiveness on the markets where such technologies will continue to be sold after 2035. It will also reduce the potential for export, which will impact production and jobs in the EU.

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[31] CLEPA's reply to the public consultation
[32] Factory closures overshadow EU's mobility transition | CLEPA
33 ACEA-Pocket-Guide-2025-2026.pdf

While shifting from traditional to electric vehicle manufacturing does not per se result in net job losses (see point 6.3.1.4), losing today's export power would be detrimental for employment in the EU automotive value chain. BCG reports[34] that BEVs will dominate and drive profits but in the short term the shift towards BEV may negatively affect profitability Allowing manufacturers to diversify their portfolio could help them to better optimise their short term profits, depending on their individual strategies.

Concerning renewable fuels, leaving a role, albeit limited, in road vehicles to RFNBO and advanced biofuels can stimulate and enable investment across the entire value chain. Therefore, allowing renewable fuels to continue playing a role in road transport, by recognising this role in the new vehicles' CO_2 emission standards, can be important for overcoming the high upfront costs of bio-refineries and related value chain as well as e-fuels production, and ensuring a longer-term return on investment. Moreover, this could help fuel producers to better optimise their production process avoiding a sub-optimal use of co-products (fuels that could be used in road), which can negatively impact the financial viability and business case for transforming existing refineries, ultimately supporting a more sustainable and economically viable transition.

2.2.5. Driver 5: In the vans segment, consumers demand is not significantly shifting to zero-emission vehicles and limited other technologies have been developed to cut emissions from vans

Contrary to cars, vans are mostly bought and used for professional uses. Some stakeholders (vehicle manufacturers) have highlighted that some vans buyers (especially micro-enterprises) may only have access to public recharging infrastructure, which becomes a barrier due to costs and especially in areas without widespread availability of such infrastructure. This leads to low demand of ZEV for these use-cases. In addition, very limited alternative technologies have been developed for the vans segment – only a very few hybrid electric (NOVC-HEV) vans exist (2,6% market share) while only a couple of manufacturers have put OVC-HEV on the market (1,2% market share). In this context, manufacturers are expected to have difficulties to reach their 2030 targets.

2.2.6. Driver 6: Limitations of the current EU legal framework to provide consumers with adequate climate related vehicle information

The evaluation of the Car Labelling Directive found that while it had at least to a certain extent achieved its initial objectives of informing consumers of the CO_2 emissions of new cars, several factors limit its potential impact on consumer choices and encouraging more sustainable decisions. Its relevance will be further limited as the uptake of zero-emission vehicles increases, for which the information required to be provided so far is inadequate. Also, potential vehicle buyers are increasingly relying on digital platforms for gathering information prior to purchase, and those are not covered by the current Directive.

[34] Profit in the Future Automotive and Mobility Industry | BCG

2.3. How likely is the problem to persist?

As regards the **first problem**, it is likely that the market dynamics in the short and medium term will continue to show fluctuations due to the different factors explained above.

In particular, the geopolitical context is likely to remain volatile over the coming years, with persistent uncertainties for vehicle manufacturers and their suppliers. In addition, digitalisation and technological changes will continue, at even a higher speed than before, creating opportunities for new competitors to challenge the incumbents.

As regards the **second problem**, this is also likely to persist. The likelihood of this will also depend on technological developments and the evolution of other markets and their policies. Fuel industry stakeholders claim that it is not possible to mobilise the necessary investments in the development of the sustainable renewable fuel value chain and in the reconversion of refineries and production facilities in the EU if the light-duty vehicles market does not remain open for such fuels. They argue that the current CO_2 standards may limit a beneficial spill-over effect for the decarbonisation of hard to abate sectors, such as aviation and maritime. However, since in such sectors sustainable renewable fuels are necessary and the demand will increase substantially to reach climate neutrality, other stakeholders highlight that it is essential to avoid that the policy framework would hamper or disincentivise the use of such fuels in those sectors due to excessive competition with other uses, such as in road transport.

As regards the **third problem**, this is also likely to persist. Alternatives to zero-emission vehicles may not come to the market in time to support an agile adaptation of their product portfolio. Demand for zero-emission vehicles may still increase significantly by 2030, but it risks not being in line with what would be needed to reach the CO_2 targets.

As regards the **fourth problem**, as was shown by the recent evaluation of, several factors have limited the potential impact of the Car Labelling Directive that Directive in enabling a more informed consumer choice towards vehicles with lower CO_2 emissions. As a result, the Directive's effectiveness can be expected to further decrease over the coming years, with an increasing market uptake of electric vehicles, unless changes are made to address its shortcomings.

3. WHY SHOULD THE EU ACT?

3.1. Legal basis

Title XX (Environment) of the Treaty on the Functioning of the European Union (TFEU), in particular Article 191 and Article 192, empowers the EU to act to ensure a high level of protection of the environment. Based on Article 192 of the TFEU, the EU has already adopted policies to address CO_2 emissions from cars and vans through Regulation (EU) 2019/631, currently effective since 1 January 2020 and to provide consumers with information relating to the fuel economy and CO_2 emissions of new passenger cars offered for sale or lease through Directive 1999/94/EC.

3.2. Subsidiarity: Necessity of EU action

Climate change is a transboundary problem, where coordinated EU action can supplement and reinforce national, regional and local action effectively. EU action is justified on the grounds of subsidiarity, in line with Article 191 of the Lisbon Treaty.

3.3. Subsidiarity: Added value of EU action

As the CO_2 emission standards for vehicles and the car labelling requirements are set at EU level, the objectives of this initiative, can only be achieved at Union level.

4. OBJECTIVES: WHAT IS TO BE ACHIEVED?

4.1. General objectives

As set out in the Communication on the Union's climate target for 2040, stability and full implementation of the legislative framework in place for meeting the 2030 climate and energy targets is a precondition for the EU to stay on course to reach climate neutrality in 2050. Within that context, the general objective of this initiative is **to provide a more flexible and technology-neutral approach, taking into account technological and market developments, while staying the course on climate neutrality and maintaining predictability for manufacturers and investors in the fair transition towards zero-emission mobility.**

4.2. Specific objectives

The general objectives translate into the following specific objectives.

1. Provide more flexibility for manufacturers to meet their CO_2 emission targets

Compliance options should be further expanded in order to allow manufacturers to meet their targets in a more flexible way, which enables them to cope with unexpected fluctuations in vehicle demand, instabilities in the supply chain, or other external factors.

With reference to the problems highlighted, the initiative aims at ensuring a wider range of technological solutions become available for manufacturers to meet the CO standards, thereby also providing more flexibility to deal with possible issues related to consumer demand, deployment of recharging infrastructure and possible value chain disruptions.

2. Enhance technology neutrality of the CO_2 emission standards

The objective is to consider that a broader portfolio of technologies for manufacturers' compliance with the targets beyond 2035. .

3. Maintain the contribution of the CO_2 standards towards the climate targets set in the EU Climate Law

All policies, including the vehicle CO_2 emission standards, should be consistent with the climate targets set out in the EU Climate Law.

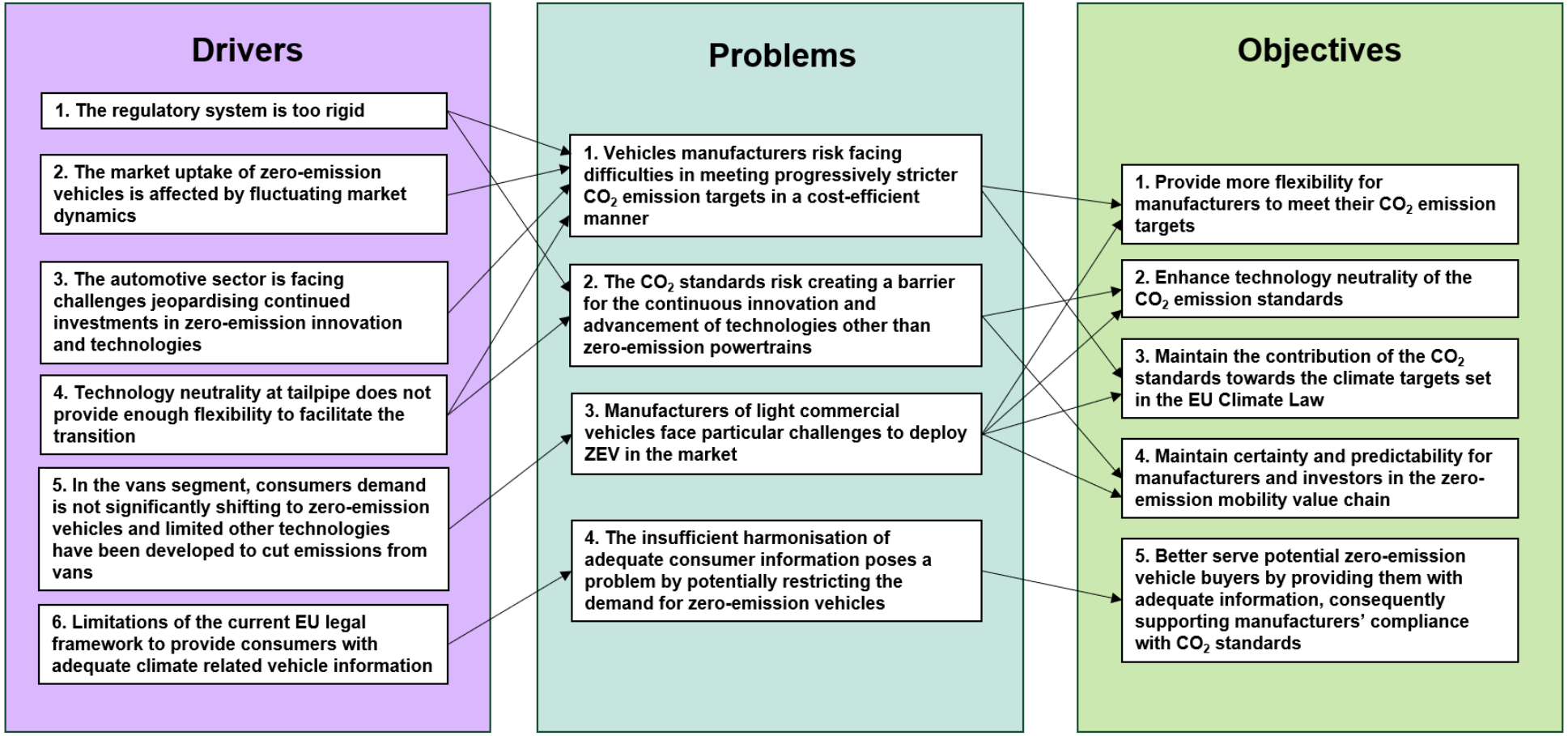
4. Maintain certainty and predictability for manufacturers and investors in the zero-emission mobility value chain

It is key to ensure investments in the further development of zero-emission technologies and in the related value chain, including in particular batteries and infrastructure, to support the competitiveness of EU industry in line with the Industrial Action Plan for the European automotive sector.

5. Better serve potential zero-emission vehicle buyers by providing them with adequate information, consequently supporting manufacturers' compliance with CO_2 standards

Consumers should be provided with information enabling them to play an active role in the transition to decarbonisation. Potential vehicle buyers should be better supported in making sustainable purchase decision by providing them with relevant information on vehicle emission performance in a more harmonised way and using up-to-date tools. At the same time, this can support manufacturers in meeting their CO_2 targets thanks to re-orientation of consumer preferences towards zero-emission vehicles.

General objective: to provide a more flexible and technology-neutral approach, taking into account technological developments and market developments, while staying the course on climate neutrality and maintaining predictability for manufacturers and investors in the transition towards zero-emission mobility



5. WHAT ARE THE AVAILABLE POLICY OPTIONS?

This Section describes the options identified to address the problems listed in Section 2.1 and to achieve the objectives defined in Section 4. It sets out the rationale for their selection and design, taking into account the public consultation, additional stakeholder input as well as internal and external study reports.

The options explored are grouped into the following categories: (i) CO_2 emission targets for cars and vans; (ii) Role of sustainable renewable fuels; (iii) Role of plug-in hybrids and range extender electric vehicles; (iv) Other flexibilities for meeting the CO_2 targets; (v) Financial support via use of fines; (vi) Vehicle labelling.

5.1. What is the baseline from which options are assessed?

In line with the Better Regulation toolbox, the baseline includes all relevant policies and measures, which are assumed to continue to be in force, as well as relevant Commission proposals under discussion by the co-legislators. The baseline has been designed to include the initiatives of the 'Fit for 55' package[35], including the provisions of Regulation (EU) 2019/631, in particular the EU fleet-wide CO_2 emission targets set out therein. It also includes the proposed amendment of the European Climate Law to include a 2040 climate target for the EU[36], of reducing the EU's net greenhouse gas emissions by 90% by 2040 relative to 1990, with a limited contribution towards the 2040 target of high-quality international credits of 3% of 1990 EU net emissions. It also reflects the revised CO_2 emission performance standards for heavy-duty vehicles[37], the new Euro 7 standards[38], the revised TEN-T Regulation[39], as well as the initiatives part of the Greening Freight package[40] and Roadworthiness package[41]. It also considers the current fragmented support framework at national level for corporate ZEV.

In line with the Better Regulation toolbox, the baseline assumes that all legislation in place and proposed by the Commission is fully implemented, including the ETS2 which caps the emissions from road transport and buildings, and the Renewable Energy Directive, setting targets for renewable energy in transport as well as mandates for RFNBO and advanced biofuels. Council General Approach and confirmed by the EP plenary vote on the Climate Law postpones ETS2 from 2027 to 2028 (now in trialogues). Even with a 1-year delay for ETS2, Member States remain legally obliged to meet their binding 2030 targets under the Effort Sharing Regulation, ensuring that the EU stays on course to climate neutrality.

Therefore, under the baseline, vehicle manufacturers are assumed to comply with the CO_2 emission performance standards for new vehicles throughout the time period considered, including consideration for the latest adopted amendment providing for multiannual compliance flexibilities for the period 2025-2027.

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[35] Delivering the European Green Deal - European Commission

[36] COM(2025) 524 final

[37] Regulation (EU) 2024/1610

[38] Regulation - 2024/1257 - EN - EUR-Lex

[39] Regulation - EU - 2024/1679 - EN - EUR-Lex

[40] Green Deal: Greening freight for more economic gain with less environmental impact (europa.eu).

[41] Updated rules for safer roads, less air pollution and digital vehicle documents

As explained in the Annex to the Impact Assessment, the models have been calibrated for the baseline to the latest available data, up to Autumn 2025 for what concerns the new vehicle fleet composition.

A more detailed description of the baseline scenario is provided in Section 6.1.1.

5.2. Description of the policy options

5.2.1. CO_2 emission targets

The options for the EU fleet-wide CO_2 emission target levels for new cars and for vans set out in this Section are defining the target trajectory over the period 2030-2040 in five-year steps. The target levels under the three options considered next to the baseline (Option TL_0, no change compared to the current legislation) are the following:

Under option **TL_90**, car and van manufacturers no longer need to meet a 100% reduction target. Instead, a 90% reduction target would apply from 2035. Under option **TL_100_2040**, a 90% reduction target applies for 2035 and the 100% reduction target kicks in from 2040 onwards, for both cars and vans. Both options would provide manufacturers with the possibility to comply with the targets with a wider range of technological options. Under option **TL_vans**, vans manufacturers benefit from a lower reduction target in 2030 (as in option TL_90), while the 100% reduction target remains in place from 2035 onwards for both cars and vans.

Stakeholders expressed a wide range of opinions. Policy stability was identified as essential by some Member States, local authorities, environmental NGOs, academics and the electricity sector. By contrast, most other industry respondents, alongside feedback from a mobilised citizens' campaign, considered the 2035 target unattainable due to slower uptake of zero-emission vehicles than anticipated (see Annex 2 for details).

5.2.2. Role of sustainable renewable fuels

Fuels policy is an important aspect of road transport decarbonisation. So far, the EU legal instruments are regulating GHG emissions of vehicles and transport fuels separately.

Responses to the public consultation indicated a diversity of views amongst stakeholders. Automotive industry associations and fuel producers advocated for accounting fuels when assessing compliance with the CO_2 standards or creating a new category of vehicles operating solely on sustainable renewable fuels. NGOs and public authorities expressed the opposite view (see Annex 2 for details).

The following fuels are considered as eligible for the flexibility mechanism:

- Fuels whose market uptake is incentivised by the Renewable Energy Directive (RED)[42]: renewable fuels of non-biological origin (RFNBOs), as defined in and fulfilling at least the GHG saving criteria set out in the RED, and advanced biofuels,

[42] EUR-Lex - 02018L2001-20240716 - EN - EUR-Lex

as defined in and fulfilling the sustainability and at least the GHG saving criteria set out in the RED[43] (hereinafter: Sustainable Renewable Fuels "SRF")

- Only sustainable e-fuels: RFNBOs, as defined in and fulfilling at least the GHG saving criteria set out in the RED.

The options concerning the flexibility mechanism to establish a role for eligible fuels are the following[44]:

- **Carbon credit mechanism (CCM)**: from 2035 onwards, eligible fuels put on the EU market generate credits (expressed in g CO_2/km). Those credits are added to the fleet-wide CO_2 emission targets for cars and vans, so that vehicle manufacturers' target compliance takes into account the contribution of the eligible fuels.
- **Vehicles exclusively running on the eligible fuels (VEEF)**: from 2035 onwards, a manufacturer's new cars and vans running exclusively on the eligible fuels would be accounted as emitting 0 g CO_2/km for the purpose of assessing that manufacturer's compliance with its CO_2 targets. The prerequisite for this option is a change in the type-approval to ensure that "vehicles running exclusively on eligible fuels" can be registered in the EU.

To avoid that both options create a disincentive for manufacturers to invest in zero-emission powertrains, the contribution of this flexibility mechanism to the vehicle CO_2 target compliance should be capped.

5.2.3. Role of Plug-in hybrid and Range extender electric vehicles (PHEV and REEV, together OVC-HEV)

PHEV and REEV contain both an electric powertrain and an internal combustion engine and they can be externally charged. Therefore, they are both considered as Off-Vehicle Charging Hybrid Electric Vehicles (OVC-HEV) in the context of the type-approval legislative framework. OVC-HEV represented a passenger car market share of 7,1% in 2024[45], with a very strong predominance of PHEV. Additional technical information on OVC-HEV can be found in Annex 8.

During the public consultation, a majority of respondents representing industry, both SMEs and large groups, along with about half of the EU citizens that responded, indicated that the role of OVC-HEV should be recognised in the longer term (i.e. after 2035). They suggest that the real-world emissions can be lowered and that those vehicles would provide for a valuable technological solution in case full electrification is not obtained. NGOs have been strongly advocating against OVC-HEV, notably recalling that their real-world CO_2 emissions are multiple times higher than the official values recorded during type-

[43] The Renewable Energy Directive establishes that energy from RFNBOs shall be counted towards the Member States targets only if the GHG emissions savings from the use of those fuels are at least 70 %. For biofuels, biogas consumed in the transport sector, and bioliquids produced in installations starting operation from 1 January 2021, the threshold is at least 65%.

[44] Additional details are provided in Annex 8

[45] For vans only around 1%

approval[46]. A majority of public authorities replied that the role for OVC-HEVs should be limited due to their limited environmental benefits.

In view of this, the two options below will be considered, under which certain eligible OVC-HEV would not lead to target exceedance post-2035. To avoid a disincentive for manufacturers to invest in zero-emission powertrains, the number of OVC-HEV that could be accounted for in this way should be capped. In order for an OVC-HEV to be eligible, both options apply conditions with the aim of incentivising only those OVC-HEV with the potential of being effectively used to the highest extent possible as a ZEV. Eligible OVC-HEV would need to qualify as a "low-emission vehicle", i.e. have tailpipe emissions up to 50 g CO_2/km (WLTP). Moreover, the two options identify the following additional vehicle characteristics for the vehicles to be eligible for the flexibility mechanism:

- **OVC-HEV_1:** eligible vehicles must have an electric range exceeding a certain value;
- **OVC-HEV_2:** eligible vehicles must have an have an electric range exceeding a certain value, as well as additional characteristics to maximise their use in electric mode (technical details are provided in Annex 8).

A variant is also considered in which manufacturers who take advantage of the zero accounting of PHEV emissions in the calculation of their average emissions need to use low-carbon steel, in order to compensate for the CO_2 emissions from these PHEV. Based on a methodology to calculate the carbon intensity of the steel and the related label, which should be defined in the proposal for an Industrial Accelerator Act (IAA) under preparation, equivalent credits under the CO_2 standards are calculated, taking into account the quantity and the carbon intensity of the steel used by manufacturers, as well as the average lifetime milage of the vehicles.

5.2.4. Other flexibilities

In order to increase the possibilities for manufacturers to design a strategy for meeting their targets in the most cost-efficient way, the following options will be considered.

5.2.4.1.Multiannual compliance assessment

This option would mean that manufacturers are not obliged to meet their targets each year, but rather over a period of multiple consecutive years. Both the average CO_2 emissions and the specific emission targets of a manufacturer would be averaged over that period and compliance would be assessed at the end of the period. This would allow manufacturers to exceed their target in certain years, as long as the exceedance is compensated during the other years of the defined compliance period.

5.2.4.2.Super-credits for small and affordable ZEV

This option would aim to incentivise the sales of smaller, and more affordable zero-emission cars. Small ZEVs would be counted with multipliers when calculating the

[46] COM(2024) 122 final and b644dafe-1385-4b56-98d9-21e7e9f3601b_en

average CO_2 emissions of a manufacturer. As in the past under Regulation (EU) 2019/631 and its predecessors, a cap for such "super-credits" would apply.

5.2.5. Most relevant combinations of options

To facilitate a structured and meaningful comprehensive quantitative analysis, two combinations of options have been designed, taking into account insights gained from the initial assessment of the specific individual options. These combinations were chosen to cover the combined and cumulative effects of the range of options considered.

Care was taken to ensure that the stakeholder input was well-reflected in the choice, and that the most significant alternatives were retained for the analysis.

The two combinations of options considered, each representing a different degree of flexibility added to the baseline, are the following:

	COMBI_1	**COMBI_2**
Targets	2030 vans: 40% reduction (instead of 50%)	2030 vans: 40% reduction (instead of 50%) cars and vans: 90% reduction from 2035 (instead of 100%)
OVC-HEV	From 2035: OVC-HEV with range > 150 km and meeting additional parameters are counted as emitting 0 g/km, up to 10% of new vehicles in a manufacturer's fleet	Same as COMBI_1, but with a 20% cap
Fuels	From 2035: vehicles running exclusively on SRF are counted as emitting 0 g/km, up to 10% of new vehicles in a manufacturer's fleet	Same as COMBI_1, but with a 20% cap
Small ZEV cars	Super-credits with multiplier 1.25, up to 5% of the 2021 reference target	Super-credits with multiplier 1.5, up to 10% of the 2021 reference target

5.2.6. Financial support via use of fines

Excess emission premiums are imposed on manufacturers in accordance with Article 8 of Regulation (EU) 2019/631, if their average specific emissions exceed their specific emission targets in a given calendar year. The amounts of the premiums shall be considered as revenue for the EU general budget.

In their response to the public consultation, industry stakeholders sought greater flexibility in the use of fines, proposing that they serve as a support mechanism rather than a punitive measure. While also supporting reinvestment, citizens and NGOs generally advocated for using the revenues to support workers, development of charging infrastructure, and demand-side measures such as consumer incentives.

The following options aiming to allocate the amounts of the excess emissions premium to a specific fund that may support the automotive sector will therefore be considered, next to the baseline option (change nothing):

- **REV_IF**: Assign revenues to the Innovation Fund to be used to top-up the instrument that includes the whole supply chain of automotive-related projects such as batteries or recharging infrastructure, or other emission reduction technologies.

- **REV_SCF**: Assign revenues to the Social Climate Fund to be used for projects that support socially inclusive actions to help citizens and businesses access cleaner mobility options during the transition.

5.2.7. Vehicle labelling

A clear majority of stakeholders supports the harmonisation and simplification of vehicle labelling as well as adding specific information for zero-emission vehicles to the label. There is little support for adding other information to the label. Most stakeholders consider it important to extend the label to cover new vans. The consumer organisations called for extending the scope to second-hand cars, but there was little further support to cover all second-hand cars.

The following options will therefore be considered:

- **LAB_1:** This option would introduce the following changes compared to the Car Labelling Directive:

- Establishing a fully harmonised, single label design based on the EU energy label[47];
- Adding information elements on the label: electric energy consumption and electric range (for BEV and OVC-HEV);
- Extending the scope to new vans and to second-hand cars and vans offered for sale or lease[48] and first registered in the EU after the entry into force of the legislation;
- Removing the requirement to have a paper guide and paper poster;
- Adding a QR code on the label giving access to additional information stored in an online database;
- Requiring all types of advertisement (online, TV, printed media) to include essential information from the label.

- **LAB_2:** This option would include all the elements of option LAB_1, with a further extension of the scope to all second-hand cars and vans[49], including those first registered before the legislation enters into force.

[47] Understanding the Energy Label - Energy Efficient Products
[48] By professional retailers
[49] Offered for sale or lease by professional retailers

5.3. Options discarded at an early stage

5.3.1. Energy efficiency thresholds for new ZEV

According to Article 15 of the Regulation, the Commission shall assess the impacts of establishing minimum **energy efficiency thresholds** for new zero-emission vehicles placed on the Union market. An assessment of the information currently at hand showed that the possible benefits of defining such efficiency thresholds are rather limited. The expected cost-optimal energy efficiency improvement for new zero-emission cars in the medium segment, in 2030, compared to a 2020 baseline gasoline vehicle, is 82%, whereas the maximum theoretical improvement of the energy efficiency using new technologies is 86%. The additional 4%-points energy savings would come at a significant cost of approximately EUR 2 600. Electric vehicles, due to physics, are already significantly more energy efficient than internal combustion engine vehicles, which convert at most 30% of their energy input into movement. Introducing additional requirements for zero-emission vehicles, the benefits of which are uncertain, at a time when a ramp-up of the market is highly necessary, is not an option to be further pursued.

6. WHAT ARE THE IMPACTS OF THE POLICY OPTIONS?

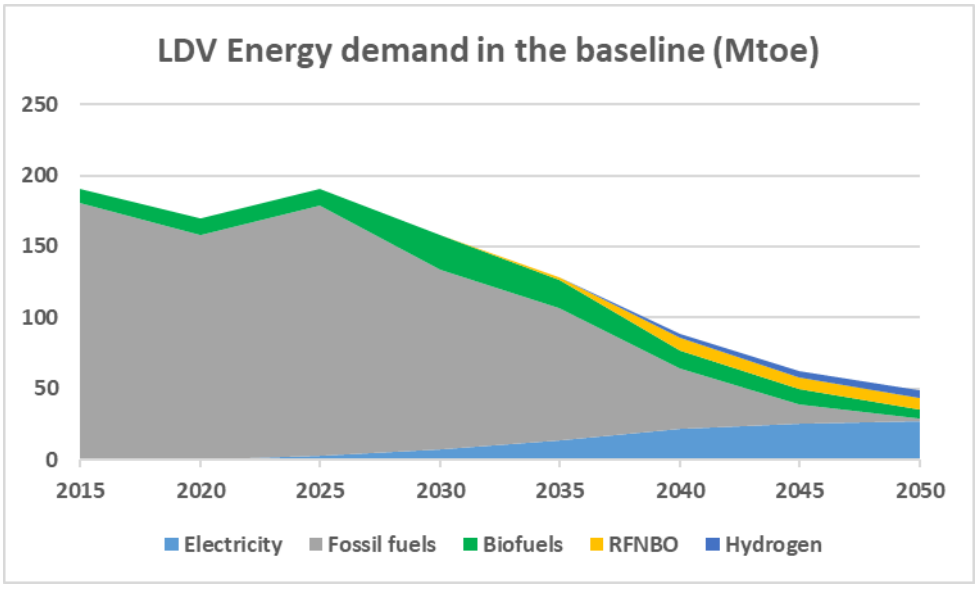
6.1. Introduction

The quantification of the impacts of the options defined in Section 5 relies on a number of models and methodological approaches as detailed in Annex 4. The baseline has been designed to include the initiatives of the 'Fit for 55' package[50], as well as the Commission proposal to amend the European Climate Law to include a 2040 climate target of reducing the EU's net GHG emissions by 90% relative to 1990, with a limited contribution of high-quality international credits of 3% of 1990 EU net emissions[51].

6.1.1. Baseline scenario results

In the baseline scenario, the share of ZEV in new registrations is projected to increase from 16% in 2025 to 60% in 2030 for cars, and from 8% in 2025 to 50% in 2030 for vans. From 2035, all new cars and vans are projected to be ZEV. The share of ZEV in the overall stock in 2030 is projected at 13% for cars and 10% for vans, going up to respectively 83% and 82% in 2050. The projections show around 240 million zero-emission LDVs on the EU roads in 2050. Driven by the increasing uptake of the more efficient BEV in the fleet, the energy demand of LDVs is projected to decrease by 17% by 2030 and by 74% by 2050, both relative to 2015. The share of LDV energy demand over time coming from the different energy sources is presented in Figure 1, which shows that the liquid fuels become progressively decarbonised[52].

Figure 1: LDV final energy demand (baseline)



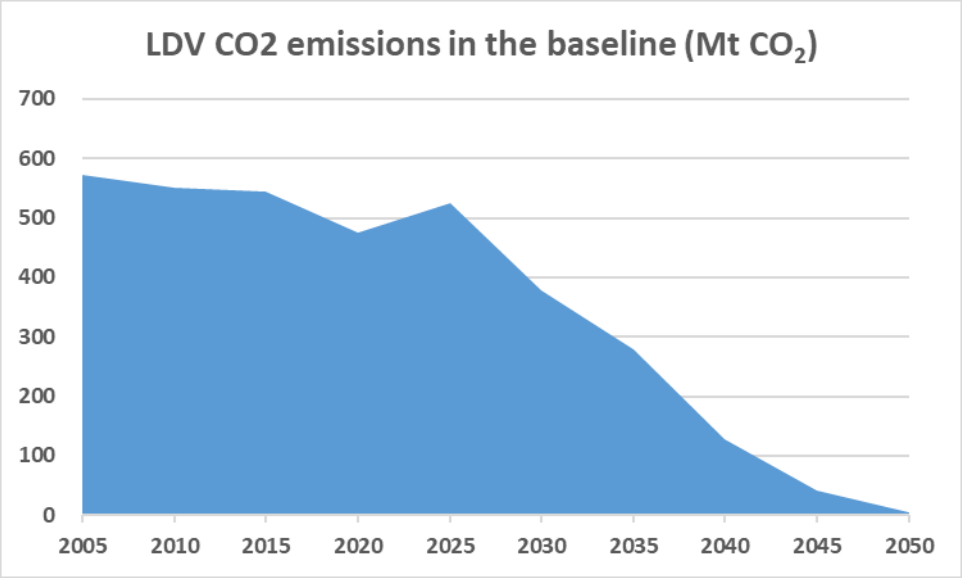
[50] Delivering the European Green Deal - European Commission

[51] The baseline also incorporates the projected transport activity draws on the long-term population projections from Eurostat and GDP growth from the *Ageing Report 2024*.

[52] Electricity energy demand remains limited because of the efficiency of vehicles using it.

CO_2 emissions from LDVs are projected to decrease by 48% by 2030 relative to 2015, and to be close to zero by 2050, thanks to the large-scale ZEV uptake and some use of renewable and low-carbon fuels, as shown in Figure 2.

Figure 2: LDV CO_2 emissions (baseline)



The external costs of air pollution of LDVs are projected to decrease by 63% in 2030 and 98% in 2050 compared to 2015.

6.1.2. SME tests and impacts on fundamental rights

This initiative is considered to have a relevant impact on SMEs. Stakeholders have been consulted and impacts identified in the following sections, where relevant. The assessment looked at how the broader impacts of the policy options can play out for smaller firms, considering their role in the supply chain, as Tier 1 and 2 suppliers. The options may bring possible benefits from changes in the demand for specific technologies, their ability to absorb adaptation costs, engage in innovation, and maintain market positioning relative to larger competitors. For vehicle labelling, the main impact in this context is due to the simplification of the label. See Sections 6.3, 6.5 and Annex 6 for additional details.

This initiative does not have any impact on fundamental rights.

6.2. Assessment of options

The quantitative analysis presented in this Section shows the impacts of the policy options as compared to the baseline. The results of the analysis are mostly driven by changes in the fleet composition due to the different policy options, as well as by changes in transport activity, influenced by costs. In options where less efficient and more costly vehicles (on a total cost of ownership (TCO) basis) are projected, consumers experience an increase in expenditure for transportation needs, and transport activity reduces accordingly. Reduction in activity is also reflected in a reduction of the volumes of the new fleet and in a smaller vehicle stock. The lifetime of vehicles is also somewhat extended as a result.

The detailed description of the methodological approaches as well as the detailed results for the assessment of all the options and combinations (including on costs, energy demand, air pollution and CO_2 emissions) are provided in Annex 8.

6.2.1. CO_2 emission targets

Lowering the 2030 target to 40% for vans (TL_Vans) and lowering the 100% target to 90% for all LDVs (with a 100% target in 2040 in TL_100_2040, and a 90% target as of 2035 in TL_90) leads to an increase in the registrations of non-ZEV.

For cars, the registration share of non-ZEV, mostly ICEV, is around 10% in the years in which the target is 90%. In 2050, there are 23 million less ZEV cars on EU roads under option TL_90 and 8 million less under option TL_100_2040.

For vans, the registration share of non-ZEV is 41% in 2030 (TL_Vans), and 16-19% in the years in which the target is 90%, with OVC-HEV making up for most of the non-ZEV fleet.

6.2.1.1.Economic Impacts

Adjustment costs[53]

From a system perpective, in the different policy scenarios, there is a slight increase in total costs, including capital and operating costs (fuel and non-fuel costs) for the LDVs. The net present value (NPV) of the total costs incurred between 2030 and 2050 increases by 0.4 % for vans in TL_Vans (EUR 16 billion). For LDV it increases by 0.04% (EUR 10 billion) in TL_100_2040 and by 0.2% (EUR 53 billion) in TL_90. In all scenarios, total costs are the result of an increase in fuel costs (due to less efficient vehicles), which is higher than the capital costs reduction[54]. The total costs increase despite a slight reduction in activity (1% in TL_100_2040 and 2% in TL_90, from 2040)[55]. Therefore the increase in the cost per kilometre is slightly higher than the increase in total cost[56].

Net economic costs for new vehicles from different perspectives[57]

Reducing the target level ambition causes a small increase in TCO, both from a user and from a societal perspective. TL_90 has the highest impacts, with additional costs: (i) for a

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[53] Following the same methodological approach as in previous Impact Assessments, including the report underpinning the Climate target 2040 proposal, adjustment costs are presented from the perspective of the transport sector (light-duty vehicles subsector). They include: capital costs related to transport equipment; fuel costs, including fuel-related taxes like excise duties and value added taxes; other operating costs: fixed operation costs (e.g. maintenance costs); variable non-fuel operation costs (e.g. charges, registration taxes and other ownership taxes).

[54] The higher cost of TL-90 is due to the lower target (90%) applying as of 2035, and the cumulative effect over the 2030-2050 period

[55] Lower activity is driven by a lower disposable income due to increased expenditure for transportation needs (due to lower shares of the cheapest option, BEV, on a TCO basis).

[56] The reduction in the activity of cars is only slightly compensated by the switch to other modes such as rail and public road transport

[57] For the TCO analysis, the economic impacts have been assessed by considering the changes (compared to the baseline) in capital costs, fuel costs, and operating and maintenance (O&M) costs for an "average" new

car purchased in 2035 of around EUR 100 for the first user, EUR 440 for the second user and EUR 580 for the third user and (ii) for a car purchased in 2040, of EUR 460, EUR 640 and EUR 630, respectively. From a societal perspective[58], TCO increases by EUR 870 (2035 car) and EUR 1300 (2040 car). The extra costs are driven by the lower efficiency and higher fuel costs over the use period of the conventional vehicles in the fleet. Impacts on second and third users are higher since they pay a lower share of the initial vehicle value and face higher fuel costs according to the projected fuel prices. Impacts are larger for vans than for cars, also due to their higher mileage. Annex 8 provides additional information on the impacts on TCO.

In all options, manufacturers face a reduction in costs[59], compared to the baseline. Detailed results are presented in Annex 8 (section 4.2.c).

Total cost of ownership by powertrain and sensitivity analysis on electricity and battery costs

The TCO of BEV mainly depends on two parameters: (i) battery prices, which determine the capital cost component of the TCO, and (ii) electricity prices, which determine the operating cost component of the TCO. The values of the parameters for the main analysis take into account technology costs which were corroborated with, as well as the endogenous evolution due to the policy framework in place.

Sensitivities have been performed on these two parameters. They show that changes in the values of these two parameters – for the ranges analysed - do not alter the results in terms of TCO of BEV compared to the other powertrains.

Figure 3 shows the TCO for a 2030 small car and large car[60]. Results are presented for two powertrains, a PHEV and a BEV, both in comparison to a gasoline ICEV. The graphs refer to the use period of the first, second and third owner.

vehicle, registered in the time periods considered. An "average" new vehicle of a given year is defined by averaging the contributions of the different segments of small, medium, large vehicles and powertrains by weighting them according to their market penetration as projected. It represents the change in the fleet composition driven by the policy.

[58] This parameter indicator reflects the change in costs over the lifetime of 20 years of an "average" new vehicle, without considering taxes and using a discount rate of 3%. In this case, the costs considered also include the external cost of CO_2 emissions (in line with Handbook on the external costs of transport – Version 2019 – 1.1, Publications Office, 2020, https://data.europa.eu/doi/10.2832/51388)

[59] The costs for automotive manufacturers are calculated as the difference, between the policy options and the baseline, of the manufacturing costs, averaged over the EU-wide new vehicle fleet of cars and vans registered in 2035 and 2040. They depend on the costs of the technologies that they will deploy in the new vehicles fleet to meet the CO_2 targets under the respective scenario conditions.

[60] The results are shown for certain vehicle segments and users for illustrative purpose. However, the same calculations are performed for all segments and users, with qualitatively similar results (DIONE model).

Figure 3: Cars 2030 Cumulative TCO difference vs. ICEV

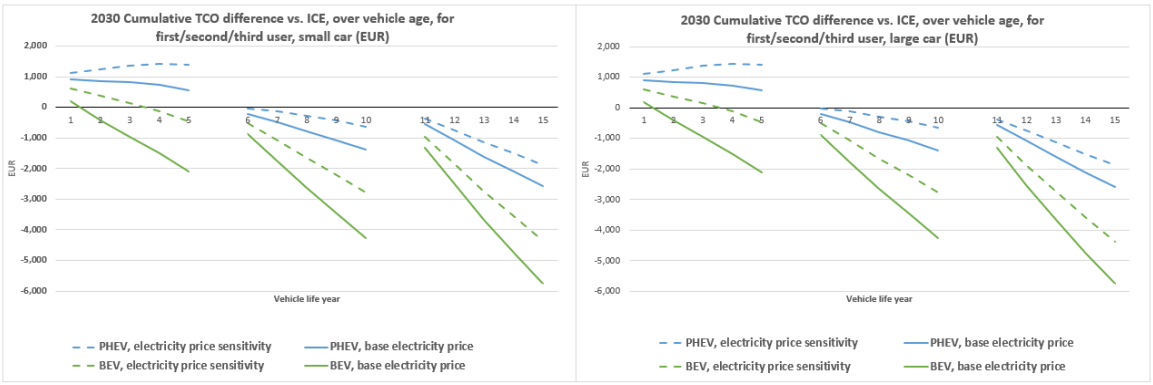


Figure 3 also includes a sensitivity showing the impact of changes in the electricity price. This aims to capture the uncertainty of the future development of electricity prices, as well as the spread of the costs of different private and public charging options.[61]. The sensitivity shows that, in comparison to conventional vehicles, TCO for BEV cars and vans over the 5-year use period remain lower than that for same-segment conventional vehicles, for all segments and user perspectives, meaning that BEV remain the least-cost option.

In a sensitivity analysis where battery costs are 20% higher than in the baseline trajectory, TCO calculations for a new 2030 vehicle show that over the 5-year use period, BEV cars and vans costs remain lower than that for same-segment conventional vehicles, for all segments and user perspectives. Additional details are provided in Annex 8.

6.2.1.2.Energy system and environmental impacts

For the three options, an increase in the energy demand of LDVs is projected, as the decrease in electricity demand is more than offset by an increase in the demand for liquid fuels[62] to power vehicles that are around three times less efficient than BEV.

In TL_vans, this increase is limited in time, as the change in targets only affects the period 2030 to 2034. The energy demand of vans is projected to increase by 1% in 2030, 4% in 2035 and 2040, and 1% in 2050. The demand for liquid fuels of vans increases by around 6% on average, between 2035 and 2050. In TL_100_2040 and TL_90, the impact is more significant, with the energy demand of LDVs increasing by 1% in 2035 in both scenarios, by 4-5% as of 2040 in TL_100_2040, and by 6% in 2040 and 12-13% in 2050 in TL_90. In TL_100_2040 the demand for liquid fuels is projected to increase by 8% in 2040 and 16% in 2050, while in TL_90 by 11% in 2040 and 57% in 2050.

The changes in the energy demand lead to an increase in cumulative (2030 to 2050) CO_2 emissions of 4% for vans (0.6% for all LDVs) in TL_vans, and of 3 % and 5% for all LDVs in the scenarios TL_100_2040 and TL_90. This is equivalent to 167 Mt CO_2, in the TL_90 scenario. The projected environmental impact is not very high in terms of CO_2 emissions,

[61] The projected electricity price by the PRIMES model results from the implementation of the policies described in the baseline, including in particular the EU ETS, and it reflects a user pattern based on a mix of 50% private and public charging.
[62] There is a similar increase in the fossil fuel, biofuels and synthetic fuel components.

since the increased number of non-ZEV remaining in the stock of cars are projected to be powered by progressively decarbonised fuel. In a scenario in which the bio- and e-fuel blends do not increase compared to the quantities needed to comply with the Renewable Energy Directive targets, which are set for 2030, the impacts are projected to be significantly higher: +8% cumulative CO_2 emission in the TL_90 scenarios, equivalent to 299 Mt CO_2.

6.2.2. Role of sustainable renewable fuels

The impacts of the options around the role of sustainable fuels, both type of fuels and mechanism, are driven by the changes in the fleet composition projected in the model in the different options[63].

Under the option CCM, the specific emissions targets of all manufacturers would be increased through a correcting mechanism that reflects the market deployment of the eligible fuels. In the CCM-RFNBO scenario, around 2% of new vehicles is projected to be non-ZEV in 2035 due to the projected low quantities of those fuels in the market in 2035. From 2040 the share of non-ZEV increases to around 10% for cars (8% ICEV plus 2% PHEV) and 10-12% for vans (8-9% PHEV plus 2-3% ICEV). If instead credits are given for SRF, the share of non-ZEV increases more significantly, to 14% in 2035 for both cars and vans, with an increase in 2040 (16% for cars and 19% for vans) and a slight decrease thereafter (13% in 2050 for both types of vehicles). As a consequence, in 2050, the projected number of ZEV on the EU roads declines by 14 million, if credits are given for RFNBO only, and by 28 million, if credits are given for SRF.

Under the option VEEF, vehicle manufacturers would have to put on the markets vehicles than can only run on the eligible fuel. The share of non-ZEV remains limited due to high fuel costs becoming a barrier for market uptake and availability of less expensive alternatives. From 2035 onwards, in the scenario VEEF-RFNBO, only 1% of the new cars is projected to be an ICEV (for vans, the share is higher: 10% in 2035, progressively declining to 5% from 2045). Since SRF are projected to be cheaper than RFNBO, this share increases to 4% in the scenario VEEF-SRF in 2035, but goes back to 1% as from 2040 for cars when BEVs become less expensive due to the projected battery cost decrease (for vans, down from 13% in 2035 to 6% from 2045).

6.2.2.1.Economic Impacts

Adjustment costs

Under both options (CCM and VEEF), adjustment costs increase, while cars and vans activity is reduced. Also, the number of new non-ZEVs registered from 2035 onwards increases.

[63] Concerning renewable fuels: the model projects RFNBO carbon intensity to reduce almost 100% compared to fossil; advanced biofuels carbon intensity reduces significantly over time, reaching values close to (but never equal to) 100% compared to fossil only in the longer term. The results of the analysis are based on carbon intensity of fuels as projected by the model. For fuels reaching a 100% greenhouse gas emission savings the costs would be higher.

In the CCM scenarios, the NPV of the total costs 2030-2050 for all LDVs increases by 0.08% if credits are provided for RFNBO only (CCM-RFNBO) and by 0.2% if credits are provided for SRF (CCM-SRF). This is equivalent to about EUR 19 billion and EUR 51 billion, respectively. This is due to an increase in fuels costs, which more than offset a slight decline in capital and operating costs. This increase in total costs happens despite a slight reduction in activity (around 1% in CCM-RFNBO and around 3% in CCM-SRF, in 2050). Therefore the impact on the cost per kilometre is somewhat higher than on total costs.

In the VEEF scenarios, the share of non-ZEV remains limited due to high fuel costs becoming a barrier for market uptake and availability of less expensive alternatives. From 2035 onwards, in the scenario VEEF-RFNBO, only 1% of the new cars is projected to be an ICEV (for vans, the share is higher: 10% in 2035, progressively declining to 5% from 2045). Since SRF are projected to be cheaper than RFNBO, this share increases to 4% in the scenario VEEF-SRF in 2035, but goes back to 1% as from 2040, for cars when BEVs become less expensive due to the projected battery cost decrease (for vans, it goes from 13% in 2035 to 6% from 2045).

Given the limited uptake of those vehicles described above, in 2050, in the scenarios VEEF-RFNBO and VEEF-SRF, the number of ZEV on the EU roads declines by 3 and 4 million vehicles, respectively[64]. In the VEEF scenarios, the change in NPV of the total costs for all LDVs is negligible, as is the reduction in activity. According to the modelling results, the price of the eligible fuels could be a limiting factor for their market deployment and the TCO of the vehicles using them is higher than that of alternatives (as shown in Section 6.2.1.1**)**

The VEEF analysis also looked at a scenario where transport users would take up these vehicles to a level of 10% or 20% of the new fleet. In such scenario, the NPV of the total costs for all LDVs increases by 0.07% in VEEF-SRF and by 0.11% by in VEEF-RFNBO with a 10% share (equivalent to EUR 17 and 27 billion) and by 0.14% in VEEF-SRF and by 0.22% by in VEEF-RFNBO with a 20% share (EUR 35 and 54 billion)[65]. The increase in costs is limited due to a projected significant reduction in activity for cars and vans (from -1.2% in 2040 to -3% in 2050 in VEEF-SRF and from -1.5% in 2040 to -4% in VEEF-RFNBO with a 10% share and from -2.5% in 2040 to -7% in 2050 in VEEF-SRF and from -3% in 2040 to -8% in VEEF-RFNBO with a 20% share)

Net economic costs from different perspectives

The CCM scenarios show an increase in TCO, driven by the increase in the share of conventional and less efficient vehicles, similarly to what is described in Section 6.2.1.1. In the CCM-SRF scenario, which is the scenario with the highest impacts, the additional costs for cars are around EUR 200 for the first user, EUR 630 for the second user and EUR 780 for the third user for a vehicle purchased in 2035 and EUR 620, 830 and 800 for a vehicle purchased in 2040. From a societal perspective, it increases to EUR 1 250 (2035) and EUR 1 700 (2040). The changes are higher for vans than for cars, as their higher

[64] Compared to a total of 240 million vehicles in the baseline.

[65] Again, this cost increase is explained by a decline in capital cost and non-fuel operating costs which are more than compensated by an increase in the fuel costs

mileage and higher overall energy consumption exacerbate the effects of lower efficiency improvements (compared to baseline) and rises in fuel price over time.

As regards the VEEF options, these come at very limited TCO changes, as their share remains very low. However, if users would take up these vehicles to a level of 10 or 20% of the new fleet, additional costs occur for end users and from a societal perspective (higher in the case of RFNBO only and lower for a fuel mix). This is again explained by the less efficient fleet, and the fact that this fleet consumes more and more costly fuel, in particular in the case of RFNBO. Technology for ensuring that these vehicles can run exclusively on the eligible fuels also adds to their cost, albeit very little. The impacts on TCO are higher than in the CCM-SRF case, already with a 10% share of VEEF-RFNBO vehicles in the new fleet. Notably, when vehicles running only on RFNBO with a 20% fleet, the additional cost for cars is around EUR 1 800 for a first user and EUR 2 000 for the second and for the third user. The societal cost amount to almost EUR 5 000. Impacts are somewhat smaller for cars purchased in 2040. Impacts are higher for vans than for cars[66][67].

In all options, manufacturers face a reduction in costs, compared to the baseline. Detailed results are presented in Annex 8 (section 4.2.c).**Additional considerations for VEEF option**

The VEEF option may require technical adaptation to refuelling stations that may need some upgrading to provide the eligible fuel. The cost of equipping a pump with the possibility to communicate over-the-air with the vehicle (e.g. to confirm to the vehicle it is being refuelled with the eligible fuel) is estimated at EUR 540. In case fuel providers would need to replace an existing tank and pump for providing the eligible fuel this would lead to an additional cost of EUR 48 500.

6.2.2.2.Energy system and environmental impacts

Under option CCM, the energy demand and CO_2 emissions increase, as less efficient vehicles (that run on RFNBO, SRF or on fossil fuels) are put on the market. This impact is more outspoken when credits also account for (cheaper) SRF (instead of RFNBO only). Under option VEEF, the increase in energy demand is caused by an increase in demand for the eligible fuels (RFNBO, SRF), and not by an increase in the demand for fossil fuels[68].

The changes in the fleet composition under these options lead to an increase in the energy demand of LDVs, despite the lower activity (as in Section 6.2.2.1). In the CCM-RFNBO scenario, the energy demand is projected to increase by 1% in 2040 and by 8% in 2050. In the CCM-SRF scenario, the increase is higher: 7% in 2040 up to 16% in 2050. In both scenarios a decrease in electricity demand is more than offset by an increase in the demand for less efficient liquid fuels. Similarly to what is shown in Section 6.2.1.2: the demand for

[66] Additional details are provided in Annex 8

[67] When looking at the costs for vehicle manufacturers, for options VEEF, results also take into account a capital cost increase for each vehicle of around EUR 350 for each conventional vehicle that can exclusively be powered by SRF (more details in Annex 8)

[68] For this reason, the model does not project an increase in emission in the transport sector

liquid fuels increases by 3% in 2040 and 38% in 2050 for option CCM-RFNBO and by 13% in 2040 and 72% in 2050 for option CCM-SRF.

In the VEEF scenarios, the impact is smaller and the energy demand increases only by a few percentage points, since the share of non-ZEV remains limited. However, the demand for the eligible fuels in LDV increases more substantially: in VEEF-RFNBO by 50% in 2035 (although the share of RFNBO in total energy demand remains low, increasing from 1 to 2%) and by around 20% from 2040. In VEEF-SRF, the demand for the eligible fuels increases by 7% in 2035, 12% in 2040 and 15% from 2045. The demand for oil products is declining very slightly, in line with the moderate decrease in activity.

For the scenario where transport users would take up these vehicles to a level of 10% or 20% of the new fleet (possible cap levels), the results change significantly and the number of ZEV in the 2050 EU fleet declines by 23 (RFNBO) to 28 (SRF) million vehicles (10% share) and by 53 (RFNBO) to 56 (SRF) million vehicles (20% share). Therefore, the energy demand of LDVs increases by 12% in 2040 and by 42-44% in 2050. Also the fuel mix changes substantially. In the VEEF-RFNBO scenario, the demand for RFNBO in LDV almost triples in 2035 and 2040 and increases almost 5 times in 2050. As explained in Annex 8, the additional electricity demand needed for producing RFNBO is significantly bigger than than the electricity saved directly in road transport. In the VEEF-SRF scenario, the demand for SRF increases by 12% in 2035, by 70% in 2040, more than doubles in 2045 and more than triples in 2050. It is also important to note that the decline in activity mentioned in Section 6.2.2.1 leads to a reduction in the number of new cars and vans by around 6% in 2040 and 10% from 2045.

In the baseline a cap is set for the overall bioenergy use in the entire EU energy system that is aligned with the potential of the JRC's ENSPRESO Biomass database[69],[70], and that translates into a domestic production of feedstocks for bioenergy of 210 Mtoe in 2040 (235 Mtoe in 2050), which is roughly 60% higher than the current overall bioenergy production level[71]. This is complemented by a specific cap on the use of forestry products and residues[72] as feedstocks for bioenergy purposes. Finally, the modelling assumes a limitation of the contribution of bioenergy net imports to 15 Mtoe[73] . These caps aim at limiting the uptake of bioenergy in the energy system in view of sustainability considerations. The additional demand for advanced biofuels across most fuels-related scenarios remains within the corresponding potential of the related feedstocks, although the 2035-2040 period may represent a stress point as the remaining available potential may be low. The scenario with the highest market penetration of advanced biofuels exceeds the cap throughout the period 2040-2050 and therefore creates issues for the availability of

[69] The JRC ENSPRESO Biomass database provides different potentials for biomass for energy purposes combining assumptions on land use, productivity and activities: https://data.jrc.ec.europa.eu/collection/id-00138

[70] The cap on bioenergy availability considered here is in-between the "low scenario" and the "medium scenario" of the JRC ENSPRESO Biomass database.

[71] According to Eurostat energy balances (2024 edition), total production of bioenergy in 2023 was 134 Mtoe.

[72] Forestry-based feedstocks are key for sustainability and LULUCF dimensions. The cap on such type of feedstock is set at 50 Mtoe, which is 35% lower than in the "low scenario" of the JRC ENSPRESO database.

[73] This is roughly double the current levels of net imports (according to Eurostat energy balance (2024 edition) in 2022 bioenergy imports were 22 Mtoe and net import 7 Mtoe).

renewable fuels for other competing economy sectors such as maritime and aviation, electricity production or industry. In the other scenarios, the additional quantities required for passenger cars and vans transport can be met under the cap throughout the period up to 2050, without drawing bioenergy from other sectors.

Additional details and an overview of other literature concerning the potential availability of sustainable biological feedstocks and their costs is provided in Annex 8.

Concerning CO_2 emissions, in the CCM scenarios, because ZEV are replaced by ICEV and OVC-HEV, the model projects an increase in cumulative (2030 to 2050) CO_2 emissions of 1% (RFNBO only), and 4% (SRF). In the VEEF scenarios, road transport CO_2 emissions do not increase (they actually slightly decrease, around 0.5%, due to the signifcant decrease in activity described in Section 6.2).

6.2.2.3. Administrative burden

The CCM option would rely on monitoring the amount of eligible fuel put on the market via mechanisms already in place (the Union Database for Biofuels[74]). Therefore, no significant additional burden would be determined for vehicle manufacturers and fuel producers. The VEEF option would not lead to any additional burden, however changes to the type-approval would be needed to identify vehicles running exclusively on the fuels concerned[75], which would result in some additional administrative burden. Systems to ensure the exclusivity criteria would likely be the same throughout a manufacturer's portfolio (or potentially two systems, if a manufacturer develops it for both renewable gasoline and diesel), which would only require to approve it once, and not for every type-approval. The Euro 7 Impact Assessment estimates overall administrative costs for a manufacturer for each full emissions type approval (encompassing numerous elements e.g. WLTP, RDE, evaporative emissions, etc.) between EUR 20 000 and EUR 64 000. Therefore, the expected one-off cost to test only the exclusivity criteria would be significantly lower.

6.2.3. Role of OVC-HEV

The analysis looked at scenarios where OVC-HEV with certain characteristics are taken up in 2035 to a level of 10% or 20% of the new fleet (possible caps).

The modelling results show that allowing OVC-HEV with a range higher than 150 km to be accounted as emitting 0 g/km from 2035 (which is valid for the two options considered), would lead to new registrations of such vehicles of around 4% of the new car fleets and 14% of the new van fleet. The limited uptake of these vehicles is driven by the fact that, according to the model, those vehicles are not purchased by transport users in significant quantities, especially for cars, as they are less energy efficient and more expensive than

[74] https://wikis.ec.europa.eu/spaces/UDBBIS/pages/68190923/Union+Database+for+Biofuels+-+Public+wiki

[75] In 2023, the Commission presented a proposal to amend the type-approval rules to allow for the approval of vehicles running exclusively on CO_2 neutral fuels. Manufacturers would have to demonstrate during type-approval that a system is in place ensuring that no other fuel could be used to operate those vehicles. This would also have to be checked as part of in-service conformity to ensure the robustness of the system.

BEVs (as shown in Section 6.2.1.1.3). The higher share of OVC-HEV in the vans fleet projected by the model may reflect that this would be an interesting option for certain categories of van users, such as micro-enterprises and self-employed individuals, that may have limited possibilities to rely on private charging and may therefore find a BEV less convenient. The number of ZEV in the 2050 LDV fleet would decrease by 10 million.

6.2.3.1.Economic Impacts

Adjustment costs

The NPV of the total costs for all LDVs changes marginally due to the balancing of two effects: the uptake of vehicles with a less favourable TCO increases, and a consequent small reduction in activity (1% from 2045). If instead a 10 or 20% share of OVC-HEV reaches the market, the NPV of the total costs for all LDVs decreases by 0.1% (10% share) or 0.2% (20% share) (resp. EUR 24 billion and 47 billion). However, the total cost reduction is driven by a reduction in LDV activity (-1% in 2040 and -2% in 2050 with a 10% share, -2% in 2040 and -4% in 2050 with a 20% share)[76], which means that the costs per vehicle kilometre under these options actually increase. When looking at option OVC-HEV_2, it is important to note that this results in a limited additional cost for vehicle manufacturer of about EUR 200 per vehicle.

Net economic costs for new vehicles from different perspectives

For cars, the OVC-HEV option comes at additional TCO, which however is relatively modest if the uptake of these vehicles is moderate. If instead a higher share (20%) is reached, the additional TCO is around EUR 870 and 790 for the first and second users, 710 for the third user, due to higher fuel costs, and just slightly higher for a vehicle purchased in 2040. Societal costs are around EUR 1850 (2035) and EUR 2000 (2040). Also in this case, costs for vans are higher. Additional costs arise from the fact that OVC-HEV have higher capital costs as well as higher fuel costs than BEV. Annex 8 provides additional information on the impacts on TCO.

A low penetration of these vehicles has a very minor impact on manufacturers' costs, compared to the baseline, while a higher (20%) share would lead to a small increase in manufacturers' costs. Detailed results are presented in Annex 8 (section 4.2.c).When a variant is considered in which manufacturers need to compensate for the OVC-HEV emission using low-carbon steel, the cost of an average car[77] would increase, proportionally to the share of OVC-HEV to compensate. With the projected uptake of these vehicles, the additional cost per vehicle (for the whole new vehicles fleet) would amount to around EUR 40. If instead a higher share of OVC-HEV (20%) is reached, the additional cost would increase to around EUR 190 per vehicle.

Additional considerations on economic impacts

In the baseline, it is highly likely that vehicle manufacturers or their suppliers would keep developing and producing in Europe, as of 2035, only ZEV or parts thereof, for which

[76] See Section 6.1.2.1.2 for an explanation

[77] Since manufacturers can spread the extra-cost over their whole fleet, according to pricing strategies

there will be a domestic market. While many global markets are also evolving towards zero-emission mobility, there will be continued demand for non-ZEV also post-2035, since few countries have already committed to ZEV only[78]. Production in the EU of OVC-HEV and their combustion engine powertrain related parts would be likely either stopped or be moved to those parts of the world where there will still be demand for them. Such evolution could have a detrimental economic impact on the European automotive value chain. Options OVC-HEV_1 and OVC-HEV_2, which maintain some future in the EU domestic market after 2034 for well-designed OVC-HEV with low CO_2 emissions on the road, would support European industry's domestic investment and production of OVC-HEV and the associated ICE supply chain. The details and choice of the technical vehicle parameters for OVC-HEV_1 and OVC-HEV_2 used for the analysis are explained in Annex 8.

6.2.3.2.Energy system and environmental impacts

The scenario shows that allowing a limited number of the best performing OVC-HEV on the market (option OVC-HEV_2) has a limited impact on the energy system and on CO_2 emissions, provided that these vehicles are mostly used in electric mode. These vehicles would have low CO_2 emissions and the limited additional demand for liquid fuels would be met by a blend which is progressively decarbonised.

The scenario projects a moderate increase in the energy demand of LDVs (around 1% from 2040), despite the slightly lower activity (see Section 6.2.3.1). A decrease in electricity demand is more than offset by an increase in the demand for liquid fuels[79]. The model projects similar trends in fuel mix as shown in Section 6.2.1.2: the demand for liquid fuels increases by 2% in 2040 and 7% in 2050. The OVC-HEV scenarios show only a limited increase in cumulative (2030 to 2050) CO_2 emissions (+0.4%). These results are driven by a projected market penetration of OVC-HEV that does not reach the cap level, since the market uptake of OVC-HEV competes with alternative choices that are less expensive. However, in the scenario where the market shares of OVC-HEV actually reach the cap, which is set for the quantitative analysis at either 10% or 20% of the new fleet, the number of ZEV in the 2050 EU fleet declines by 24 (10% share) and 48 (20% share) million. Thus, the energy demand of LDVs increases by 1% in 2040 and by 3% in 2050 with a 10% share, and by 2% in 2040 and by 6% in 2050 with a 20% share. The decline in activity leads to a reduction in the number of new cars and vans by around 2-3 % with a 10% share and around 5-6% with a 20% share, from 2040. In this scenario, the increase in emissions becomes more significant (+1% with a 10% share and +2% with a 20% share) in 2040.

It is important to highlight that the projected environmental impact is not very high in terms of CO_2 emissions, since the increased number of non-ZEV remaining in the stock of cars (i) is made of efficient hybrids, with low emissions, and (ii) non-ZEV are projected to be powered by progressively decarbonised fuel. In a scenario in which the bio- and e-fuel blends do not increase compared to the quantities needed to comply with the RED targets, which are set for 2030, the cumulative impacts (2030-2050) are projected to be

[78] Apart from the EU, this is only the case for the UK, which has set a zero-emission vehicle only requirement applying from 2035.
[79] Similar increase in the fossil fuel, biofuels and synthetic fuel components

significantly higher, up to +3% CO_2 emission with 20% OVC-HEV, equivalent to 67 Mt CO_2.

6.2.3.3.Administrative burden

Option OVC-HEV_1 does not add administrative burden as it does not require additional monitoring or reporting by manufacturers, nor does it affect the type-approval of the vehicles. Option OVC-HEV_2 would require small changes to the type-approval, without imposing additional testing. Vehicles could be approved based on a manufacturer declaration, which can be verified through the already existing market surveillance mechanisms. This would therefore lead to a minimal additional administrative burden for manufacturers and approval authorities[80].

6.2.4. Other flexibilities

6.2.4.1.Multi-annual compliance

The estimation of the GHG emission impact of this option is based on the assumption that this could lead to a shift between drivetrains over the years 2030-2032 – from ZEVs towards ICEVs and OVC-HEVs in the first year, and vice versa in the last year. As this compensations happens over the years, in principle this modality is quasi-neutral in terms of emissions. It only slightly increases cumulative emissions under the assumption that some anticipation of the future targets occurs in the baseline, so that some overachievement of the target is realised (e.g. in 2031 and 2032). Even in this scenario, and assuming all manufacturers use the flexibility, the increase in the energy demand of LDVs leads to a very limited increase in cumulative (2030 to 2050) LDV tailpipe CO_2 emissions of 0.3%.

6.2.4.2.Super-credits for small ZEV

Adjustment costs

For the sake of the assessment, small ZEV are counted as 1.25 or 1.5 vehicles when calculating the average emissions of a manufacturer between 2030 and 2034. A cap is set at 2.5 or 5% of the 2021 reference emissions. Since the incentive is only relevant until the emissions reductions target reaches 100%, the impact on the total costs is negligible.

Net economic costs from different perspectives

This option results in a slightly higher share of non-ZEV (because super-credits allow to reach compliance with lower share of ZEV). Therefore, as before additional fuel costs of a less efficient new fleet lead to a small additional TCO. It can help manufacturers to avoid

[80] Manufacturers would declare that the vehicles concerned are only able to run in pure electric mode until the battery is fully depleted, along with the charging power. For the vehicles put on the market, the first parameter could then be checked as part of the existing real-world data monitoring, while the charging power is typically communicated to customers and could be easily verified on an ad hoc basis. The non-electric range of OVC-HEV is already determined at type-approval, but would need to be added to the Certificate of Conformity of the vehicles to allow monitoring.

fines in case of compliance issues, but it also slightly increases the societal cost due to externalities. This option has no impacts for vehicles purchased from 2035.

Energy system and environmental impacts

The results show a moderate increase in the number of registrations of new non-ZEV. In 2030, the model projects 1.5 and 3 percentage points decrease in the ZEV share (with the 1.25 and 1.5 multiplier, respectively), most of ZEV being replaced by ICEV. From 2035, there is no difference in the share of new ZEV. This leads to a small increase in the energy demand of LDVs (between 0.1 and 0.2% with the 1.25 multiplier and between 0.2% and 0.5% with the 1.5 multiplier), as the small decrease in electricity demand is more than offset by an increase in the demand for liquid fuels[81]. This leads to a small increase in cumulative (2030 to 2050) CO_2 emissions of all LDVs of 0.2% or 0.4%, depending on the multiplier used. However, since the current availability of BEV in the smaller segments is limited, a multiplier could also incentivise the manufacturers to place on the market more of these vehicles together with also higher volumes of ICEVs, which in the short term can provide them more profit margin and therefore a short-term economic advantage. The broader benefits of small cars also include higher resource efficiency, possible avoided congestion costs, and reduction in space occupancy.

6.3. Assessment of combinations of options

The combinations of options described in Section 5.2.5 were assessed.

As regards the options related to the role of sustainable renewable fuels, the two combinations cover both SRF. Such broader fuel choice provides further flexibility for the automotive manufacturers that choose to take this route and is the most cost-efficient amongst the options considered as regards the eligible fuels, in particular as SRF are projected to be cheaper than RFNBO. With respect to the mechanism, both CCM and VEEF could be implementable and present costs and benefits. However, compared with VEEF, CCM leads to higher adjustment costs and higher emissions. The VEEF option could provide further certainty for automotive manufacturers since they control the development of the powertrains for which the flexibility applies, and it is backed-up by the work of a dedicated cross-industry group[82] (that analysed practical ways to implement it. For these reasons, the VEEF option has been included in both combinations of options.

The option providing for multiannual compliance has not been included in the combinations assessed as adding this would bring excessive cumulative flexibility and regulatory complexity, while not bringing significant additional benefits.

In both combinations of options, the share of non-ZEV increases compared to the baseline. In the projections shown below the caps for the flexibility for OVC-HEC and VEEF are not reached in the model since less expensive alternative options are preferred in the market. In case the caps for OVC-HEC and VEEF would be reached, the impacts would be bigger (as shown in Section 6.2).

[81] There is a similar increase in the fossil fuel, biofuels and synthetic fuel components
[82] WGMM

The projections show that in the COMBI_1, in 2030, there is a slight decrease in the share of ZEV in new cars (2 p.p.) which is driven by the super-credits for small ZEV. From 2035 instead the share of ZEV new cars decreases instead due to the flexibilities (OVC-HEV and VEEF). In 2035 around 7% of the new fleet is made of non-ZEV, more or less equally distributed between OVC-HEV and VEEF. From 2040 this share declines progressively, going down to 5% in 2050. From 2040 the majority (around 80%) of non-ZEV are OVC-HEV. For vans, in 2030, the lower target brings a more pronounced decrease in the share of ZEV in 2030 (-9 p.p.). In 2035 the share of non-ZEV vans increases to 15%, more or less equally distributed between OVC-HEV and VEEF. From 2040 the share of non-ZEV stabilises around 10%, and the majority (around 75%) of non-ZEV are OVC-HEV.

In COMBI_2, in 2030, there is a slightly more pronounced decrease in the share of ZEV in cars (3 p.p.) which is driven by the higher multipliers applied to small ZEV for the super-credits. Driven by the lower target applied together with the additional flexibilities, in 2035 around 17% of the new fleet is made of non-ZEV (80% of which are ICEV). From 2040 this share declines to around 15% (70% of which are ICE). For vans, from 2035, the share of non-ZEV increases to 27%. The majority of these non-ZEV are ICEV.

Table 2: New fleet composition in Baseline, COMBI_1 and COMBI_2.

	Share of new cars by powertrain					**Share of new vans by powertrain**				
	2030	**2035**	**2040**	**2045**	**2050**	**2030**	**2035**	**2040**	**2045**	**2050**
BASELINE										
ICEV	37%	0%	0%	0%	0%	49%	0%	0%	0%	0%
PHEV	3%	0%	0%	0%	0%	2%	0%	0%	0%	0%
ZEV	60%	100%	100%	100%	100%	50%	100%	100%	100%	100%
COMBI_1										
ICEV	39%	3%	1%	1%	1%	58%	7%	3%	3%	3%
PHEV	3%	4%	4%	3%	4%	1%	8%	8%	8%	7%
ZEV	58%	93%	94%	96%	95%	41%	85%	89%	90%	90%
COMBI_2										
ICEV	41%	13%	11%	10%	11%	58%	19%	15%	13%	13%
PHEV	3%	3%	5%	3%	4%	1%	7%	8%	8%	7%
ZEV	56%	83%	84%	87%	85%	41%	73%	77%	79%	80%

6.3.1.1.Economic Impacts

Adjustment costs

From a system perpective, the total cost of COMBI_1 does not show significant changes compared to the baseline despite a small decrease in activity (-1% from 2040). For COMBI_2 there is an increase in total costs, including capital and operating costs for the vehicles, despite a decrease in activity.

As shown in Table 3, the net present value (NPV) of the total costs (2030 to 2050) for all LDVs increases by 0.4% (EUR 93 billion more than in the baseline in COMBI_2, including

environmental costs). This is caused by higher fuel costs due to less efficient vehicles, which are not fully compensated by the slight decline in capital cost and other operating costs, and by the increased environmental costs. The increase in costs happens despite a slight reduction in activity (around -1% in 2040 and -3% from 2045, more pronounced in cars)[83], driven by a lower disposable income due to increased expenditure for transportation needs (due to lower shares of the cheapest option, BEV, on a TCO basis). Therefore the impact on the cost per kilometre is slightly higher[84]. Table 3 also shows the cumulative CO_2 and air pollution costs.

Table 3: Net present value (NPV) of the total costs and of the environmental external costs (2030-2050) (baseline and difference to baseline, in EUR billion)

	Capital costs	**Operating costs, including energy costs**	**CO2 costs**	**Air pollution costs**	**Total Costs**
Baseline	8 643	16 224	368	94	25 329
COMBI_1	-7	10	1	2	6
COMBI_2	-43	116	15	5	93

Error! Not a valid bookmark self-reference. then shows the NPV of the costs (operating costs and environmental externalities presented in **Table 3**) and benefits (the savings in capital costs). It shows that the benefit/cost ratio is higher in COMBI_1 than in COMBI_2.

Table 4: Benefits and costs of the combinations of options (in EUR billion, NPV) and benefit/cost ratio

	NPV Benefits (EUR billion)	**NPV Costs (EUR billion)**	**B/C ratio**
COMBI_1	**7**	**13**	**0.5**
COMBI_2	**43**	**136**	**0.3**

The reduction in the capital cost are equivalent to the savings that manufacturers will see (EUR 7 billion in COMBI_1 and EUR 43 billion in COMBI_2).

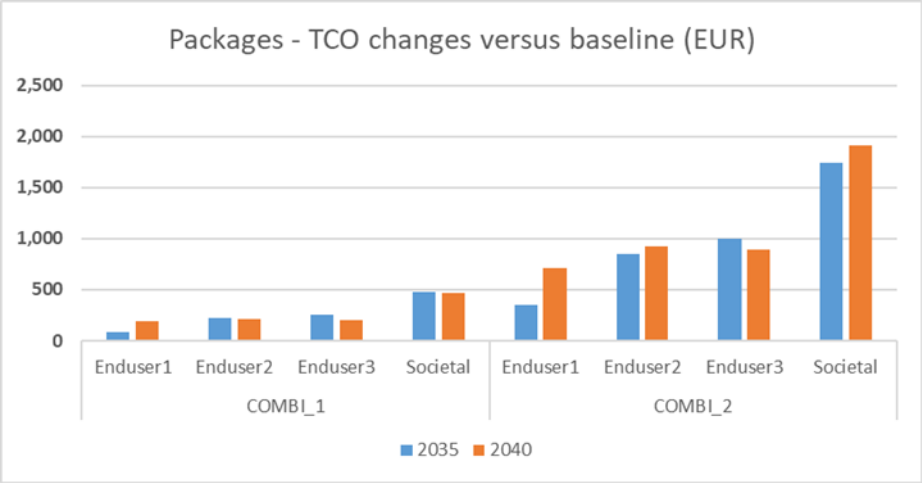
Net economic costs from different perspectives

As shown in Figure 4, TCO results for cars show a moderate increase in TCO for COMBI_1 (up to EUR 250 for each end user, and 500 for the social perspective in 20 years), and a stronger increase for COMBI_2 (up to EUR 1 000 for each end user, and almost EUR 2 000 from the societal perspective). Drivers for these cost increases are similar to what was described from a system perspective: the lower vehicle efficiency to

[83] The reduction in activity is due to the increased cost of transportation that results from a shift away from BEV, which are on a TCO-basis the less expensive option for consumers.
[84] The reduction in the activity of cars is only slightly compensated by the switch to other modes such as rail and public road transport

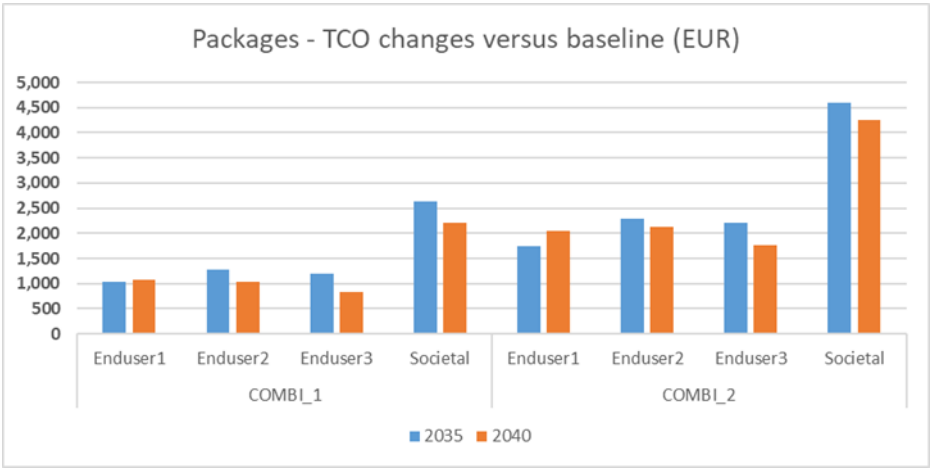
some degree in COMBI_1, and more strongly for COMBI_2, which in turn leads to higher fuel consumption and expenses.

Figure 4: TCO changes against the baseline in the COMBI options (EUR), for cars



As shown in Figure 5, for vans, similar impacts occur, but fuel costs are higher, due to higher mileage, such that additional TCO in the order of magnitude of around EUR 1000 arise for each end user and EUR 2 000 in the societal perspective for COMBI_1, and almost double these extra costs for COMBI_2.

Figure 5: TCO changes against the baseline in the COMBI options (EUR), for vans

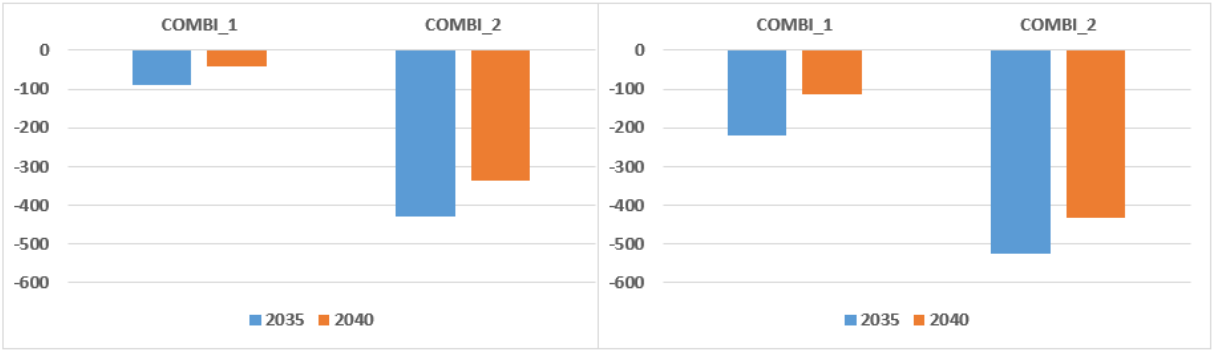


When a variant is considered, whereby manufacturers need to compensate for the OVC-HEV emission using low-carbon steel, in COMBI_1 and COMBI_2, the average cost of a new car would increase by about 40 EUR, with the projected uptake of these vehicles, with the projected share of OVC-HEV. If these shares increase reaching 20% of the fleet, this would drive additional EUR 190 per vehicle.

Costs for automotive manufacturers

The manufacturer costs[85] for COMBI_1 and COMBI_2 are shown in Figure 6, for cars and vans. In both cases, manufacturers face a reduction in costs, compared to the baseline[86].

Figure 6: Average cost differences to baseline for automotive manufacturers (in EUR/vehicle), for cars (l) and vans (r)



6.3.1.2.Energy system and environmental impacts

In both combinations of options, projections show an increase in the energy demand of LDVs, as a decrease in electricity demand is more than offset by an increase in the demand for liquid fuels, for vehicles that are around three times less efficient than BEV.

Notably, the energy demand of LDVs increases by 1% in 2035, 2% in 2040 and 4% in 2050 in COMBI_1. COMBI_2 has a bigger impact on the energy demand, as the LDV demand increase by 2% in 2035, 7% in 2040 and 21% in 2050 due to the target remaining at 90%. In COMBI_1, the demand for liquid fuels is projected to increase by 4% in 2040 and 21% in 2050, while in COMBI_2 by 14% in 2040 and 95% in 2050. However, since the demand for liquid fuels is projected to decrease significantly in the baseline, a higher share does not imply a very high increase in the amount of fuel. In fact, compared to 2015, the energy demand would then decrease by 74% in the baseline, by 73% in COMBI_1 and by 69% in COMBI_2 in 2050.

[85] The costs for automotive manufacturers are calculated as the difference, between the policy options and the baseline, of the manufacturing costs, averaged over the EU-wide new vehicle fleet of cars and vans registered in 2035 and 2040. They depend on the costs of the technologies that they will deploy in the new vehicles fleet to meet the CO_2 targets under the respective scenario conditions.

[86] While the reduction in capital costs presented above (under "adjustment costs") shows the NPV of the cumulative savings of automotive manufacturers (as calculated with the PRIMES-TREMOVE model), this section looks at the same issue from the perspective of a new vehicle sold in a certain year (calculated with the DIONE model). The two sections are fully consistent

Table 5: Changes (compared to the baseline) in the LDV energy demand (ktoe)

Energy demand LDVs (ktoe)	2030	2035	2040	2045	2050
COMBI_1 vs Baseline					
Total	**273**	**1 044**	**1 759**	**1 992**	**2 158**
Electricity	-73	-309	-598	-688	-645
Fossil fuels	286	6	242	300	109
Biofuels	62	1 172	1 183	1 362	1 430
RFNBO	0	201	1 135	1 367	1 788
Hydrogen	-2	-26	-204	-350	-524
COMBI_2 vs Baseline					
Total	**384**	**2 102**	**6 568**	**8 938**	**10 418**
Electricity	-105	-642	-2 178	-3 120	-3 518
Fossil fuels	404	1 157	4 382	4 242	1 381
Biofuels	88	1 422	2 824	4 802	6 720
RFNBO	0	215	2 031	3 895	7 123
Hydrogen	-3	-51	-492	-882	-1 289

These changes in the energy demand lead to an increase in cumulative (2030 to 2050) CO_2 emissions of 0.4 % in COMBI_1 and 5% in COMBI_2. This is equivalent to an increase of 13 Mt CO_2 in COMBI_1 and 168 Mt CO_2 in COMBI_2.

The projected environmental impact is not very high in terms of CO_2 emissions, since the increased number of non-ZEV remaining in the stock of cars are projected to be powered by progressively decarbonised fuel. In a scenario in which the bio- and e-fuel blends do not increase more than the quantities needed to comply with the RED targets, which are set for 2030, the impact are projected to be significantly higher: +2% cumulative CO_2 emission in COMBI_1 and +9% in COMBI_2, equivalent to 60 and 357 Mt CO_2.

The external costs of air pollution are projected to slightly increase but still remain significanlty lower compared to 2015 (see Annex 8 for the complete results).

The introduction of a variant to compensate for the OVC-HEV emission using low-carbon steel would not bring impacts to the energy demand and CO_2 emissions reported in this section, as the relevant changes would happen outside the transport sector. CO_2 savings linked to the switch to low-carbon steel can be expected to be equal to the additional CO_2 emissions of the OVC-HEV registered from 2035.

6.3.1.3.Innovation and competitiveness

Regulatory flexibility in the automotive sector can enhance short-term competitiveness but may weaken long-term innovation. Measures that ease compliance with targets or broaden eligible technologies help manufacturers and SMEs reduce costs, maintain production stability, and safeguard employment, in turn strengthening the sector's industrial resilience in the short- to medium-term. However, these same flexibilities risk diluting incentives for investment in zero-emission technologies and slowing the transition toward electrification, potentially undermining the EU's comparative advantage with global markets (in particular China), in innovation and clean technology exports.

Sustained competitiveness will depend on balancing immediate economic reliefs for manufacturers and suppliers, particularly for SMEs, with clear market signals that continue to support R&D, technological convergence, and leadership in emerging global markets for zero-emission vehicles. Both of the selected combinations of options include elements, which aim to achieve such balance between regulatory flexibility and openness to a broader range of technologies and maintaining the predictability and stability of the long-term signal toward ZEV, in particular through the built-in safeguards (e.g. possible caps).

Cost savings represent a cost competitiveness advantage for manufacturers and support their capacity to invest. As explained in Section 1.1, the Industrial Action Plan for the European automotive sector introduces around 50 flagship actions. The CO_2 standards will not be the only policy tool to support manufacturers competitiveness, profitability and ability to invest, but should be considered as part of a broader policy toolbox.

In terms of impact on the price of the vehicles and BEV in particular, the CO_2 standards drive economies of scale which are expected to lower the prices. This is proven already in 2025 with manufacturers starting to produce affordable model in response to the need to comply with CO_2 standards.

In this context it is also important to stress that: (i) in the options analysed, the flexibilities are capped, so to avoid a negative impact on the economies of scale that are needed, (ii) the assessed flexibilities are optional, and provide for further possibilities for manufacturers to optimise their investments and portfolios depending on their production apparatus, competitive edges and customer bases.

6.3.1.4.Macro-economic impacts, including employment

The GEM-E3 model was used to assess macro-economic and sectoral economic impacts, in particular as regards GDP, sectoral output and employment. The macroeconomic impacts of the combinations remain limited. While there are some positive direct impacts compared to the baseline due to the substitution of EV with ICEV, more domestically produced, as well as an increased switch to renewable fuels reducing import reliance, the model shows that GDP slightly declines compared to the baseline[87] in both scenarios, mainly due to higher expenditure for transportation, leading to higher production costs in Europe and an overall decrease in competitiveness, as well as higher costs of capitals, mainly due to the increase of the capital intensive renewable fuels production requiring significant upfront spendings.

Table 6: Macroeconomic aggregates (% change from baseline)

	2040		2050	
Macroeconomic Aggregates	**COMBI_1**	**COMBI_2**	**COMBI_1**	**COMBI_2**
Gross Domestic Product	-0.02%	-0.04%	-0.04%	-0.12%
Investment	0.02%	0.05%	0.02%	0.12%
Private Consumption	0.00%	-0.04%	-0.01%	-0.04%

[87] At EU level, real GDP is projected to be 23% higher in 2030 than in 2015, 39% higher in 2040, and 60% higher in 2050 compared to 2015.

Total employment is marginally impacted, with minor increases in the short-term and small reductions in the longer-term relative to the baseline. Sectoral employment generally follows the trends in domestic production. Employment in the overall transport equipment sector shows a net positive effect due to the higher domestic content of ICE transport equipment, while sustainable renewable fuels also experience employment gains driven by their increased adoption. The sharpest employment declines are observed in EV equipment, reflecting the substitution towards ICE vehicles, as well as in batteries, due to reduced demand from the EV transport equipment sector. Further details are available in Table 7.

Table 7: Sectoral employment, in selected sectors (% change from baseline)

	2040		2050	
	COMBI_1	COMBI_2	COMBI_1	COMBI_2
Oil	-0.02%	1.18%	0.07%	1.01%
Power Supply	-0.40%	-1.27%	-0.45%	-2.82%
Biofuels and synthetic fuels	5.08%	9.79%	7.67%	28.99%
Hydrogen	-0.52%	-1.13%	-0.32%	-1.53%
Transport equipment (excluding EV)	1.95%	4.56%	1.54%	3.67%
Batteries	-3.67%	-9.17%	-3.28%	-9.86%
EV Transport Equipment	-5.07%	-12.36%	-4.94%	-13.62%
Total	0.002%	-0.002%	-0.054%	-0.178%

Additional considerations on employment in the automotive sector

While jobs in the European automotive industry kept increasing up to 2023, net job losses were announced as of 2024. For instance, German unions estimate that about 50 000 jobs were lost in the country between June 2024 and June 2025[88], while EU vehicle part suppliers report that the sector announced more than 54 000 jobs to be cut in 2024, and 22 000 additional job cuts were announced in the first half of 2025[89] – the job creation in new value chains does not compensate these losses in the automotive supply industry, resulting in net losses.

Overall, these impacts on employment are triggered by different causes, including competitiveness problems, alongside structural production changes that include growing automation and digitalisation, and overcapacity. By contrast, some studies suggest that the shift towards zero-emission mobility has a neutral effect on employment across the entire ecosystem[90], or can even result in higher employment[91], more particularly when battery

[88] Joint Statement by VDA and IG Metall | VDA

[89] Jobs lost, trade in the red: will Europe's auto future be made elsewhere? | CLEPA

[90] Towards net-zero transport: bumpy road ahead | etui- The research project by the European Trade Union institute concludes that "employment loss is a direct consequence of electrification in the powertrain sector and to a smaller extent in automotive manufacturing as such, but the aggregate employment effect for the entire automotive ecosystem is expected to be neutral."

[91] Higher labor intensity in US automotive assembly plants after transitioning to electric vehicles | Nature Communications: –" it has been widely suggested that the transition to BEV will require 30% fewer assembly

production and assembly are included[92]. However, this may still result in disruptions, in particular at local level and in regions that specialised in ICE manufacturing such as Emilia Romagna, Saxony or Bratislava, as production and employment may shift geographically, within and between countries, which very few studies are able to evaluate today[93]. This concerns in particular the ICE value chain, for which the suppliers industry estimate about 501 000 job losses by 2040 with the CO_2 targets currently set out in the CO_2 standards[94], and which is particularly impacting SMEs related to ICE compenents that could face closure[95]. Some further flexibilities in the transition may help to mitigate local or national impacts, in particular in the ICE value chain for the suppliers industry, including SMEs, that could still benefit from a local market of new vehicles fitted with an ICE on top of producing for the aftermarket and for export markets.

6.3.1.5.Social Impacts

The main element considered regarding social impacts is whether and to what extent the policy combinations affect different population groups differentiated according to their income. Therefore, building on the TCO analysis for first and second users, this analysis looks at the impacts on the welfare of consumers, taking into account the particular characteristics of different income groups (five quintiles Q1-Q5, with Q5 having the highest income). It also looks at the affordability of ZEV in the different income groups.

Across all scenarios, affordability patterns differ markedly between first, second, and third users and, within each user group, are shaped mainly by vehicle size and, to a lesser extent, by powertrain type. Average vehicle affordability remains broadly stable over time among the different scenarios, with only a few isolated changes. Cars in vehicle segments that in the baseline are not affordable for certain income groups, remain so in the other scenarios. For example, the lowest income quintile continues to face affordability issues as first users of cars.

From a subjective TCO perspective, all income groups face increases in ownership costs relative to their annual income (compared to the baseline), reflecting the slightly higher share of ICEVs in the fleet (with higher operating expenditures) under both COMBI_1 and COMBI_2 compared with the baseline. These cost increases are larger for lower-income groups, as the same absolute changes represent a higher share of their income. Between 2030 and 2035, cost increases become more pronounced for all income groups, and by 2040, they stabilise, with some small variations depending on the combination and income level.

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workers than those needed for ICE". However, based on publicly available datasets on vehicle production and employment, labour intensity has actually increased at U.S. vehicle assembly plants that have fully transitioned to assembling BEV.

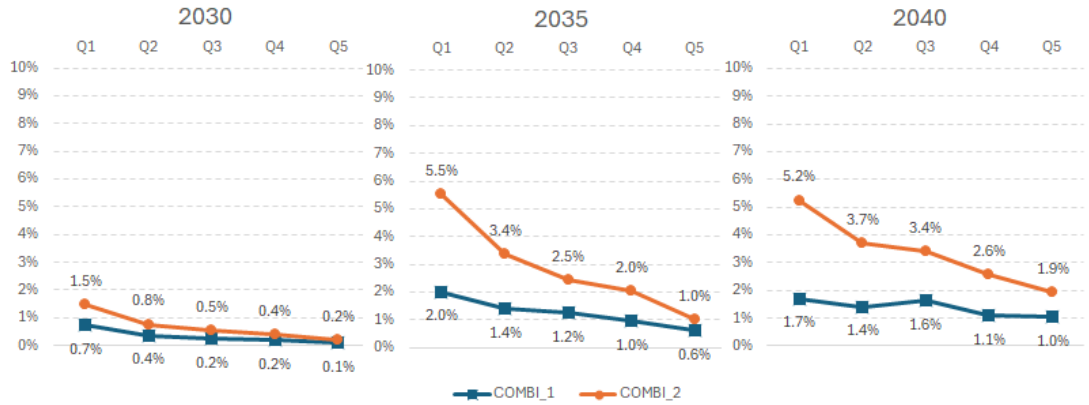
[92] The transition to electrified vehicles: Evaluating the labor demand of manufacturing conventional versus battery electric vehicle powertrains by Turner Cotterman, Erica R.H. Fuchs, Kate Whitefoot, Christophe Combemale :: SSRN (Social Science Research Network)

[93] Towards net-zero transport: bumpy road ahead | etui

[94] Employment-tracker-update_22.10.2024_3.pdf

[95] The future of the automotive value chain (EN)

Figure 7: Average "subjective TCO" changes (% of annual income) for income groups in COMBI_1 and COMBI_2 for a new car purchased in 2030, 2035 and 2040[96]



6.4. Financial support via the use of fines

Under option REV_IF, the possible revenue from excess emission premiums would be assigned to the Innovation Fund (IF)[97], which supports inter alia innovative low-carbon technologies and clean mobility projects. When launching calls for proposals, part of the IF could be allocated to support specific types of projects, including in areas such as clean mobility, batteries, and related technologies, with this allocation clearly indicated in the call. This part would be supplemented by amounts derived from fines. However, the IF has already allocated a significant amount of money for the battery value chain and the Battery booster initiative includes a comprehensive set of actions aimed to contribute to this objective.

Under option REV_SCF, the revenue from the excess emission premiums would be assigned to the Social Climate Fund (SCF), for projects related to zero-emission mobility. Redirecting the revenue of the excess emissions premia to the SCF would provide additional opportunities to incentivise a mass market of zero-emission powertrains, which in turn can help manufacturers meet their CO_2 targets (SCF).

In relation to both options, it should be noted that the overall impact of the additional revenue generated is expected to be limited, considering that the CO_2 emission performance standards Regulation provides a framework for manufacturers to meet their specific emission targets and does not aim at raising revenues. Assigning the revenue to a specific fund and distributing the additional resources may slightly increase the administrative burden, compared to the current situation where the revenue goes to the general EU budget.

[96] Positive values represent cost increases. Assumptions used to calculate the average TCO savings: all Q1 are 3rd users, 50% of Q2 are 3rd users and 50% are 2nd users, Q3 are all 2nd users, 50% of Q4 are 2nd users and 50% are 1st users, Q5 are all 1st users.
[97] As established by Article 10a(8) of Directive 2003/87/EC

6.5. Vehicle labelling

6.5.1. Impacts on information provision to consumers

The main aspects considered are whether the information provided through vehicle labelling is useful to influence consumer choices, allows comparison among different vehicles choices, and is tailored to consumers' needs. These impacts could only be assessed in a qualitative manner[98], since it is not possible to disentangle the vehicle labelling's specific contribution to consumers behaviour in a quantitative way. In addition, how many additional consumers, i.e. potential buyers of zero-emission cars, vans and second-hand vehicles, can be informed via the vehicle labelling is also considered.

Option LAB_1 has a strong positive impact on the different aspects explained above concerning the information provided to consumers. The full harmonisation of the vehicle label, based on the well-established design of the energy label, makes the information more understandable by potential buyers and more easily comparable between different vehicles. The improved information on ZEV helps consumers access the information they need to compare these vehicles with other powertrains, thus supporting informed purchase decisions and increasing consumers' confidence in this relatively new technology. The link to a database with additional information gives consumers further detailed information to meet specific needs they may have. This option also reaches more potential vehicle buyers than the baseline option.

Option LAB_2 has a stronger positive impact than LAB_1, as it covers nearly all potential vehicle buyers due to the extension of the scope to all second-hand vehicles.

6.5.2. Economic, Social and Environmental Impacts

Compliance costs for businesses

For vehicle manufacturers, their affiliated dealers and independent car dealers, compliance costs include the cost for providing the necessary information for the vehicle label and for displaying it. These costs have been calculated as the NPV of the total additional costs (compared to the baseline) to be incurred over the period 2029-2040 (see also Annex 4). For the baseline option, the net compliance cost for businesses is approximately EUR 3 per new vehicle sold[99].

For option LAB_1, the additional compliance cost for businesses amounts to EUR 243 million. The increase in the cost is due to the extension of the scope. These additional costs are partially compensated by the full harmonisation of the label, resulting in simplification compared to a different label in each Member State, and the removal of the

[98] In general, it is not possible to establish a causal link between legal provisions on providing consumer information and changes in consumer behaviour, since the consumers' decision may be influenced by many other factors than the specific information provided via a label or other channels – such as price and personal preferences. This makes it hard to disentangle the specific effect that the vehicle labels may have on purchasing or leasing choices.

[99] See SWD(2025)155 Evaluation of Directive 1999/94/EC of the European Parliament and of the Council relating to the availability of consumer information on fuel economy and CO_2 emissions in respect of the marketing of new passenger cars, page 12

obligation to display a poster in showrooms. Hence, the resulting cost savings for businesses of EUR 100 million bring the additional net compliance costs for businesses to EUR 143 million. In summary, the additional cost of LAB_1 is not more than EUR 1 per new vehicle sold.

For option LAB_2, next to the abovementioned costs and savings, there are additional costs due to the scope extension to all second-hand vehicles. This results in an additional net compliance cost for businesses of EUR 437 million, or not more than EUR 3 per new vehicle sold.

Under both options considered, the administrative burden for vehicle dealers is significantly reduced thanks to the harmonisation of the vehicle label. Whereas currently, car dealers have to create and print nationally determined labels based on information they receive from manufacturers, both options introduce **simplification** by having one single vehicle label model that is applied across all Member States.

Impacts on SMEs

For option LAB_1, the simplification of the label reduces administrative burden for all dealers, of which the largest part are SMEs. For option LAB_2, the impact on SMEs is somewhat negative, due to the extension of the scope to second-hand vehicles, which has a bigger impact on SMEs in relative terms due to a need for additional systems and procedures for information collection.

Implementation costs for national authorities

For option LAB_1, the harmonisation removes the need for developing a national label design and this results in net cost savings for national authorities of EUR 10 million. For option LAB_2, the extension of the scope to all second-hand vehicles brings higher enforcement costs and this leads to a small net cost of EUR 7,5 million for national authorities.

Environmental and Social Impacts

Both options may support an increased demand for ZEV, which results in less CO_2 and pollutant emissions than under the baseline option. The impacts are higher for option LAB_2 due to the additional coverage of second-hand vehicles. For both options, impacts on employment and vulnerable consumer groups were found to be minimal.

7. HOW DO THE OPTIONS COMPARE?

The options are compared against the following criteria: effectiveness, efficiency, coherence, proportionality.

This comparison is done for (i) the two combinations of options related to the targets and flexibilities, (ii) the two options concerning the financial support via the use of fines and (iii) the two options regarding vehicle labelling. Table 8 summarizes this assessment.

Table 8: Summary of key impacts expected

--	-	**0**	+	++

Strongly negative	Weakly negative	Neutral	Weakly positive	Strongly positive

Options considered	*Effectiveness*	*Efficiency*	*Coherence*	*Proportionality – added value*
1. COMBINATIONS OF OPTIONS CONCERNING TARGETS AND FLEXIBILITIES				
COMBI_1	+	+	+	**0**
COMBI_2	+	-	**0**	**0**
2. FINANCIAL SUPPORT VIA USE OF FINES				
REV_IF	**0**	+	+	+
REV_SCF	**0**	++	+	+
3. VEHICLE LABELLING				
Lab_1	+	+	+	+
Lab_2	++	0	+	+

7.1. Combinations of options related to targets and flexibilities

Comparison of the two combinations of options (COMBI_1 and COMBI_2), is done in relation to specific objectives 1-4 of this initiative, taking into account the delicate balance sought between those objectives.

Effectiveness

Option COMBI_1 adds **flexibility** for van manufacturers in the period 2030-2034, but maintains the 100% reduction targets for both cars and vans for 2035. Therefore, compared with option COMBI_2, which modifies the 2035 targets, option COMBI_1 has a stronger focus on **maintaining the contribution of the CO_2 standards towards the climate targets set in the EU Climate Law and the certainty and predictability for manufacturers and investors in the zero-emission mobility value chain** . For the period starting in 2035, both options provide openings for more **technology options** for vehicle manufacturers by accounting well-performing OVC-HEV and vehicles running exclusively on SRF as emitting 0 g/km. This will stimulate (limited) investments in combustion engines in the longer term, possibly supporting the competitiveness of some European manufacturers in other markets. Option COMBI_2 adds further flexibility through the reduced 2035 target and a more relaxed cap for the OVC-HEV and VEEF options. In addition, car manufacturers that put a higher share of small ZEV on the market, would benefit more than under option COMBI_1 due to a higher multiplier and a higher cap.

Option COMBI_2 may seem more **effective** in providing manufacturers with more flexibility in their options to comply with the CO_2 emissions standards, while also opening slightly more options in terms of technologies, including in the longer term. However, by reducing the 2035 targets, option COMBI_2 weakens further the signal for investments in zero-emission mobility. This is particularly relevant for the associated value chain, including recharging infrastructure operators and the battery value chain as the number of zero-emission vehicles on the road will be lower, also in the longer term, which jeopardises the business case for investments.

As shown in the assessment, the **climate implications** of both options are limited. The increase in cumulative (2030 to 2050) CO_2 emissions is 0.4 % (13 Mt CO_2) in COMBI_1 and 5% (168 Mt CO_2) in COMBI_2. This is due to the design of the options, aiming at preserving the necessary longer term predictability by limiting the changes in target levels and providing for safeguards by capping the flexibilities. Climate impacts are further limited by the fact that the non-ZEV are projected to be powered by fuels that are progressively decarbonising. In this respect, the foreseen safeguards are also essential in view of the limited availability of SRF, to avoid competing uses and displacement from uses in other sectors. Also, the importance of option OVC-HEV_2 should be recalled, which requires additional technical parameters to be met by the OVC-HEV in order to be eligible for the flexibility. This should ensure that the vehicles are primarily used in zero-emission mode and therefore minimise the climate impacts of this flexibility.

Efficiency

Although both COMBI_1 and COMBI_2 result in greater adjustment costs, the total costs of COMBI_1 do not show significant changes compared to the baseline. For COMBI_2 there is a more significant increase in total costs which makes it **less efficient**, as indicated by its lower benefits/cost ratio (0.3) compared to COMBI_1 (0.5), see Table 4. Option COMBI_2 also comes with higher costs (TCO) for end users. The findings from the economic assessment underline the importance of setting caps to limit the negative impact on the cost-efficiency.

Coherence

Option COMBI_2 gives greater freedom to vehicle manufacturers for adopting the technologies they see fit to reach their CO_2 targets. In addition, Option COMBI_1 is more **coherent** with the climate objectives as it results in less CO_2 emissions than COMBI_2 and it maintains a strong signal for the longer term needs and investments in the zero-emission value chain. While in both combinations the overall impacts are limited, COMBI_2 entails a higher risk of increased emissions in case the higher number of non-ZEV would not be powered by progressively decarbonised fuels[100] and in case the flexibilities are used to the full extent. At the same time, COMBI_1 is also **more coherent** with the objectives of the Air Quality Directive and the National Emission reduction Commitments Directive than COMBI_2, as it limits further the number of non-zero-emission vehicles put on the market as from 2035.

Proportionality

COMBI_1 and COMBI_2 do **not change the fundamental approach** of the instrument - including as regards the role of the Commission, the Member States or the regulated entities (manufacturers) - which has been functioning in this way for nearly 15 years. Also, these combinations of options do not bring significant additional **administrative burden**, nor simplification, and present no differences in that respect. Therefore, the score on proportionality of both options is neutral.

[100] The Renewable Energy Directive does not currently set targets post 2030.

7.2. Financial support via the use of fines

Assigning the revenue from any fines collected under the Regulation to the Innovation Fund (REV_IF) or Social Climate Fund (REV_SCF) should be seen in the context of supporting the transition to zero-emission mobility. These options would allow the excess emissions premiums to be perceived more as a tool to support the sector in transitioning, and not merely as a deterrent to avoid non-compliance. The two options are therefore compared in relation to the first specific objective of this initiative. As the Regulation's aim is to create a framework for manufacturers to meet their specific emission targets and thus to reduce CO_2 emissions from passenger cars and vans, overall, the additional revenue generated is expected to be limited, variable and uncertain as it will depend on whether and how much manufacturers will exceed their targets. Therefore, the **effectiveness** of the two options is rather limited.

Option REV_IF would increase the administrative burden to manage uncertain additional funding for the IF calls. This makes it score lower in terms of **efficiency** and **proportionality – added value**. Putting option REV_SCF into practice would be less cumbersome and the earmarking would not cause additional administrative burden.

The objectives of the two funds are very different: the IF, as in general all the innovation policies, would clearly improve long-term economic efficiency as demonstrated by different studies. The SCF offers short-term decarbonisation opportunities to vulnerable citizens.

Option REV_IF would mean that any revenues from fines – which are by nature annual and uncertain – would be added to the amounts available under the Innovation Fund. The IF works on the basis of calls organised to stimulate innovation for specific technologies. These calls are organised every few years, with focus on certain innovative technologies (e.g. batteries). The calls rely on bids proposed by the industry, which often correspond to large industrial projects that have been designed with a certain innovation objective in mind. In this context, it may be difficult to complement such projects to reflect evolving available amounts in the Fund, which would mean that specific calls in relation to the automotive sector would need to be launched taking into account the uncertainty of possible additional funding, that project promoters would also need to factor in that uncertainty. This would entail additional administrative burden to plan calls, as well as to draft and analyse bids, in a way that reflects such situation.

Option REV_SCF can, on the other hand, benefit from the comparatively more flexible structure of decision-making under the SCF. SCF investments are based on Plans proposed by Member States to address energy and transport poverty on their territory. Such investments are typically scalable, as they would generally rely on a quantified number of small operations – for instance, a support scheme for the purchase of zero-emission vehicles in a given Member State could be based on a central scenario with 10 000 vehicles supported, but could easily be scaled up to 15 000 vehicles in case more budget is available – this possibility can be planned under the proposed Plans. The SCF structure, with disbursements based on quantitative milestones, can cater for such situations, taking into account that SCF amounts may change depending on whether additional funds are made available by Member States themselves, on when the ETS2 starts operation, and through possible revisions of Plans over time.

In this context, administrative aspects linked to dealing with potential additions of budget under the SCF would appear less cumbersome and would not cause additional administrative burden.

In terms of **coherence**, the options score equally. REV_IF may lead to additional support for projects in the fields of vehicle batteries or recharging infrastructure, which would fit with the objectives of the vehicle CO_2 emission standards. REV_SCF may provide additional support for zero- and low-emission mobility solutions for households in transport poverty. In light of the increasing number of projects supporting the zero-emission mobility being implemented across Member States, it would seem more appropriate to direct revenues generated from fines towards reinforcing the SCF, without additional complexity for the distribution among MS. Allocating these resources to the Fund would enhance its capacity to support vulnerable households and communities in the transition towards sustainable mobility. Such an approach would ensure coherence with existing social measures while promoting a just and equitable implementation of the Union's climate objectives.

7.3. Vehicle labelling

The two options related to vehicle labelling are compared in relation to the third specific objective of this initiative.

Option LAB_2 scores better on **effectiveness** as it covers more vehicles than option LAB_1, which means that the information in the label and promotional material will reach more potential buyers of second-hand ZEV. However, as option LAB_2 comes with a slightly higher cost for businesses, it does not score as good in terms of **efficiency** as option LAB_1. Both options LAB_1 and LAB_2 address the findings of the Evaluation.

LAB_2 addresses all second-hand cars and vans offered for sale or lease by professional retailers, including those first registered **before** the legislation will enter into force, whereas LAB_1 is limited to those first registered in the EU **after** the entry into force of the legislation.

The additional number of consumers reached under LAB_2 compared to LAB_1 is estimated as 17 million in the first year. In total, 145 million additional second-hand vehicle buyers would be reached by LAB_2 compared to LAB_1 over the period 2029-2040.In this context, LAB_2 allows to reach a significantly higher number of buyers over the period.

For both options, compared to the baseline (current Directive), extending the scope to cover second-hand vehicles will introduce some costs for all dealers that are active in the second-hand vehicles market and for training of selected staff for these dealers that do not have previous experience with the car label. The cost difference between LAB_1 and LAB_2 comes from gradually introducing the ongoing cost for printing and affixing the labels for LAB_1 rather than for all second-hand vehicles at once for LAB_2:

- For LAB_1: NPV calculated from 2029 to 2040 is EUR 205.4 million, assuming a linear increase of annual costs from EUR 0 in 2029 to EUR 23.9 million in 2040, with an average of EUR 12 million over that period;

- For LAB_2: NPV calculated from 2029 to 2040 is EUR 499.4 million, assuming a constant cost of EUR 43.5 million per year over that period.

The additional cost per label for printing and affixing is estimated to be EUR 2.6 for both options.

Both options are **coherent** with other EU legislation as they support manufacturers in meeting their CO_2 emission targets by providing more adequate information regarding ZEV. The parameters to be used for informing potential buyers are all based on type-approval data required by the EU type-approval legislation. Also, the harmonised vehicle label design will be based on that of the Energy Labelling Regulation.

Regarding **proportionality – added value**, both option LAB_1 and LAB_2 ensure that the harmonisation of the label design effectively leads to simplification. Although it brings more administrative burden for vehicle dealers, option LAB_2 adds further value for potential buyers of second-hand vehicles.

8. PREFERRED OPTION

Based on the analyses in this impact assessment and on the comparisons of options set out in section 7, the following options are preferred.

Regarding the combinations of options concerning targets and flexibilities, the preferred option appears to be **COMBI_1**. Both combinations of options assessed provide for more technology neutrality and flexibility. However, COMBI_1 allows for a higher contribution of the LDV CO_2 standards towards the climate targets set in the EU Climate Law and also provides more certainty and predictability for manufacturers and investors in the zero-emission mobility value. It scores significantly better in terms of benefits/costs ratio.

Regarding the financial support via the use of fines, **REV_SCF** is the preferred option. Both options assessed appear equally coherent and come in support of the transition to zero-emission mobility. However, REV_SCF may bring more direct benefits to the automotive sector.

Regarding vehicle labelling, option **LAB_2** is the preferred option, since it covers more vehicles, which means that the information in the label and promotional material will reach more potential buyers of second-hand ZEV, and as a result brings more effectiveness, despite a slightly higher cost for businesses when expressed per label.

REFIT (simplification and improved efficiency)

As regards the CO_2 standards Regulation, no REFIT evaluation could be performed, due to the need to accelerate the review to provide predictability for investors and manufacturers, as underlined in the Industrial Action Plan for the European automotive sector. For vehicle labelling, the preferred option LAB_2 contributes to simplification and improved efficiency of the current Car labelling Directive by harmonisation of the label design, in line with its evaluation.

9. HOW WILL ACTUAL IMPACTS BE MONITORED AND EVALUATED?

A well-established system is in place for monitoring the implementation of the legislation and its impact. The legislation will continue to rely on this well-established monitoring and compliance framework.

9.1. Indicators

For the specific policy objectives the following core monitoring indicators have been identified:

1. **Provide more flexibility for manufacturers to meet their CO_2 emission targets, while maintaining the integrity of the system**

   - The EU fleet average CO_2 emissions will be monitored annually, on this basis it will be possible to monitor the usage and role of the flexibilities for manufacturers compliance.

2. **Enhance technology neutrality of the CO_2 emission standards, while maintaining the indispensable certainty and predictability for manufacturers and investors in the zero-emission mobility value chain**

   - The industrial innovation spendings in zero-emission and non-zero-emission technologies in the EU will be monitored from public information shared by industrial actors from different relevant sectors.

   - The number and share of zero-emission and non-zero-emission vehicles will be monitored through the annual monitoring data.

3. **Better serve potential zero-emission vehicle buyers by providing them with adequate information, consequently supporting manufacturers' compliance with CO_2 standards**

   - Consumer organisations will be consulted to provide views on whether the information provided by the vehicle labelling is adequate.

9.2. Operational objectives

Based on the policy options, the following operational objectives have been identified:

Operational objective	**Indicators**
Reach CO_2 targets with support from the additional flexibilities.	Compliance of manufacturers with their specific emissions targets
Ensure that EU industry can keep investing in non-zero-emission technologies while still providing certainty and predictability on what concerns zero-emission technologies.	Innovation spendings in non-zero and zero-emission technologies, as well as share of zero-emission vehicles and deployment of related charging infrastructure.

Ensure that vehicle buyers have access to adequate information before purchasing a vehicle.	Feedback from consumer organisations on the adequateness of the label.