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First Flood Risk Mangement Plans - Member State: The Netherlands

Accompanying the document

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL

on the implementation of the Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC)
Second River Basin Management Plans
First Flood Risk Management Plans

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Acronyms

APSFR	Areas of Potential Significant Flood Risk
CBA	Cost-Benefit Analysis
EEA	European Environment Agency
FD	Floods Directive
FHRM	Flood Hazard and Risk Map
FRMP	Flood Risk Management Plan
NGO	Non-Governmental Organisation
NWRM	Natural Water Retention Measures
PFRA	Preliminary Flood Risk Assessments
PoM	Programme of Measures
RBD	River Basin District
RBMP	River Basin Management Plan
SEA	Strategic Environmental Assessment
UoM	Unit of Management
WFD	Water Framework Directive
WISE	Water Information System for Europe

Introduction

The Floods Directive (FD) (2007/60/EC) requires each Member State (MS) to assess its territory for significant risk from flooding, to map the flood extent, identify the potential adverse consequences of future floods for human health, the environment, cultural heritage and economic activity in these areas, and to take adequate and coordinated measures to reduce this flood risk. By the end of 2011, Member States were to prepare Preliminary Flood Risk Assessments (PFRAs) to identify the river basins and coastal areas at risk of flooding (Areas of Potential Significant Flood Risk – APSFRs). By the end of 2013, Flood Hazard & Risk Maps (FHRMs) were to be drawn up for such areas. On this basis, Member States were to prepare Flood Risk Management Plans (FRMPs) by the end of 2015.

This report assesses the FRMPs for the Netherlands[1]. It assesses the FRMPs and Member State reporting to the European Commission in 2016. Its structure follows a common assessment template used for all Member States. The report draws on two main sources:

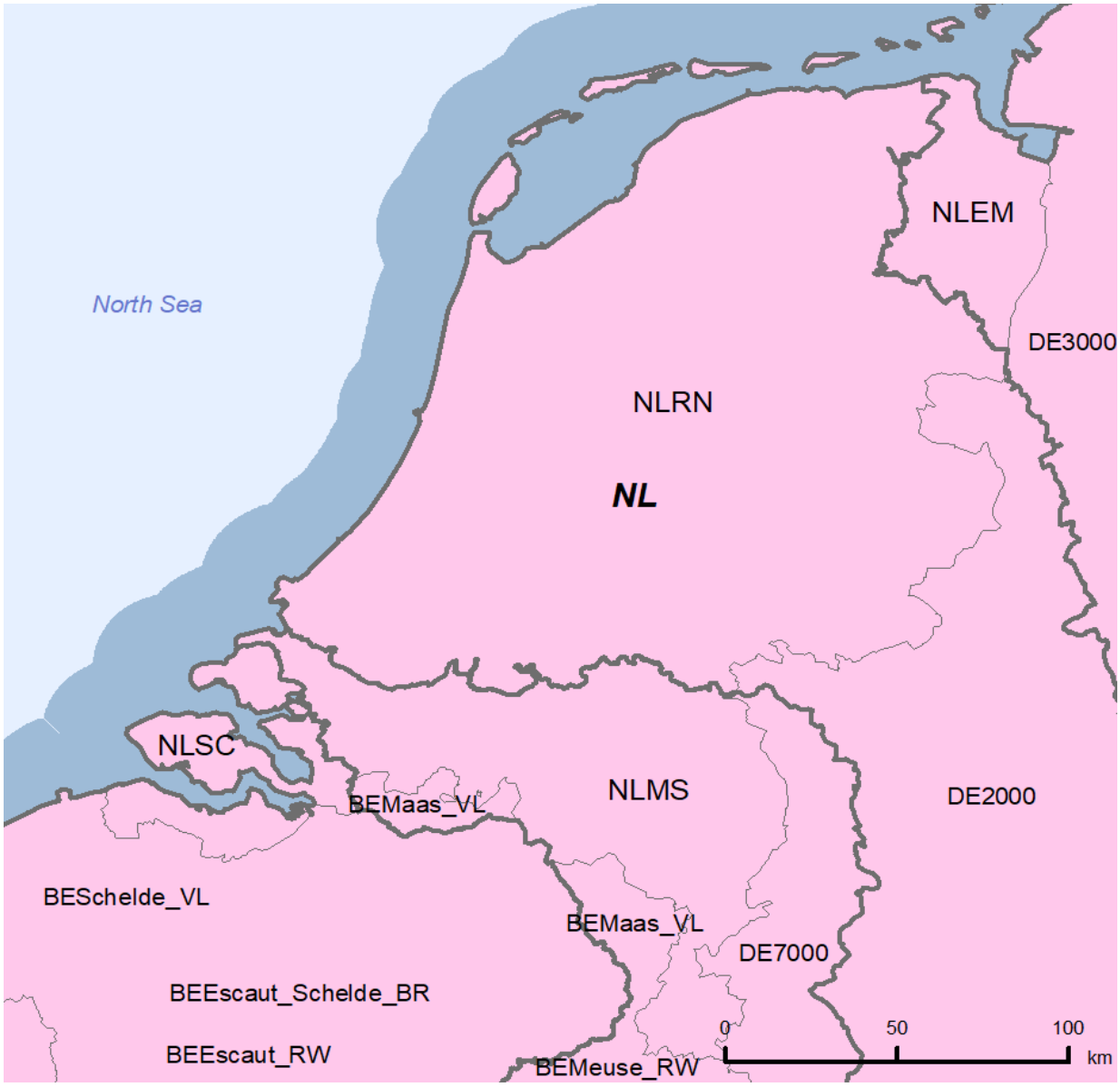
- Member State reporting to the European Commission on the FRMPs[2] as per Articles 7 and 15 of the FD: this reporting provides an overview of the plans and details on their measures
- Selected FRMPs: the Netherlands has reported four FRMPs. All four have been considered in the assessment.

[1] The present Member State assessment reports reflect the situation as reported by each Member State to the Commission in 2016 or 2017 and with reference to FRMPs prepared earlier. The situation in the MSs may have altered since then.

[2] Referred to as "Reporting Sheets" throughout this report. Data must be reported in a clear and consistent way by all Member States. The format for reporting was jointly elaborated by the Member States and the Commission as part of a collaborative process called the "Common Implementation Strategy": http://ec.europa.eu/environment/water/water-framework/objectives/implementation_en.htm
Whereas a key role of the Commission is to check compliance with EU legislation, the Commission also seeks information to allow it to determine whether existing policies are adequate. It also requires certain information to create a European-wide picture to inform the public.

Overview

Figure 1 Map of Units of Management/River Basin Districts



International River Basin Districts (within European Union)
International River Basin Districts (outside European Union)
National River Basin Districts (within European Union)
Countries (outside European Union)
Coastal Waters

Source: WISE, Eurostat (country borders) as presented in the 2012 RBMP assessment reports

The Netherlands has designated four Units of Management (UoMs) under the Floods Directive, with one FRMP for each UoM. The four UoMs correspond to the River Basin Districts (RBDs) designated under the Water Framework Directive.

The FRMPs are part of the National Water Plan (2016-2021), which was approved by the (at that time) Ministry of Infrastructure and Environment and the Ministry of Economic Affairs.

The table below gives an overview of the four UoMs in the Netherlands, including the UoM code, the name, and the number of APSFRs reported. It also shows if all documents required for each UoM were submitted to European Environment Agency's (EEA) WISE[3] – the FRMP as a PDF and the reporting sheet as an XML.

Table 1 Overview of UoMs in Netherlands

UoM	Name	Number of APSFRs	XML reported	PDF Reported
NLEM	EMS	No ASPFR assigned (Art. 13.1b applied)	Yes	Yes
NLMS	MEUSE	No ASPFR assigned (Art. 13.1b applied)	Yes	Yes
NLRN	RHINE	No ASPFR assigned (Art. 13.1b applied)	Yes	Yes
NLSC	SCHELDT	No ASPFR assigned (Art. 13.1b applied)	Yes	Yes

The FRMPs can be downloaded from the following web page:

- https://www.helpdeskwater.nl/onderwerpen/wetgeving-beleid/eu-richtlijn/overstromingsrisico/

Overview of the assessment

The table below gives an overview of the evidence found during the assessment of the FRMPs. The following categorisation was used for the column concerning evidence:

- **Evidence to the contrary**: An explicit statement was found stating that the criterion was not met.
- **No evidence**: No information found to indicate that the criterion was met.
- **Some evidence:** Reference to the criterion is brief and vague, without a clear indication of the approach used for the criterion. Depending on the comment in the adjacent column, "some evidence" could also be construed as "weak evidence".
- **Strong evidence:** Clear information provided, describing an approach followed in the FRMP to address the criterion.

[3] http://rod.eionet.europa.eu/obligations/603/deliveries?id=603&tab=deliveries&d-4014547-p=1&d-4014547-o=2&d-4014547-s=3

Table 2 Overview of the evidence found during the assessment of the FRMPs

Criterion	Evidence	Comments
FRM objectives have been established	Strong evidence	The Netherlands has set common objectives for all FRMPs at national level for protection against floods, prevention of their consequences and for crisis management. Moreover, the FRMPs refer to long-standing Dutch legal requirements for flood protection, such as the national safety standards for flood protection works.
FRM objectives relate to...		
...the reduction of potential adverse consequences	Strong evidence	One common objective in the FRMPs is the prevention of the consequences of flooding.
...the reduction of the likelihood of flooding	Strong evidence	The FRMPs include a common objective to protect against flooding. Moreover, the FRMPs cite long-standing legal protection standards in the Netherlands, including new safety requirements for flood protection works.
...non-structural initiatives	Strong evidence	One of the three themes of the national objectives is crisis management. Moreover, an objective on prevention refers to limiting flood impacts via spatial planning.
FRM objectives consider relevant potential adverse consequences to...		
...human health	Some evidence	The objectives themselves do not explicitly refer to human health, but they refer to national legal protection standards that do so (notably, the Delta Programme standard that the probability that an individual dies as a consequence of the risk of flooding must not exceed the 1:100.000 per year by 2050). Moreover, the FRMPs state that the objectives address human health.
...economic activity	Some evidence	The objectives do not explicitly refer to economic activity, though this is a key aim of flood risk management in the Netherlands, such as flood safety rules cited in the FRMPs. Moreover, the FRMPs state that the

Criterion	Evidence	Comments
		objectives refer to economic activity.
...environment	Some evidence	Although the objectives set out in the FRMPs do not refer directly to the environment, the FRMPs state that the objectives address this. Netherlands' reporting sheets highlight that the National Water Plan includes a healthy ecosystem as part of its main goal[4]. Moreover, in the "Room for the River" approach, synergy is sought between flood risk reduction and environmental values,
...cultural heritage	Some evidence	The objectives themselves do not explicitly refer to cultural heritage, but the FRMP's text indicates that this is addressed by the flood objectives.
Measures have been...		
...identified	Strong evidence	The Netherlands has reported 116 aggregated measures and no individual measures. The Netherlands has reported measures across all four aspects of flood risk management, with the majority of measures (68 of 116, 59 %) for protection.
...prioritised	Strong evidence	The Netherlands has reported high priority for 108 of its 116 measures, very high priority for four measures and moderate priority for four measures.
Relevant aspects of Article 7 have been taken into account such as...		
...costs & benefits	Some evidence	The four FRMPs assessed refer to cost benefit as a criterion for the establishment of priorities for the selection of measures. Specifically, they refer to the use of CBA for previous plans and programmes and indicate that the FRMPs were built on these results; however, details are lacking on the methodology and outcomes as well as the use

[4] The Netherlands subsequently remarked that by taking measures to protect lives and the economy, the environment is automatically included and that the environment was also included in the FHRMs.

Criterion	Evidence	Comments
		of the previous CBA work in the FRMPs themselves[5].
...flood extent	Strong evidence	Flood extent is addressed in the digital maps, whose links are provided in each of the assessed FRMPs.
...flood conveyance	Strong evidence	A reference to conveyance routes is found in all four FRMPs. In particular, conveyance (*afvoer van hoogwater*) is mentioned throughout the Rhine FRMP (NLRN and also in the Meuse, which highlights that rivers need more space (so called *Uiterwaarden*) to allow the evacuation of water.
...water retention	Strong evidence	The Netherlands has had a long-standing programme to implement 'Room for the River', and measures are included in the FRMPs.
...environmental objectives of the WFD	Some evidence	There is a reference in each of the FRMPs that synergies with the objectives of WFD were sought in the measures. However, there is a lack of further evidence (e.g. FD measures that point explicitly towards contributing to the WFD)
...spatial planning/land use	Strong evidence	Spatial planning and land use is being considered in the FRMPs. (These aspects were already included in earlier programmes that formed the basis for the FRMPs.)
...nature conservation	Some evidence	All FRMPs state in general terms that synergies exist between flood protection and nature in the implementation of measures, though specific details are not provided.
...navigation/port infrastructure	Some evidence	All four FRMPs assessed make a brief reference that they take into consideration navigation and port infrastructure.
...likely impact of climate change	Strong evidence	The FRMPs provide information on potential climate impacts and contain measures that consider climate change. The FRMPs

[5] The Netherlands subsequently clarified that the FRMP (page 50, 'geschiedenis van de normering') described that the flood standards (and the new flood standards adopted in 2017) are based on CBA.

Criterion	Evidence	Comments
		moreover underline that climate considerations are implicit in their overall approach to flood risk management.
Coordination with other countries ensured in the RBD/UoM	Strong evidence	All four FRMPs refer to active coordination with neighbouring Member States, both within international river basin commissions as well as bilaterally.
Coordination ensured with WFD	Strong evidence	The same authorities developed both the RBMPs and FRMPs, and the FRMPs indicate that coordination was ensured through several mechanisms, including the identification of synergies between measures.
Active involvement of interested parties	Some evidence	The reporting sheets note that the FRMPs were developed on the basis of earlier plans and programmes, which themselves underwent a broad consultation with the public, NGOs, the private sector and government authorities. For this reason, government authorities were mainly involved in the actual development and drafting of the FRMPs.

Good Practices

The assessment identified the following good practices in the Dutch FRMPs assessed.

Table 3 Good practices in the Dutch FRMPs

Topic area	Good practices identified
Integration of previously reported information in the FRMPs.	Each of the FRMPs contains a separate document on international coordination, indicating how the Netherlands has coordinated with neighbouring Member States on flood risk areas.
Setting of objectives for the management of flood risk.	Common, national safety levels have been identified and are used to assess the safety of flood protection infrastructure and to guarantee the same level of safety for all citizens.
Planning/implementing of measures and their prioritization for the	The FRMPs provide a clear indication of funding sources for the measures, even though the overall budget is not provided. All measures are linked to one of the seven national objectives set for

Topic area	Good practices identified
achievement of objectives.	the FRMPs. The FRMPs include measures for spatial planning and natural water retention, continuing the work of the Netherlands in these approaches to flood risk management
Consideration of climate change in the FRMPs assessed.	The FRMPs provide an overview of projected climate impacts, include measures that address climate change or moreover indicate that climate is considered in the overall approach to flood risk management.
Public participation.	Two websites were created to raise awareness and provide public information on the FRMPs and related flood information, including the FHRMs.

Areas for further development

The assessment identified the following areas for further development in the Dutch FRMPs assessed.

Table 4 Areas for further development in the Dutch FRMPs

Topic area	Areas identified for further development
Setting of objectives for the management of flood risk.	The objectives in the FRMPs are not specific or measurable, though the FRMPs refers to other national flood targets, such as the national safety levels, that are specific and measurable. The information on these earlier plans and policies is limited in the FRMPs and the FRMPs themselves do not describe the process for setting objectives, nor the links between their objectives and other existing in parallel policy objectives and targets for flood risk management in the Netherlands.
Planning/implementation of measures and their prioritization for the achievement of objectives.	The FRMPs do not contain detailed information on costs of measures in the UoM. Each FRMP describes in very general terms what the measures are trying to achieve, where they are to be achieved and how they are to be achieved: Consequently, the measures are not specific or measurable in terms of quantifiably contributing towards achieving the objectives set. The FRMPs provide brief information on the process for monitoring existing programmes, but do not clearly explain how the measures themselves will be monitored, nor indicate if a baseline is used.
Use of cost-benefit analysis (CBA) in the FRMPs assessed.	While the Netherlands undertook a detailed CBA for prior flood programmes, it is not clear from the FRMPs, or the reporting sheets, how this information was used for the FRMP's measures and little information is provided on the methodology.

Topic area	Areas identified for further development
Consideration of climate change in the FRMPs assessed.	No reference in the FRMPs assessed to the national climate change adaptation strategy.
Public participation.	The FRMPs indicate that the public, NGOs and the private sector were not actively involved in their preparation, since previous flood programmes had employed broad consultation methods.
Flood risk governance.	Prior to the FRMPs, the Netherlands established programmes to address flood prevention and protection, such as the Delta Programmes and the Room for the River Programme. The FRMPs provide only limited information on these earlier programmes and on Dutch policy and legislation to address flood risks, with insufficient explanation to interpret the background and linkages between these prior and ongoing initiatives and the FRMP. Neither the FRMPs nor the reporting sheets indicate if an SEA was carried out for the FRMPs[6].

Recommendations

Based on the reported information and the FRMPs, the following recommendations are made to enhance flood risk management (not listed in any particular order):

- To be able to assess progress, objectives should be defined in an as specific and measurable way as possible. The FRMPs should indicate whether a baseline is used for monitoring progress and if not elaborate one.
- The FRMPs should clearly describe their links with other prior and ongoing flood programmes and legislation in the Netherlands. The links between the FRMP's objectives and those of other Dutch programmes and legislation for flood risk management should be clearly indicated, as should the process for developing the objectives.
- The FRMPs should provide information on the estimated costs of their measures as well as the links that measures may have with other flood risk programmes.
- The FRMPs should clearly indicate how an analysis of costs and benefits is used in selecting and prioritising their measures and provide a methodology of the approach.
- The FRMPs should provide clear information on the organisation of public participation and the active involvement of stakeholders.

[6] The Netherlands subsequently commented that an SEA was carried out on the draft second National Water Plan for 2016-2021 (document titled "PLANMER NATIONAAL WATERPLAN 2, MINISTERIE VAN INFRASTRUCTUUR EN MILIEU, MINISTERIE VAN ECONOMISCHE ZAKEN", dated 21 November 2014). The draft FRMP's (and RBMP's) are part of this national Plan. The SEA was an independent process and –the Netherlands continue - should not be mixed with the (final) FRMP's process.

- The FRMPs should indicate if a Strategic Environmental Assessment was carried out for related plans or programmes whose measures the FRMPs adopt.
- The coordination between the FRMPs and the national climate change adaptation strategy should be ensured or elaborated upon.

1. Scope of the assessment and sources of information for the assessment

1.1 Reporting of the FRMPs

The Netherlands has reported four FRMPs. Each FRMP covers one of the four UoMs designated in the Netherlands. In addition, a national document was reported: this summarises the national objectives and common methodology used across the four UoMs.

The Netherlands did not make use of Article 13.3 of the Floods Directive, which allowed Member States to make use of previous flood risk management plans for the first cycle (provided their content is equivalent to the requirements set out in the Directive).

1.2 Assessment of the FRMPs

All four FRMPs in the Netherlands are assessed.

Table 5 UoMs covered by Dutch FRMPs

UoM code	UoM Name
NLEM	EMS
NLMS	MEUSE
NLRN	RHINE
NLSC	SCHELDT

2. Integration of previously reported information

2.1 Conclusions drawn from the preliminary flood risk assessment

The conclusions of the PFRA are presented in all four FRMPs assessed. This includes a summary map showing areas of potential significant flood risk (APSFRs). All FRMPs assessed had a textual description which includes tables listing the APSFRs. The Netherlands applied Art. 13.1b and has thus decided to prepare flood hazard and risk maps rather than carrying out a PFRA under the FD.

All four FRMPs provide links to detailed flood risk maps that show the APSFRs: http://www.risicokaart.nl[7].

A reference to conveyance routes is found in all four FRMPs. In particular, conveyance (*afvoer van hoogwater*) is mentioned throughout the Rhine FRMP (NLRN) and the Meuse FRMP, which highlight that rivers need more space (so called *Uiterwaarden*) to allow the evacuation of water.[8]

2.1.1 Coordination with neighbouring Member States on shared RBDs/UoMs

For each of the assessed FRMPs, there is a separate document on international coordination, which summarises the flood risk areas identified in coordination with neighbouring Member States[9]. While regular coordination is carried out in all four international UoMs, for the FRMP for the Ems UoM, a joint risk assessment with Germany concluded that coordination could focus on the main channel of the Ems and the estuary of Ems-Dollard (with yearly bilateral contacts), smaller water bodies did not pose risks.

2.1.2 Information how the PFRA was used in the development of the FHR maps

As noted above, the Netherlands applied Art. 13.1(b) of the Floods Directive and did not carry out a PFRA: The FRMPs indicate that flood risks were well known in all UoMs.[10]

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7 The maps itself are found on the page https://nederland.risicokaart.nl/risicokaart.html
8 FRMP NLRN, p.43 and FRMP NLMS, p.24.
9 Internationaal deel overstromingsrisicobeheerplan for UoM's Ems, Rhine, Meuse, Schelde.
10 FRMP NLRN, p.30 and similar statements in other FRMP.

2.2 Presentation of Flood Hazard and Risk Maps (FHRMs) in the FRMPs

The flood hazard and flood risk maps are presented in all four FRMPs in overview maps for the UoM, showing seawater and fluvial flood hazards and risks[11]. Each FRMP has a map section at the end of the document containing these maps. In none of the FRMPs do the FHRMs cover pluvial floods, groundwater floods, floods due to artificial water bearing infrastructure sources or floods from no specific sources. They do, however, include combined floods from seawater and fluvial sources.

In addition, all four FRMPs provide links to the flood hazard and flood risk maps, on the web site www.risicokaart.nl, which is oriented towards providing public information. However, the link is to the main page and the FHRMs are difficult to find on this website. The maps are found on the page https://nederland.risicokaart.nl/risicokaart.html.

2.2.1 Maps for shared flood risk areas

Flood hazard and flood risk maps have been prepared for flood risk areas shared with other Member States[12]. These maps are available in the international documents for each UoM[13]. The latter are separate documents that are part of the national FRMPs: the international part is called part A of each FRMP, the national part is called part B. However, the maps provided in the documents are of low resolution.

Three of the four FRMPs (the exception being the FRMP for the Ems) coordinated mapping in shared flood risk areas with neighbouring Member States. Joint maps have been provided for the international parts of the FRMPs. International coordination took place in all four UoMs. For the Ems international UoM, the FRMP indicates that coordination between Germany and the Netherlands mainly focused on the Ems River and its estuary of the Ems-Dollard. The Netherlands and Germany concluded that no further regular coordination was required on the common smaller tributaries of the Ems, as common areas with flood risks are absent there, due to the nature of the small transboundary rivers and canals which do not cross the border.

2.2.2 Conclusions drawn from the flood hazard and flood risk maps

In all the FRMPs, Flood hazard and risk maps (FHRMs) have been used to develop the FRMPs. Based on the reporting sheets and the FRMPs assessed:

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[11] FRMP NLRN, p.78 and following; FRMP NLMS, p.76 and following; FRMP NLEM, p.76 and following and FRMP NLSC, p.76 and following.

[12] Reporting sheets.

[13] Entitled Internationaal deel overstromingsrisicobeheerplan, the international part of the FRMP.

- The FHRMs were used to set priorities for flood risk management (e.g. locations, economic activities, assets)

The Netherlands has a long-established water management, with a regular checking of the norms and standards for dykes. The preparation of FRMPs resulted in the identification of several streams outside low risk zones that do not have dykes (e.g. in Limburg, part of the Meuse UoM) and that can generate significant flood risks: this was identified as a gap and measures have been included in the FRMPs.[14]

2.3 Changes to the APSFRs or other Flood Risk Areas

The FRMP assessment looked for information on changes in the identification of APSFRs since December 2011, or in the FHRMs since December 2013, indicated in the FRMP. Neither the FRMPs nor the reporting sheets referred to changes.[15]

2.4 Areas for further development in the earlier assessment of the flood hazard and risk maps

The FHRM assessment[16] identified the following areas for further development for the Netherlands:

- According to Art.6(5)(a) flood risk maps shall show the potential adverse consequences associated with flood scenario in terms of number of inhabitants affected. It appears that this information was not presented on all the maps assessed (even though habitable buildings have been reported in the area).
- Only fluvial floods have been mapped. It was not clear if the other sources are not considered as potential significant floods in the NL.

Some of these areas for further development are explicitly addressed within the FRMPs assessed:[17]

- Other flood sources are not considered as to pose significant risk.
- The map sections of each FRMP contain maps showing the number of affected inhabitants/hectare, but not the total number of inhabitants affected. The total number of inhabitants affected has been given in the explanatory text of the flood risk maps.

[14] Reporting sheets of NLEM, NLSC, NLRN, NLME.
[15] Reporting sheets and FRMPs for NLEM, NLSC, NLRN, NLME.
[16] European Commission, Assessment of Flood Hazard and Flood Risk Maps – Member State Report: NL – Netherlands, December 2014. Available at: http://ec.europa.eu/environment/water/flood_risk/pdf/fhrm_reports/NL%20FHRM%20Report.pdf
[17] The FRMPs of NLEM, NLSC, NLRN, NLME.

- The maps show floods from fluvial and seawater sources, as well as combined flooding from these two sources; other flood sources are not shown because they don't present a significant risk.

2.5 Good practices and areas for further development in the FRMPs regarding integration of previously reported information

The following **good practice** was identified:

- Each of the FRMPs contains a separate document on international coordination, indicating how the Netherlands has coordinated with neighbouring Member States on flood risk areas.

3. Setting of Objectives

3.1 Focus of objectives

The FRMPs present seven common general objectives set at national level. These objectives cover three themes: (1) protection against floods, (2) prevention of the consequences and (3) crisis management. Across these themes, the Netherlands has set the following seven common objectives (*doelen*):

Protection against floods

1. The Netherlands will continually go through cycles of standardisation and testing of flood defences and will introduce measures to meet the protection levels in legislation and regulations[18];
2. The Netherlands will take measures where necessary to address flood risks along waters without embankments;
3. The Netherlands will prepare for future developments that are important for protection against flooding;

Prevention of the consequences

4. The Netherlands will limit the consequences of flooding via spatial planning choices;
5. The Netherlands prepares for future developments which are important for prevention of the consequences of flooding;

Crisis management

6. Dutch crisis management will guarantee decisive and effective action before, during and after a flood disaster;
7. The Netherlands will prepare for future developments that are important for flood crisis management.

The FRMPs provide information on current protection levels cited in the first objective. A 1/100-year protection level is required for flood protection infrastructure in the Netherlands (and water bodies without dykes, or other protection works, are assessed to check if works are needed to ensure this level of protection). The FRMPs also refer to the safety standard to be

[18] The Netherlands subsequently underlined that the first step in the Dutch approach to flood risk management is the establishment of legal protection standards. Flood protection infrastructure is periodically checked to see if it meets the standards. If this is not the case, appropriate improvement measures are taken.

achieved by 2050[19]: the risk of fatalities due to flooding should be no higher than 1 in 100,000 citizens per year.

In addition, the Netherlands' reporting sheets refer to the National Water Plan, which cites the safety standards such as the one described above. The National Water Plan calls for good protection from and prevention of flooding and against drought as well as achieving good water quality and a healthy ecosystem as a basis for well-being and prosperity.

The objectives set in the four FRMPs[20]:

- aim to reduce the adverse consequences of floods;
- aim to reduce the likelihood of flooding[21];
- refer to non-structural measures[22].

3.2 Specific and measurable objectives

In the Netherlands, the FRMPs' objectives are stated in general terms and do not indicate what they are trying to achieve (in a quantitative or measurable sense), where, when and how they are to be achieved. Nonetheless, the FRMPs also cite the national flood standards, such as the 2050 safety standard: these overall targets are specific and measurable.

The Netherlands has linked each of its measures to one of the seven specific FRMP objectives (see section 4).

3.3 Objectives to reduce adverse consequences from floods

The objectives set in the Netherlands call for the prevention of the consequences of flooding. The FRMPs moreover state that the objectives address the four elements cited in the Floods Directive: human health, economic activity, environment and cultural heritage[23] [24].

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[19] Set in 2015 under the Delta Programme: https://english.deltacommissaris.nl/delta-programme/delta-decisions

[20] These categories are included in Art. 7 of the Floods Directive.

[21] The assessment adopts the generally accepted definition of risk as a product of consequence times likelihood, thereby also in alignment with Art. 7(2) of the FD.

[22] Non-structural measures include measures such as flood forecasting and raising awareness of flooding as well as land use planning, economic instruments and insurance.

[23] FRMP Maas, p. 38; FRMP Rhine, p. 42.

[24] The Netherlands subsequently stated that health and economic activity have been explicitly named in national law as goals for flood protection. Moreover, by taking measures to protect lives and the economy, cultural heritage and the environment are automatically protected too.

3.4 Objectives to address the reduction of the likelihood of flooding

The objectives call for protection to reduce flood risks, and they refer to the national safety standard target to ensure that flood related infrastructure protects against 1/100 year to 1/10.000 floods for regional flood defences and 1/250 to 1/10.000 for primary flood defenses.

3.5 Process for setting the objectives

While the FRMPs provide an overview of flood risk management in the Netherland and cite existing legislation and standards, neither the four FRMPs nor the reporting sheets submitted by the Netherlands provide information on the process for setting the FRMPs' objectives.

3.6 Good practices and areas for further development regarding setting objectives

The following **good practice** was identified:

- Common, national safety levels have been identified and are used to assess the safety of flood protection infrastructure and to guarantee the same level of safety for all inhabitants.

The following **areas for further development** were identified:

- The objectives in the FRMPs itself are not specific or measurable, although the FRMPs refer to other national flood targets, such as the national safety levels, that are.
- The information on these earlier plans and policies is limited in the FRMPs and the FRMPs themselves do not describe the process for setting objectives, nor the links between their objectives and existing policy objectives and targets for flood risk management in the Netherlands.

4. Planned measures for the achievement of objectives

The Netherlands has reported 116 aggregated measures and no individual measures (neither the FRMPs nor the reporting sheets define aggregated[25] measures)[26]. The Netherlands has reported measures across all four aspects of flood risk management[27], though the majority are for protection:

- 28 measures are for preparedness (24 % of the total 116 measures)
- 12 measures are for prevention (10 %)
- 68 are for protection (59 %)
- eight measures are for recovery and review (7 %)

While the number of measures reported per UoM ranges from 25 to 33 measures, each UoM has seven preparedness measures, three prevention measures and two recovery and review measures: consequently, only the protection measures vary across the four UoMs (see Table A1 in Annex A for further details).

The Netherlands is well-known as a low-lying country that has historically placed a high priority initially on flood protection and later on flood risk management. The four FRMPs refer to and build on recent and ongoing national programmes and legislation for flood risk management, and in particular: the 2007 Room for the River Programme[28] (*Ruimte voor de Rivier*) to restore flood plains and other natural features as measures against flooding, now nearing completion; the Delta Programme[29] (first launched in 2008 and most recently updated in 2017) to protect against flooding and secure freshwater resources in the face of expected climate change impacts. Related to the Delta Programme, the Netherlands took several Delta Decisions[30] (proposed in 2014 and adopted in the 2015 Delta Programme): the Decision for Water Safety states that dykes and dunes should provide protection so that the risk of fatalities is no higher than 1 in 100,000 per year.

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[25] The Reporting Guidance mentions "Measures can be reported as individual measures (recommended for major projects) or aggregated measures,…" and also notes that measures may be comprised of "many individual projects". European Commission, Guidance for Reporting under the FD (2007/60/EC), 2013, pp. 54-58.

[26] The information reported to WISE was the starting point for the assessment in this section. The majority of the statistics presented are based on processing of information reported to WISE. Assuming that the Member States accurately transferred the information contained in their FRMPs to the reporting sheets (the sheets are the same for all Member States and are not customisable) and barring any undetected errors in the transfer of this information to WISE arising from the use of interfacing electronic tools, these statistics should reflect the content of the FRMPs.

[27] See Annex B for the list of measure aspects and measure types.

[28] https://www.ruimtevoorderivier.nl/english/

[29] https://www.government.nl/topics/delta-programme/introduction-to-the-delta-programme

[30] https://english.deltacommissaris.nl/delta-programme/delta-decisions

It appears that most of the measures in the FRMPs are linked to actions decided under prior programmes or policies. For example, most of the measures included in the Meuse FRMP originate from other policies and plans, including the Meuse Works Programme[31], the restoration of Stone Cladding on the Oosterschelde and the Westerschelde (under the Delta Programme)[32] and the Room for the River Programme. The description of the measures in the FRMP indicates their original policies and programmes.

4.1 Cost of measures

The Netherlands did not report information on the costs of individual measure, nor on the overall budgets for the FRMPs' measures, nor is there any information on these in the FRMPs.

4.2 Funding of measures[33]

The FRMPs provide an overview of key sources of funding, in particular for flood protection infrastructure. The management and maintenance of existing dykes is funded by taxes paid to the regional water management authorities (*waterschappen*). The national government manages flood protection infrastructure along the main rivers and the coast, providing funding from the general budget (approximately EUR 1 billion per year).

The construction of new flood protection infrastructure is funded in more or less equal shares by the national government (via the Delta Fund, *Deltafonds*) and by the regional water management authorities (*waterschappen*). The Delta Fund has allocated funding until 2028. The FRMPs report that the Netherlands follow the principle that new investments can only be funded if the projects follow an integrated approach in the management of the flood risks, and take into consideration new safety standards, new technical insights and soil subsidence.

[31] https://www.rijkswaterstaat.nl/water/waterbeheer/bescherming-tegen-het-water/maatregelen-om-overstromingen-te-voorkomen/maaswerken/

[32] https://deltaprogramma2018.deltacommissaris.nl/viewer/paragraph/1/2-deltaprogramma-/chapter/1-deltaplan-waterveiligheid/paragraph/herstel-steenbekledingen-oosterschelde-en-westerschelde-en-vooroeverbestortingen-zeeland

[33] The FRMPs of the respective UoMs, section 6.2 (*Hoofdlijnen en prioriteiten*).

Table 6 Funding of measures

	All UoMs
Distribution of costs among those groups affected by flooding	
Use of public budget (national level)	✓
Use of public budget (regional level)	✓
Use of public budget (local level)	
Private investment	
EU funds (generic)	
EU Structural funds	
EU Solidarity Fund	
EU Cohesion funds	
EU CAP funds	
International funds	

Source: FRMPs

4.3 Measurable and specific (including location) measures

Each FRMP describes in only general terms what the measures are trying to achieve, where they are to be achieved and how they are to be achieved. The FRMPs include indicators for the measures; however, in most cases these are "effort" indicators that record the completion of the measure on the basis of indicators (which measures are associated to objectives), but do not translate the completion of measures into impacts in terms of flood risk reduction objectives (see examples of indicators below under "Monitoring progress in implementing the FRMP").

In terms of location (see also Table A3 of Annex A), Netherlands has reported that measures will be carried out at UoM level, with some in two or three UoMs and many in all four UoMs.

Table 7 Location of measures

	All UoMs assessed
International	
National	✓
RBD/UoM	✓
Sub-basin	
APSFR or other specific risk area	
Water body level	
More detailed than water body	

Source: FRMPs

4.4 Measures and objectives

In its reporting, the Netherlands has associated each measure to one of the seven common national objectives (see section 3 for the objectives):

- 63 measures, all for protection, address objective 1 on protection levels of flood defences (54 % of all measures across all aspects)
- one measure for protection addresses objective 2 on unprotected waters, i.e. currently without flood defences (1 % of all measures)
- four protection measures, one in each UoM, address objective 3 on preparing for future developments that will be important for protection (4 % of all measures)
- eight prevention measures, two in each UoM, address objective 4 to limit the consequences of flooding via spatial planning (7 % of all measures)
- four prevention measures, one in each UoM, address objective 5 on future developments that will be important for prevention (4 % of all measures)
- 24 measures (16 for preparedness and eight for recovery and review – of which four preparedness and two recovery and review in each of the four UoMs) address objective 6 on guaranteeing decisive and effective crisis management (21 % of all measures)
- 12 preparedness measures, three in each UoM, address objective 7 on future developments that are important for flood crisis management.

For further details, please see Tables A5 and A6 in Annex A.

As the three themes and the seven common national objectives are not specific and measurable, it is not clear by how much the measures will contribute to their achievement.

The FRMPs moreover state that the measures are designed to work towards the new safety standards set in the Netherlands for 2050, in particular by strengthening existing infrastructure and building new flood protection infrastructure. It is not stated, however, if the implementation of the measures in the four FRMPs will by themselves achieve this target.[34] The FRMPs state that flood protection infrastructure has top priority and goes through a cycle of establishing safety standards, assessing the compliance to these standards and if necessary strengthening the infrastructure. The measures are directed towards this goal.

[34] The FRMPs of the respective UoMs, chpt 6.2 Hoofdlijnen en prioriteiten.

4.5 Geographic coverage/scale of measures

The Netherlands has reported information on the location of all measures (see Table A4 of Annex A):

- All 28 preparedness measures will be undertaken across all four UoMs (i.e. at national scale)
- All 12 prevention measures will be undertaken across all four UoMs
- All eight recovery and review measures will be undertaken across all four UoMs
- The great majority of protection measures (52 of the 68, 76 %) are also undertaken across all four UoMs
- 7 protection measures (10 % of the 68 total) are undertaken in only one UoM, either the Meuse, Rhine or Scheldt
- 6 protection measures (9 % of the 68) are undertaken in both the Meuse and the Rhine UoMs
- three protection measures (4 %) are under in all three of these UoMs (Meuse, Rhine and Scheldt)

The FRMPs, however, provide a slightly different picture, indicating that measures are formulated on the national scale and will be implemented in the specific contexts of each UoM.

4.6 Prioritisation of measures

The Netherlands has reported the priority for its 116 measures. Of these, nearly all – 108 out of 116 (93 %) – are reported as high priority. Four protection measures (3 % of the total) are indicated as very high priority) and four prevention measures are indicated as moderate priority.

The FRMPs indicate that the priority of measures is based upon the flood risks assessed, and measures are being implemented based upon the severity of flood risks. If a flood risk assessment (i.e. a regular check against legal standards) shows that if flood protection infrastructure is no longer compliant, then it is a legal priority to improve it. The FRMPs mention that all measures are of priority[35].

[35] The Netherlands clarified subsequently that in the FRMPs prevention of floods has the utmost priority. All measures that concern this have received at least priority "high". Flood standards score "very high". There is only one measure in each FRMP qualified as "medium": a "water test" of spatial planning proposals via a consultative process. This prioritisation has been done on purpose and conscientiously because all measures are deemed important and all measures have to be carried out.

It is reported in the FRMPs of the UoMs that a CBA has been elaborated by the government's Central Planning Bureau (CPB) for the Room for the River Programme 10 years ago, working further on earlier work of the Delta Commission. This analysis was the basis, in combination with individual risks (casualties, group risks) for the decisions on prioritisation of measures. The norms for regional dykes were to address a 1/100 year flood or more stringent.[36] The earlier econometric analysis (CBA) used by the CPB and the Delta Commission form, in addition to individual risks (casualties, group risks), the basis for the 2014 Delta Decision on Water Safety. According to the FRMPs, the prioritisation of protection measures was based upon this decision. It is not clear, however, how these prior analyses influenced the prioritisation of the FRMPs' measures.

The Netherlands did not report on the exact timetable of the measures, and this information is not clearly provided in the FRMPs. The FRMPs state that the measures (e.g. flood infrastructure) are subjected to a cycle of assessment, reporting and compliance; however, the FRMPs do not specify the timing of this cycle.

4.7 Authorities responsible for implementation of measures

The FRMPs indicate that there are four levels of responsible authorities[37]: the national water authority (*Rijkwaterstaat*, part of the Ministry of Infrastructure and Environment); the regional water authorities (*Waterschappen*); the provinces and municipalities. In addition, the safety regions[38], managed by municipalities, play a key role.

On protection measures:

- The Ministry of Infrastructure and Environment is responsible for policy, norms and certain primary and regional dykes;
- The regional water authorities are responsible for most primary and most regional dykes;
- Provinces are responsible for water policy and norms in their territories.

On prevention measures:

- The Ministry of Infrastructure and Environment is responsible for policy;
- The Ministry of Security and Justice has overall responsibility at national level for crisis management;

[36] The FRMPs of the respective UoMs, chpt 7.2.
[37] Chapter 3 of the FRMPs.
[38] The safety regions (veiligheidsregios) are cooperation structures between municipalities. There are 25 safety regions in the Netherlands. In case of a flood across several municipalities within a single safety region, the region becomes responsible for coordination and crisis management. The mayor of the largest municipality acts as chairman of the safety region.

- The provinces and municipalities are responsible for implementation in their territories, along with designated safety regions (*veiligheidsregio's*).

The responsible authorities for preparedness, for recovery and review measures are the *Rijkswaterstaat*, the regional water authorities and the municipalities (also in their roles in the safety regions).

A full overview of the responsible authorities is available under www.helpdeskwater.nl.

In its reporting, the Netherlands identifies one or more of these types of authorities as responsible for the measures reported (see Table A9 in Annex A):

- National authorities are responsible for 46 measures (40 % of the total);
- National authorities and the provinces are jointly responsible for 12 measures (10 %), all for protection;
- National authorities and the security regions, four measures (3 %), all for preparedness;
- National authorities and the water authorities, 13 measures (11 %), all for protection;
- National authorities, municipalities and the regional water authorities, four measures (3 %), all for prevention;
- National authorities, municipalities, water authorities and security regions, 24 measures (21 %);
- National authorities, provinces, municipalities and regional water authorities, four measures (3 %), all for prevention;
- Regional water authorities, 13 measures (11 %), all for protection.

4.8 Progress of implementation of measures

The Netherlands reported the progress of its 116 measures:

- 8 of the 116 were reported as not started (7 %) – all are recovery and review measures;
- 35 as ongoing construction (30 %) – all are protection measures;
- 73 as progress ongoing (63 %) – these include all 12 prevention measures, all 28 preparedness measures and the remaining 33 protection measures.

4.9 Measures taken under other Community Acts

Member States have been asked to report on other Community Acts under which each measure has been implemented. The Netherlands did not report this information for its measures. Nonetheless, the reporting sheets indicate that the objectives for FRMPs and RBMPs are partly overlapping, which offers opportunities for synergies.

The FRMPs do not mention measures under other EU legislation.

4.10 Specific groups of measures

The FRMPs include **spatial planning and land use measures.** An example of a spatial planning measure is the application of the 'Water Check' (*Watertoets*): an assessment of the implications of spatial plans for flood risk management in an early phase of their development.

Natural water retention measures (NWRMs) have been planned in all four FRMPs. These continue the approach established in the Netherlands in the national initiative, Room for the River Programme, developed ten years ago and largely completed by 2016[39]. Some measures in the Meuse (NLMS) and Rhine (NLRN) FRMPs were designed under this plan. An example of such a measure that include providing more space for the river is the measure for broadening of the area between the dikes of the Meuse River (*Maasverruiming*). A further measure includes creating more space for water flow within the floodplain of the Meuse by removing soil and creating channels.

The FRMPs do not include measures that specifically consider **nature conservation**, though work for Room for the River should support nature conservation. In addition, all FRMPs state in general terms that synergies exist between flood protection and nature in the implementation of measures, though specific details are not provided.[40]

All four FRMPs assessed make a brief reference that they take into consideration **navigation and port infrastructure**. In general, it is stated that the policy on flood protection always uses an integral approach, and ports and navigation are a part of this. However, no specific measures were identified.

No reference has been found in the FRMPs to **dredging** to increase the river channel capacity and its ability to convey water for flood alleviation purposes. There is a measure in all FRMPs on maintenance of the river channels (Management and maintenance of the riverbed) which aims to guarantee a fluent evacuation of flood peaks.[41] [42]

[39] See: https://www.ruimtevoorderivier.nl/english/

[40] The reporting sheets of the respective UoM, summary of the objectives.

[41] The FRMPs of the respective UoM, description of the measures, Annex 2.

[42] The Netherlands subsequently stated that dredging is carried out to maintain navigation depth and conveyance capacity, but not for flood protection. Nevertheless, some "Room for the River" measures (deepening the winter riverbed) could be considered as such.

4.11 Recovery from and resilience to flooding

Neither the FRMPs nor the reporting sheets contain a reference to insurance policy.[43] The FRMPs do mention, however, that the government covers costs[44] in case of flood damage during a disaster, though specific details are not provided.[45]

4.12 Monitoring progress in implementing the FRMP

The reporting sheets indicate that many existing measures have already undergone a process of regular monitoring and reporting. The FRMP explains that regional water authorities and national water authorities have to report on the progress of their tasks (once a year) and about the progress of large programmes (twice a year). For example, the Delta Commission makes a yearly report on progress under the Delta Programme. The reporting sheets state that the Netherlands will make use of these existing reports for the Floods Directive reporting to the European Commission.[46]

Reporting is done based upon a list of indicators for the measures. These are provided in Annex 2 of each FRMP[47]. For example,

- For the measure to manage and maintain flood protection infrastructure (*Beheren en onderhouden - B&O keringen*), the indicator is: Measure developed yes/no and qualitative description;
- For the measure on a programme to repair the stone protection of dykes in Zeeland, the indicator is the finalisation of the programme (yes/no).

Information on a baseline is not found in the FRMPs[48].

4.13 Coordination with the Water Framework Directive[49]

The table below shows how the development of the FRMP has been coordinated with the development of the second River Basin Management Plan of the WFD.

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43 FRMP NLEM; FRMP NLMS; FRMP NLRN; FRMP NLSC.
44 Chapter 9.2 in the FRMPs.
45 FRMP NLEM; FRMP NLMS; FRMP NLRN; FRMP NLSC.
46 The reporting sheets of the respective UoM, summary of progress.
47 Bijlage 2 Overzicht van maatregelen voor het verminderen van het overstromingsrisico.
48 The Netherlands subsequently commented that the Floods Directive does not explicitly require the establishment of a baseline.
49 FRMP NLEM, chpt 13.1 Afstemming met de Kaderrichtlijn Water; FRMP NLMS, chpt 13.1 Afstemming met de Kaderrichtlijn Water; FRMP NLRN, chpt 13.1 Afstemming met de Kaderrichtlijn Water and FRMP NLSC, chpt 13.1 Afstemming met de Kaderrichtlijn Water.

Table 8 Coordination of the development of the FRMPs with the development of the second River Basin Management Plans of the WFD

	All UoMs
Integration of FRMP and RBMP	
Joint consultation of draft FRMP and RBMP	
Coordination between authorities responsible for developing FRMPs and RBMPs	✓
Coordination with the environmental objectives in Art. 4 of the WFD	
The objectives of the Floods Directive were considered in the preparation of the RBMPs [a]	✓
Planning of win-win and no-regret measures in the FRMP	✓
The RBMP PoM includes win-win measures in terms of achieving the objectives of the WFD and Floods Directive, drought management and NWRMs [a]	✓
Permitting or consenting of flood risk activities (e.g. dredging, flood defence maintenance or construction) requires prior consideration of WFD objectives and RBMPs	✓
Natural water retention and green infrastructure measures have been included	✓
Consistent and compliant application of WFD Article 4(7) and designation of heavily modified water bodies with measures taken under the FD e.g. flood defence infrastructure	
The design of new and existing structural measures, such as flood defences, storage dams and tidal barriers, have been adapted to take into account WFD Environmental Objectives [a]	✓
The use of sustainable drainage systems, such as the construction of wetland and porous pavements, have been considered to reduce urban flooding and also to contribute to the achievement of WFD Environmental Objectives	

Notes: [a] based on reporting under the WFD

The responsible authorities for the implementation of the WFD and the Floods Directive are the same in all UoMs. Moreover, the FRMPs indicate that synergies exist between measures under the RBMPs and FRMPs[50], in particular for spatial measures as well as NWRMs, such as measures related to Room for the River, under the FRMPs are especially valuable for synergies with environmental objectives under the WFD, without, however, going into more detail. The FRMPs and RBMPs in the Netherlands both are under the aegis of the National Water Plan 2016-2021, which calls for a comprehensive approach for water management, encompassing flooding, water quality and water use.

4.14 Good practices and areas for further development with regard to measures

The following **good practices** were identified:

- The FRMPs provide a clear indication of funding sources for the measures, even though the overall budget is not provided.
- All measures are linked to one of the seven national objectives set out for the FRMPs.

[50] Chapter 13.1 Afstemming met de Kaderrichtlijn Water, in the respective FRMPs.

- The FRMPs include measures for spatial planning and room for the river, continuing the work of the Netherlands in these approaches to flood risk management.

The following **areas for further development** were identified:

- The FRMPs do not contain concrete information on costs of measures in the UoM.
- Each FRMP describes in only general terms what the measures are trying to achieve, where they are to be achieved and how they are to be achieved: consequently, while the measures are linked to the objectives, they are not specific or measurable in terms of a quantifiable contribution towards an objective.
- It appears that many measures in the FRMPs are linked to actions under existing flood programmes, but the FRMPs do not clearly indicate these links.
- The FRMPs provide information on monitoring for existing programmes, but do not clearly explain how their measures will be monitored, nor indicate if a baseline is used.

5. Consideration of climate change

All FRMPs assessed have measures included that consider climate change.

The FRMPs note that climate change scenarios were analysed by the Delta Commission, and indeed the Delta Programme was launched to address potential climate impacts. The timeframes that were used are 2050 and 2100. Climate change scenarios included a slow and fast climate change scenario and are based upon the IPCC scenarios. The impacts of climate change were examined at the national scale for all UoMs[51]. Based on the scenarios, it is expected that extreme events will occur more frequently due to climate change. This affects the statistical calculation of recurrence times and affect the norms to which dykes have to adhere, implying more stringent requirements for dykes.[52] The FRMPs do not indicate, however, if the main sources of flooding are expected to change under long term climate change scenarios.

The FRMPs do not refer to the national Climate Change Adaption Strategy[53], which was adopted in 2016, after their publication.

Several measures in the FRMPs specifically refer to climate change. One example is a measure for 'Room for the River' in the Meuse FRMP: increased peak levels of flooding due to climate change are considered in its design.

The FRMPs moreover underline that climate considerations are implicit in their overall approach, as:

- Climate change is taken into consideration overall in Dutch flood risk management policies, programmes and planning;
- management is adaptive overall and
- there is a cyclical evaluation of norms and safety levels, and safety levels are re-evaluated regularly to cope with climate change (e.g. rising sea level and increased frequencies of floods).[54]

However, the assessed documents do not contain details on how these considerations are implemented, though it is clear that climate change is considered in other Dutch programmes and legislation for flood risk management.

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[51] FRMP NLEM, Chpt. 4.5 Toekomstige ontwikkelingen; FRMP NLMS, Chpt. 4.5 Toekomstige ontwikkelingen; FRMP NLRN, Chpt. 4.5 Toekomstige ontwikkelingen and FRMP NLSC, Chpt. 4.5 Toekomstige ontwikkelingen.

[52] FRMP NLEM, Chpt. 7.2; FRMP NLMS, Chpt. 7.2; FRMP NLRN, Chpt. 7.2 and FRMP NLSC, Chpt. 7.2.

[53] https://ruimtelijkeadaptatie.nl/english/nas/

[54] FRMP NLEM, Programme of Measures, Annex 2; FRMP NLMS, Programme of Measures, Annex 2; FRMP NLRN, Programme of Measures, Annex 2 and FRMP NLSC, Programme of Measures, Annex 2.

5.1 Good practices and areas for further development concerning climate change

The following **good practice** was identified:

- The FRMPs provide an overview of projected climate impacts, indicate that climate is considered in the overall approach to flood risk management and include measures that address climate change.

The following **areas for further development** were identified:

- Coordination between FRMPs and national climate change adaptation strategy appears to be in need of strengthening.

6. Cost-benefit analysis

The four FRMPs assessed refer to cost benefit as a criterion for the establishment of priorities for the selection of measures. It is not clear, however, if CBA was carried out specifically for the FRMPs: the plans in fact refer to the use of CBA of previous plans and programmes and details are lacking on the methodology and outcomes in the FRMP documents.

The FRMPs note that the Central Planning Bureau carried out CBA for the 2008 Room for the River Programme. This analysis was also used by the Delta Commission. These earlier econometric analyses formed, together with further analysis, the basis for the 2014 Delta Decision on Water Safety (*Deltabeslissing watersafety*) to establish a 2050 goal to ensure that that the risk of fatalities due to flooding is not higher than 1 in 100,000 citizens per year. In the FRMPs, it is explained that the flood standards (including the new flood standard that the risk of fatalities due to flooding should be no higher than 1 in 100,000 citizens per year) have been based on CBA and that the flood standards are the basis for measures.

It is unclear from the FRMPs or the reporting sheets whether and for which types of measures CBA was used. The FRMPs and reporting sheets also do not include whether CBA was used to assess measures with transnational effects, if any.

6.1 Good practices and areas for further development

The following **area for further development** was identified:

- While the Netherlands undertook detailed CBA for prior flood programmes, it is not clear from the FRMPs, or the reporting sheets, how this information was used in the FRMPs themselves.

7. Governance including administrative arrangements, public information and consultation

7.1 Competent authorities

Based on the FRMPs and the information provided in the reported sheets, the Competent Authorities and the Units of Management identified for the Floods Directive have not changed. The Netherlands has not reported new information to WISE since 2014 [55].

7.2 Public information and consultation[56]

The table below shows how the public and interested parties were **informed** in the four UoMs assessed concerning the draft FRMPs. Information on how the consultation was actually carried out and which stakeholders participated is presented in the rest of the section:

Table 9 Methods used to inform the public and interested parties of the FRMPs

	All UoMs
Media (papers, TV, radio)	✓
Internet	✓
Digital social networking	
Printed material	
Direct mailing	
Invitations to stakeholders	
Local Authorities	✓
Meetings	
Other *	✓

Note: * "Other" in the Netherlands refers to the national government's official legal journal.

The reporting sheets submitted by the Netherlands indicate that the FRMPs were available for consultation at local authorities and via the website. The announcement of the formal public consultation was made via the government's official legal journal (the *Staatscourant*) and in newspapers. An information campaign was organised via two web sites: "our water" (www.onswater.nl), which covers both floods and water management; and "risk map" (www.risicokaart.nl), which provides information to the public on flood risks and other risks, including hazardous substances, fires and aviation accidents and also provides the FHRMs (users can obtain information on local risks by entering their address).

[55] The Netherlands subsequently indicated that the Ministry of Infrastructure and Environment (the name of the ministry at the time the FRMPs were adopted) is now the Ministry of Infrastructure and Water Management.

[56] FRMP NLEM, summary of the consultation; FRMP NLMS, summary of the consultation; FRMP NLRN, summary of the consultation and FRMP NLSC, summary of the consultation.

The table below shows how the actual **consultation** was carried out:

Table 10 Methods used for the actual consultation

	All UoMs
Via Internet	✓
Via social networking	
Direct invitation	
Exhibitions	
Workshops, seminars or conferences	
Telephone surveys	
Direct involvement in drafting FRMP	
Postal written comments	
Other	

Source: FRMPs

According to the reporting sheets, written comments could be submitted via Internet for a six-month period.

The table below shows how the **documents** for the consultation were provided:

Table 11 Methods used to provide the documents for the consultation

	All UoMs
Downloadable	✓
Direct mailing (e-mail)	
Direct mailing (post)	
Paper copies distributed at exhibitions	
Paper copies available in municipal buildings (town hall, library etc.)	✓
Paper copies at the main office of the competent authority	
Other	

Source: FRMPs

The FRMPs were available for consultation with at local authorities and on the internet for a period of six months.[57]

7.3 Active involvement of Stakeholders

The table below shows the groups of **stakeholders** that were actively involved in the development of the four FRMPs assessed:

[57] FRMP NLEM, summary of the consultation; FRMP NLMS, summary of the consultation; FRMP NLRN, summary of the consultation and FRMP NLSC, summary of the consultation.

Table 12 Groups of stakeholders

	All UoMs
Civil Protection Authorities such as Government Departments responsible for emergency planning and coordination of response actions	✓
Flood Warning / Defence Authorities	✓
Drainage Authorities	✓
Emergency services	✓
Water supply and sanitation	✓
Agriculture / farmers	
Energy / hydropower	
Navigation / ports	
Fisheries / aquaculture	
Private business (Industry, Commerce, Services)	
NGOs including nature protection, social issues (e.g. children, housing)	
Consumer Groups	
Local / Regional authorities	✓
Academia / Research Institutions	

Source: FRMPs

The Dutch reporting sheets note that the FRMPs were developed on the basis of earlier plans and programmes that had undergone broad-based consultations with the public, NGOs, the private sector and government authorities. For this reason, government authorities were mainly involved in the actual development and drafting of the FRMPs. Consequently, it appears that the public, NGOs and the private sector were not actively involved in the drafting.[58]

The FRMPs and reporting sheets do not provide details on how public authorities or stakeholders were actively involved.[59]

7.4 Effects of consultation

The reporting sheets indicate only that adaptations to the FRMPs were made where necessary in response to the consultation. The reporting sheets state that the comments and how they were considered were summarised in a document for each plan (*Nota van Antwoord*), but these documents were not found.[60]

[58] FRMP NLEM, summary of the consultation; FRMP NLMS, summary of the consultation; FRMP NLRN, summary of the consultation and FRMP NLSC, summary of the consultation.

[59] FRMP NLEM, summary of the consultation; FRMP NLMS, summary of the consultation; FRMP NLRN, summary of the consultation and FRMP NLSC, summary of the consultation.

[60] FRMP NLEM, summary of the consultation; FRMP NLMS, summary of the consultation; FRMP NLRN, summary of the consultation and FRMP NLSC, summary of the consultation.

7.5 Strategic Environmental Assessment

Neither the FRMPs nor the reporting sheets indicate if an SEA was carried out for the FRMPs.[61, 62]

7.6 Good practices and areas for further development regarding governance

The following **good practice** was identified:

- Two web sites were created to raise awareness and provide public information on the FRMPs and related flood information, including the FHRMs.

The following **areas for further development** were identified:

- The FRMPs indicate that the public, NGOs and the private sector were not actively involved in their preparation, since previous flood programmes had employed broad consultation methods.
- Neither the FRMPs nor the reporting sheets indicate if an SEA was carried out for the FRMPs.

[61] FRMP NLEM; FRMP NLMS; FRMP NLRN and FRMP NLSC.

[62] The Netherlands subsequently commented that an SEA was carried out on the draft second National Water Plan for 2016-2021 (document titled "PLANMER NATIONAAL WATERPLAN 2, MINISTERIE VAN INFRASTRUCTUUR EN MILIEU, MINISTERIE VAN ECONOMISCHE ZAKEN", dated 21 November 2014). The draft FRMP's (and RBMP's) are part of this national Plan. The SEA was an independent process and –the Netherlands continue - should not be mixed with the (final) FRMP's process.

Annex A: Supplementary tables and charts on measures

This Annex gives an overview of the data on measures provided by the Netherlands in the reporting sheets. These tables and charts were used for the preparation of section 4 on measures.

Background & method

This document was produced as part of the assessment of the Flood Risk Management Plans (FRMPs). The tables and charts below are a summary of the data reported on measures by the Member States and were used by the Member State assessor to complete the questions on the Flood measures. The data are extracted from the XMLs (reporting sheets) reported by Member States for each FRMP, and are split into the following sections:

- **Measures overview** – Tabulates the number of measures for each UoM;
- **Measure details: cost** – Cost & Cost explanation;
- **Measures details: name & location** – Location & geographic coverage;
- **Measure details: authorities** – Name of responsible authority & level of responsibility;
- **Measure details: objectives** – Objectives, Category of priority & Timetable;
- **Measure details: progress** – Progress of implementation & Progress description;
- **Measure details: other** – Other Community Acts.

On the basis of the reporting guidance (which in turn is based on the Floods Directive)[63], not all fields are mandatory, and, as such, not all Member States reported information for all fields.

Some of the fields in the XMLs could be filled in using standardised answers – for example, progress is measured via the categories set out in the Reporting Guidance. This means that producing comprehensive tables and charts required little effort. For many fields, however, a free data format was used. For some Member States, this resulted in thousands of different answers, or answers given in the national language.

In such situations, tables and charts were developed using the following steps:

- A first filter is applied to identify how many different answers were given. If a high number of different answers are given, Member State assessors were asked to refer to the raw data when conducting the assessment, and this Annex does not reflect these observations.

[63] http://icm.eionet.europa.eu/schemas/dir200760ec/resources

- If a manageable number of answers are given, obvious categories are identified, and raw data sorted.
- Measures missing information may be assigned categories based on other fields (for example, if the level of Responsibility Authority is missing, the information may be obvious from the field "name of Responsible Authority").
- Measures where obvious categories cannot be defined based on other available information (as in the example above on the name of the Responsible Authority), are categorised as "no information".

Types of measures used in reporting

The following table[64] is used in the reporting on the types of measures. Each type of measures is coded as an M-number. Measures are grouped in an 'aspect'.

NO ACTION M11: No Action	**PREPAREDNESS** M41: Flood Forecasting & Warning M42: Emergency response planning M43: Public Awareness M44: Other preparedness
PREVENTION M21: Avoidance M22: Removal or relocation M23: Reduction M24: Other prevention	**RECOVERY & REVIEW** M51: Clean-up, restoration & personal recovery M52: Environmental recovery M53: Other recovery
PROTECTION M31: Natural flood management M32: Flow regulation M33: Coastal and floodplain works M34: Surface Water Management M35: other protection	**OTHER MEASURES** M61: Other measures

[64] Guidance for Reporting under the Floods Directive (2007/60/EC): https://circabc.europa.eu/w/browse/a3c92123-1013-47ff-b832-16e1caaafc9a

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Measures overview

Table A1 - Total number of measures

Number of individual measures	0
Number of individual measures including measures which have been allocated to more than one measure type	0
Number of aggregated measures	116
Number of aggregated measures including measures which have been allocated to more than one measure type	116
Total number of measures	116
Total number of measures including measures which have been allocated to more than one measure type	116
Range of number of measures between UoMs including measures which have been allocated to more than one measure type (Min-Max)	25 - 33
Average number of measures across UoMs	29

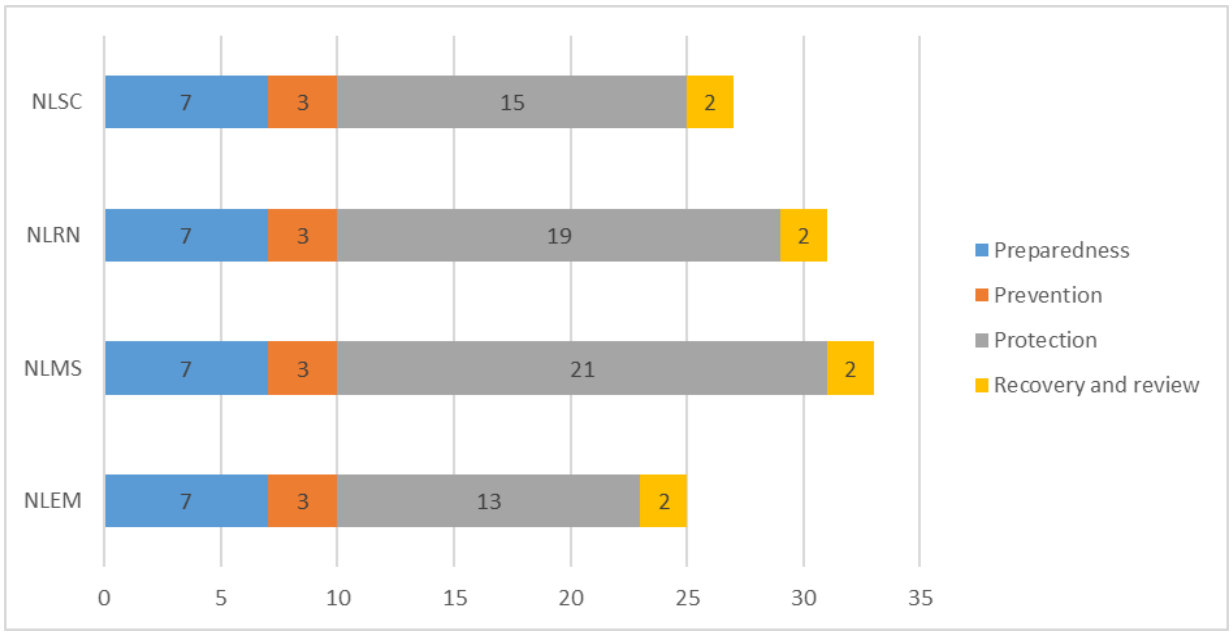
Table A2 - Number of aggregated measures per measure type and UoM

	Preparedness			**Prepared-ness Total**	**Prevention**		**Prevention Total**	**Protection**				**Protection Total**	**Recovery & review**		**Recovery & review Total**	**Grand Total**
	M41	**M42**	**M43**		**M21**	**M24**		**M31**	**M32**	**M33**	**M35**		**M51**	**M53**		
NLEM	1	2	4	7	1	2	3			10	3	13	1	1	2	25
NLMS	1	2	4	7	1	2	3	4	1	12	4	21	1	1	2	33
NLRN	1	2	4	7	1	2	3	2	2	11	4	19	1	1	2	31
NLSC	1	2	4	7	1	2	3		1	11	3	15	1	1	2	27
Grand Total	**4**	**8**	**16**	**28**	**4**	**8**	**12**	**6**	**4**	**44**	**14**	**68**	**4**	**4**	**8**	**116**
Average per UoM	**1**	**2**	**4**	**7**	**1**	**2**	**3**	**2**	**1**	**11**	**4**	**17**	**1**	**1**	**2**	**29**

Notes: The codes used are explained in section 2 of this document. All measures are aggregated as the Netherlands did not report any individual measures.

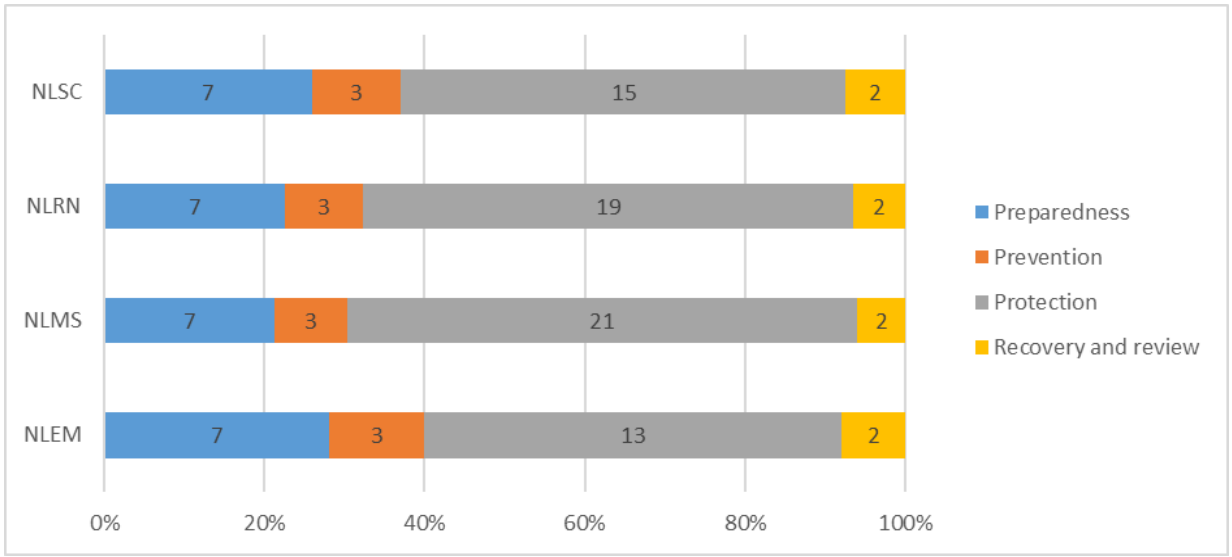
The information in Table A2 is visualised in Figures A1 and A2 below:

Figure A1 - Number of total measures (individual and aggregate) by measure aspect



Notes:
All measures are aggregated as the Netherlands did not report any individual measures.

Figure A2 - Share of total measures (aggregated and individual) by measure aspect



Notes:
All measures are aggregated as the Netherlands did not report any individual measures.

Measure details: cost

Member States were requested to report information on:

- Cost (optional field);
- Cost explanation (optional field).

The Netherlands did not report any information on cost in the reporting sheets.

Measure details: name & location

Member States were requested to report information on the following:

- Location of implementation of measures (mandatory field);
- Geographic coverage of the impact of measures (optional field).

Location of measures

The location of each measure was determined by the river basin.

Table A3 - Location of implementation by measure aspect

	Meuse (NLMS)	Rhine (NLRN)	Schelde (NLSC)	Rhine (NLRN), Meuse (NLMS)	Rhine (NLRN), Meuse (NLMS), Schelde (NLSC)	Rhine (NLRN), Meuse (NLMS), Schelde (NLSC), Eems (NLEM)	Grand Total
Preparedness						28	28
Prevention						12	12
Protection	4	2	1	6	3	52	68
Recovery & Review						8	8
Grand Total	**4**	**2**	**1**	**6**	**3**	**100**	**116**

Figure A3 - Visualisation of Table A3: Location of implementation by measure aspect

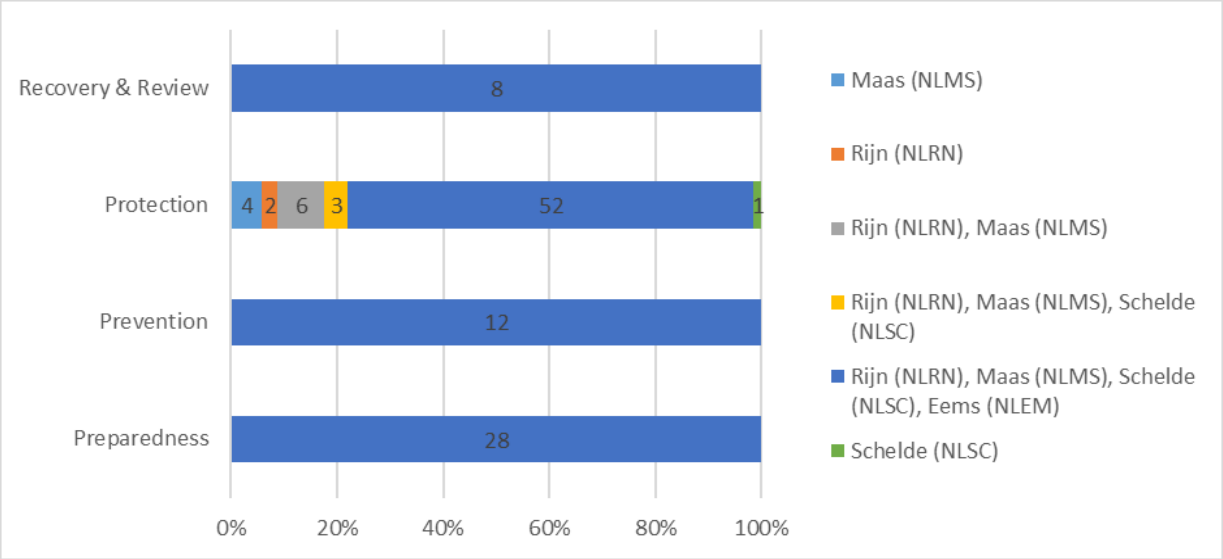
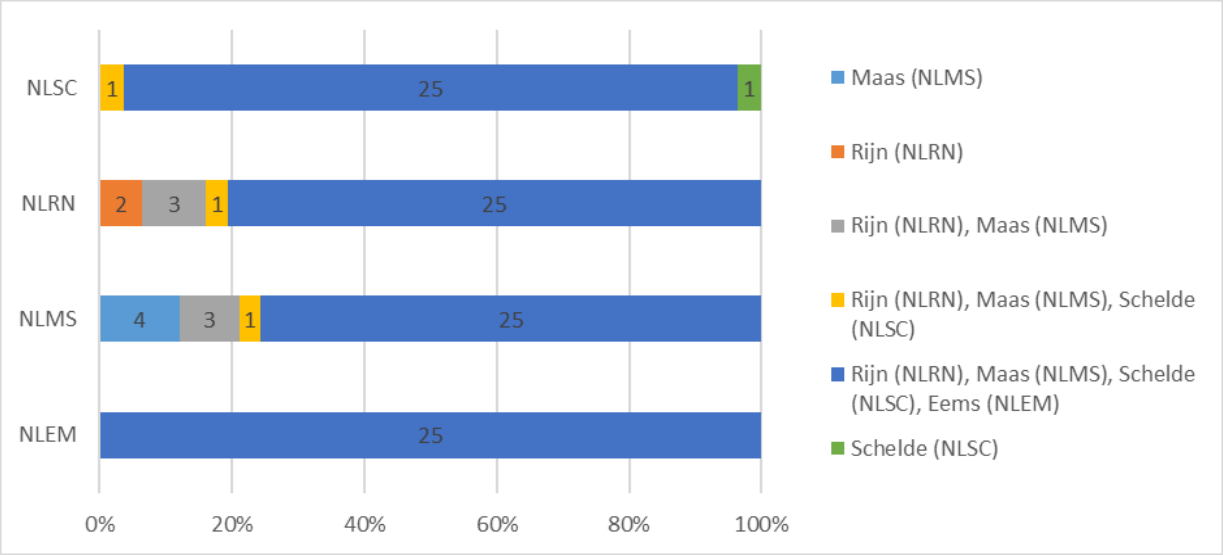


Table A4 - Location of implementation by UoM

	Meuse (NLMS)	Rhine (NLRN)	Rhine (NLRN), Meuse (NLMS)	Rhine (NLRN), Meuse (NLMS), Schelde (NLSC)	Rhine (NLRN), Meuse (NLMS), Schelde (NLSC), Eems (NLEM)	Schelde (NLSC)	Grand Total
NLEM					25		25
NLMS	4		3	1	25		33
NLRN		2	3	1	25		31
NLSC				1	25	1	27
Grand Total	**4**	**2**	**6**	**3**	**100**	**1**	**116**
Average per UoM	**1**	**1**	**2**	**1**	**25**	**0**	**29**

Figure A4 - Visualisation of Table A4: Location of implementation by UoM



Geographic coverage

The geographic coverage for each measure was "RBD".

Measure details: objectives

Member States were requested to report information on:

- Objectives linked to measures (optional field, complementary to the summary provided in the textual part of the XML);
- Category of priority (Conditional, reporting on either 'category of priority' or 'timetable' is required);
- Timetable (Conditional, reporting on either 'category of priority' or 'timetable' is required).

Objectives

The objectives reported for each measure are differentiated by the objective (*Doel*) they correspond to. The table below presents the measures in terms of the seven common national objectives they address.

These objectives are the following:

1. The Netherlands continually goes through cycles of standardization and testing of flood defences and introduces measures if necessary for protection levels in legislation and regulations;

2. The Netherlands will take measures where necessary to address flood risks along unprotected waters;
3. The Netherlands will prepare for future developments that are important for protection against flooding;
4. The Netherlands limits the consequences of flooding via spatial planning choices
5. The Netherlands prepares for future developments which are important for prevention of the consequences of flooding;
6. Dutch crisis management guarantees decisive and effective action before, during and after a (threatening) flood disaster;
7. The Netherlands will prepare for future developments that are important for flood crisis management.

Table A5 - Objectives by measure aspect

	Objective 1	**Objective 2**	**Objective 3**	**Objective 4**	**Objective 5**	**Objective 6**	**Objective 7**	**Grand Total**
Prevention				8	4			12
Protection	63	1	4					68
Preparedness						16	12	28
Recovery & Review						8		8
Grand Total	**63**	**1**	**4**	**8**	**4**	**24**	**12**	**116**

Figure A5 - Visualisation of Table A5: Objectives by measure aspect

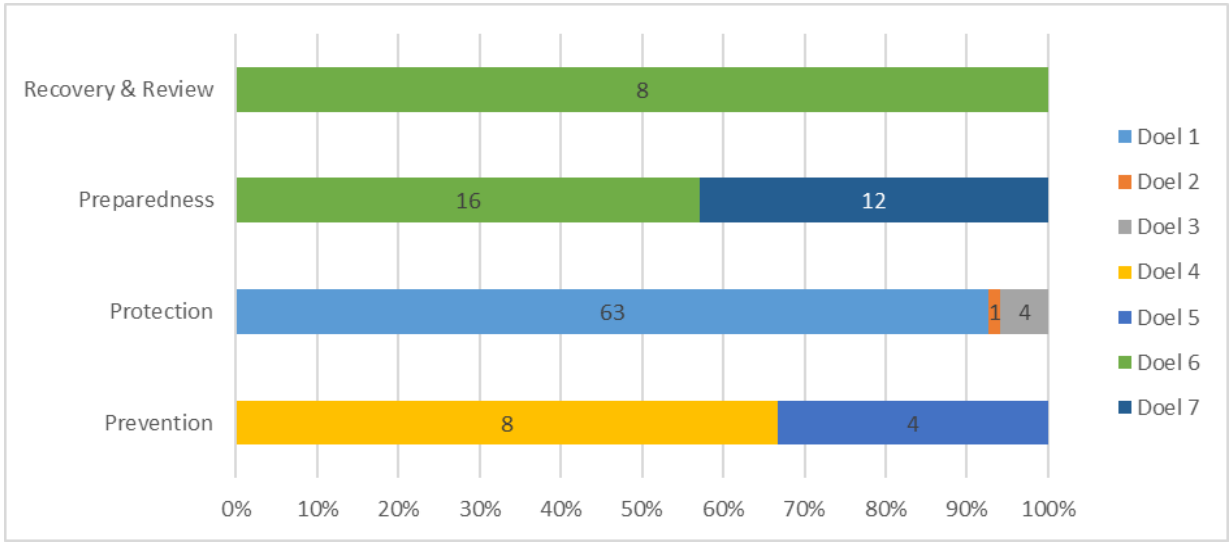
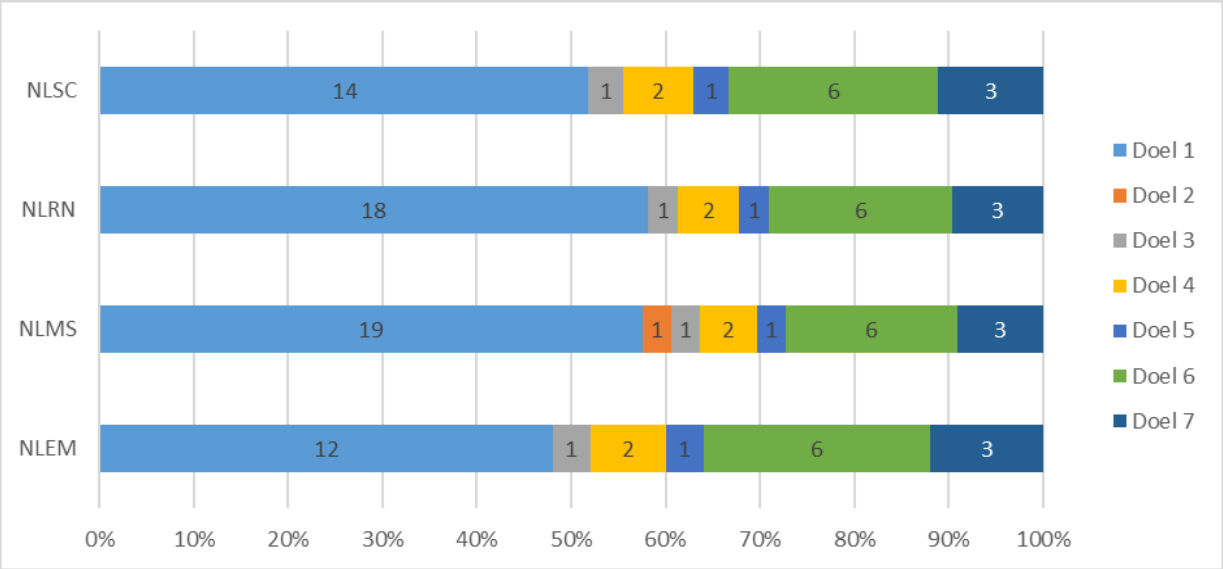


Table A6 - Objectives by UoM

	Objective 1	Objective 2	Objective 3	Objective 4	Objective 5	Objective 6	Objective 7	Grand Total
NLEM	12		1	2	1	6	3	25
NLMS	19	1	1	2	1	6	3	33
NLRN	18		1	2	1	6	3	31
NLSC	14		1	2	1	6	3	27
Grand Total	**63**	**1**	**4**	**8**	**4**	**24**	**12**	**116**
Average per UoM	**16**	**0**	**1**	**2**	**1**	**6**	**3**	**29**

Figure A6 - Visualisation of Table A6: Objectives by measure aspect



Category of priority

The Netherlands provided information for the priority of all measures. The following categories are used in the reporting sheet:

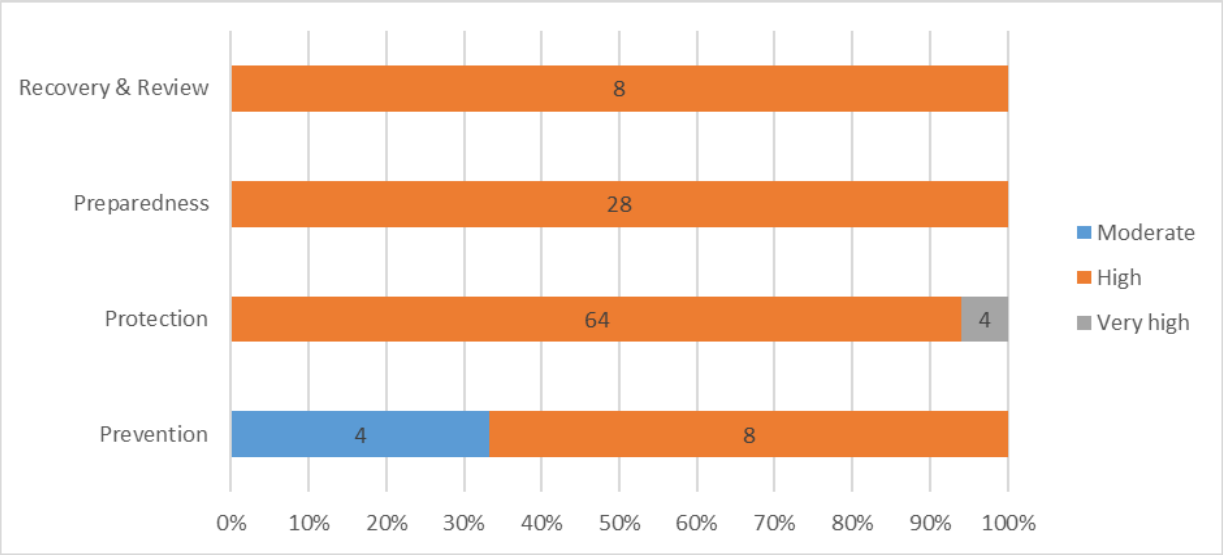
- Critical;
- Very high;
- High;
- Moderate;
- Low.

Table A7 - Category of priority by measure aspect

	Very high	High	Moderate	Grand Total
Prevention		8	4	12
Protection	4	64		68
Preparedness		28		28
Recovery & Review		8		8
Grand Total	**4**	**108**	**4**	**116**

Notes: No measures were categorised as either low or critical.

Figure A7 - Visualisation of Table A7: Category of priority by measure aspect



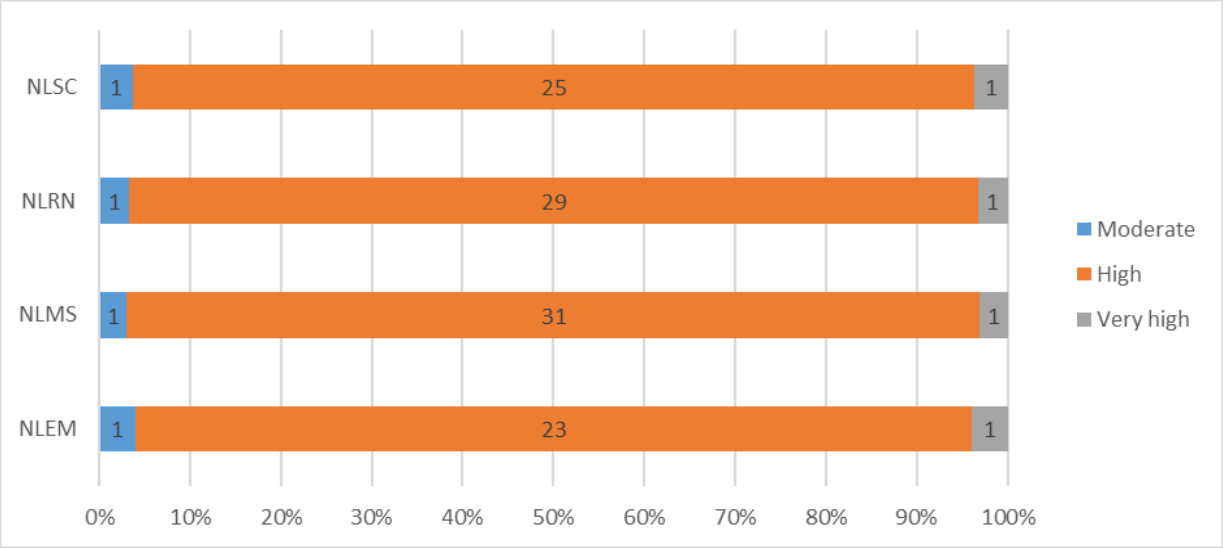
Notes: No measures were categorised as either low or critical.

Table A8 - Category of priority by UoM

	Moderate	High	Very high	Grand Total
NLEM	1	23	1	25
NLMS	1	31	1	33
NLRN	1	29	1	31
NLSC	1	25	1	27
Grand Total	**4**	**108**	**4**	**116**
Average per UoM	**1**	**27**	**1**	**29**

Notes: No measures were categorised as either low or critical.

Figure 8 - Visualisation of Table A8: Category of priority by UoM



Timetable

No information has been reported on the timetable in the reporting sheets.

Measure details: authorities

Member States were requested to report information on:

- Name of the responsible authority (optional if 'level of responsibility' is reported);
- Level of responsibility (optional if 'name of the responsible authority' is reported).

The Netherlands completed these fields for all measures. 288 different authorities were named, making a quantitative assessment of the name of authorities difficult. However, it appears that this field was filled out in a reasonably uniform manner.

Note also that measures reported more than one responsible authority, so the total number of authorities were 2 448 (keeping in mind that many are responsible for more than one measure).

The level of responsibility across measures was summarised in the following tables.

Table A9 - Level of responsibility by measure aspect

	N	N & P	N & security region	N and water board	N, M, & water board	N, M, water board, & safety region	N, P, M, & water board	Water board	Other	Grand Total
Prevention	4				4		4			12
Protection	34	12		8				13	1	68
Preparedness	8		4			16				28
Recovery & Review						8				8
Grand Total	**46**	**12**	**4**	**8**	**4**	**24**	**4**	**13**	**1**	**116**

Notes: N = national P = province M = municipality

Figure A9 - Visualisation of Table A9: Level of responsibility by measure aspect

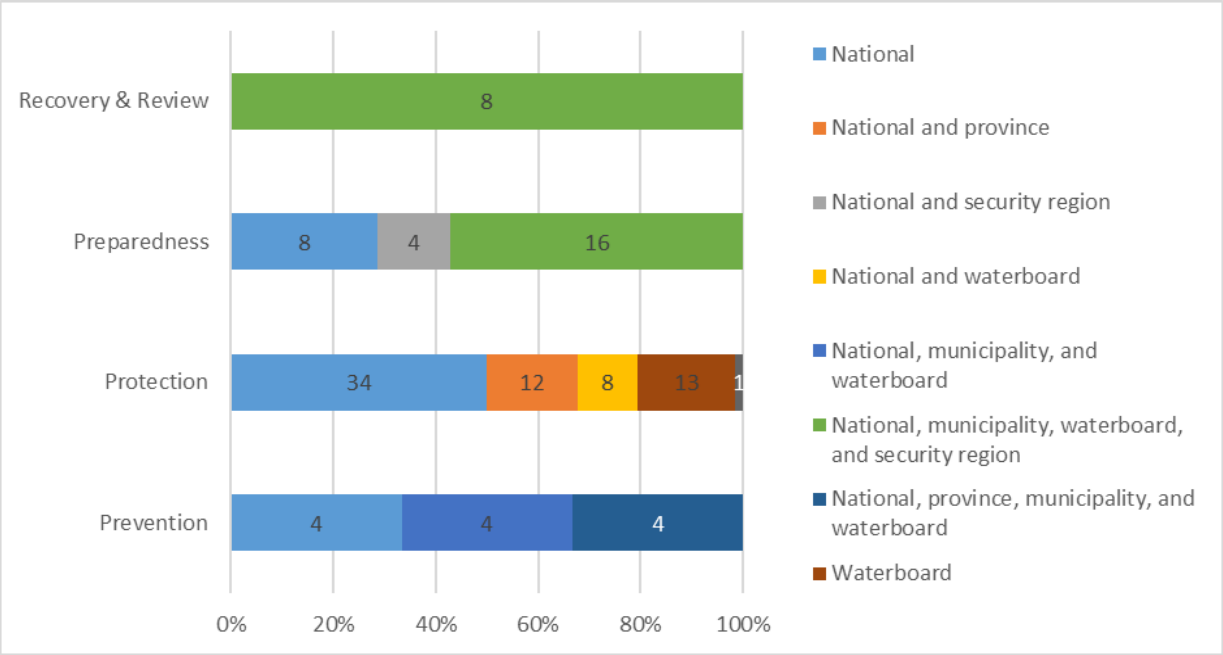
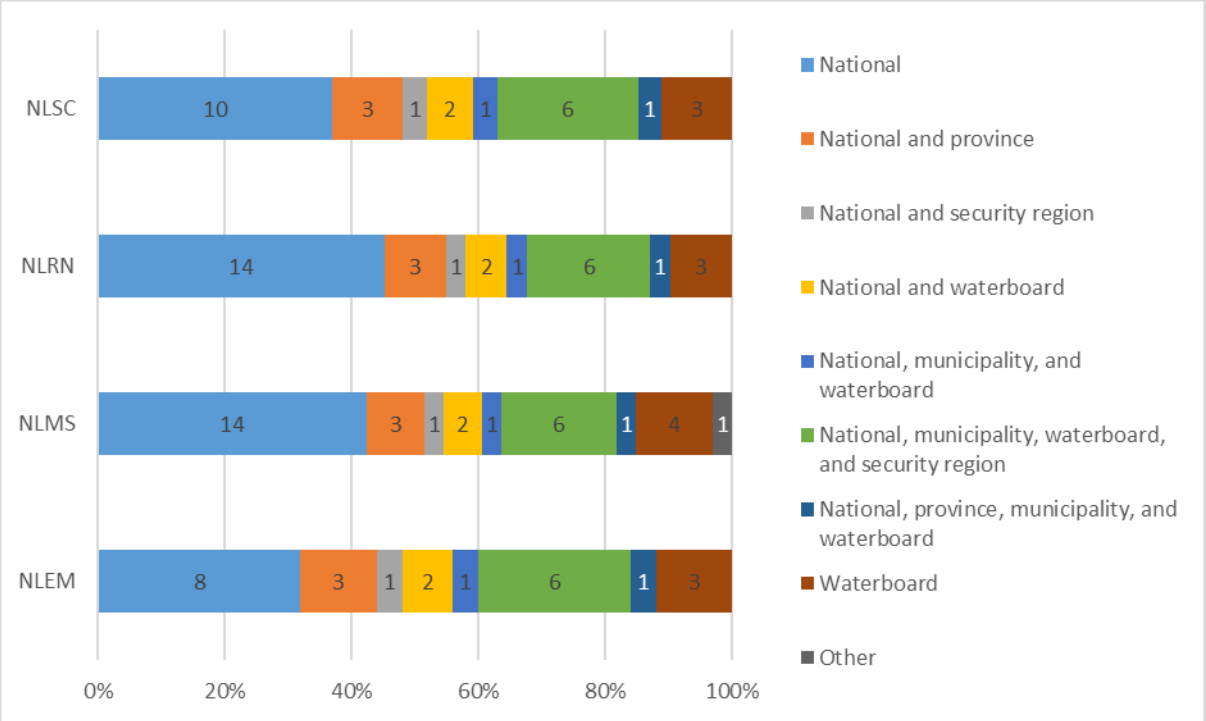


Table A10 - Level of responsibility by UoM

	N	N & P	N & security region	N & water board	N, M & water board	N, M, waterboard, &security region	N, P, M, & water board	Water board	Other	Grand Total
NLEM	8	3	1	2	1	6	1	3		25
NLMS	14	3	1	2	1	6	1	4	1	33
NLRN	14	3	1	2	1	6	1	3		31
NLSC	10	3	1	2	1	6	1	3		27
Grand Total	**46**	**12**	**4**	**8**	**4**	**24**	**4**	**13**	**1**	**116**
Average per UoM	**12**	**3**	**1**	**2**	**1**	**6**	**1**	**3**	**0**	**29**

Notes: N = national P = province M = municipality

Figure A10 - Visualisation of Table 10: Level of responsibility by UoM



Measure details: progress

Member States were requested to report information on:

- Progress of implementation of measures (mandatory field) – this is a closed question whose responses are analysed below;
- Progress description of the implementation of measures (optional field) – this is an open text question for which not all Member State reported and whose answers are not analysed here.

The Netherlands reported information about the progress of implementation of the measures. The Progress of implementation was reported as[65]:

- COM (completed);
- OGC (ongoing construction);
- POG (progress ongoing);
- NS (not started).

A full definition of these terms can be found at the end of this section.

Table A11 – Progress of implementation by measure aspect

	Not Started	Ongoing Construction	Progress ongoing	Grand Total
Prevention			12	12
Protection		35	33	68
Preparedness			28	28
Recovery & Review	8			8
Grand Total	**8**	**35**	**73**	**116**

[65] Guidance for Reporting under the Floods Directive (2007/60/EC): https://circabc.europa.eu/w/browse/a3c92123-1013-47ff-b832-16e1caaafc9a

Figure A11 - Visualisation of Table A11: Progress of implementation by measure aspect

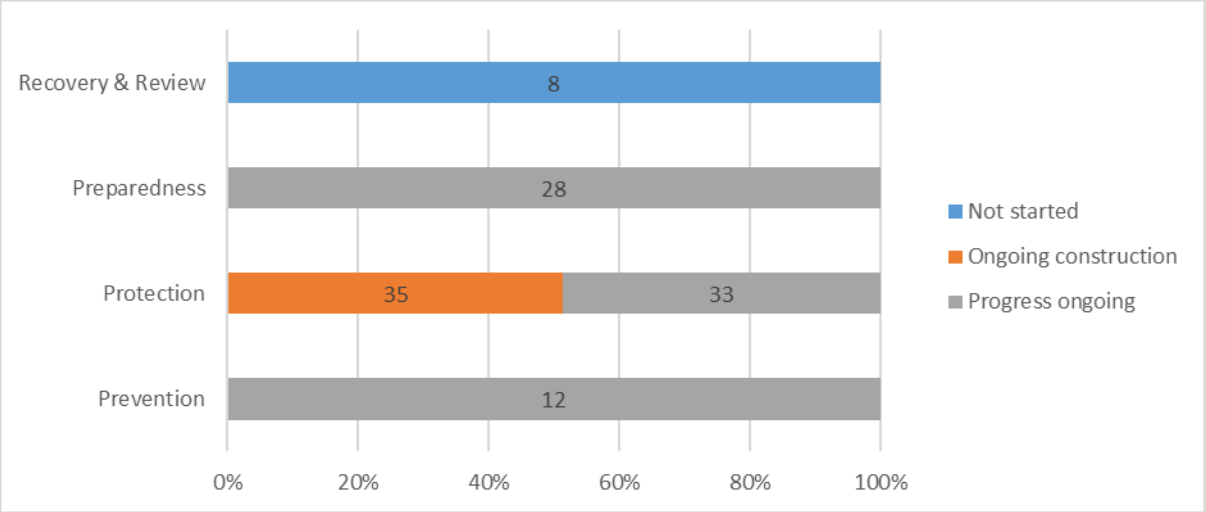
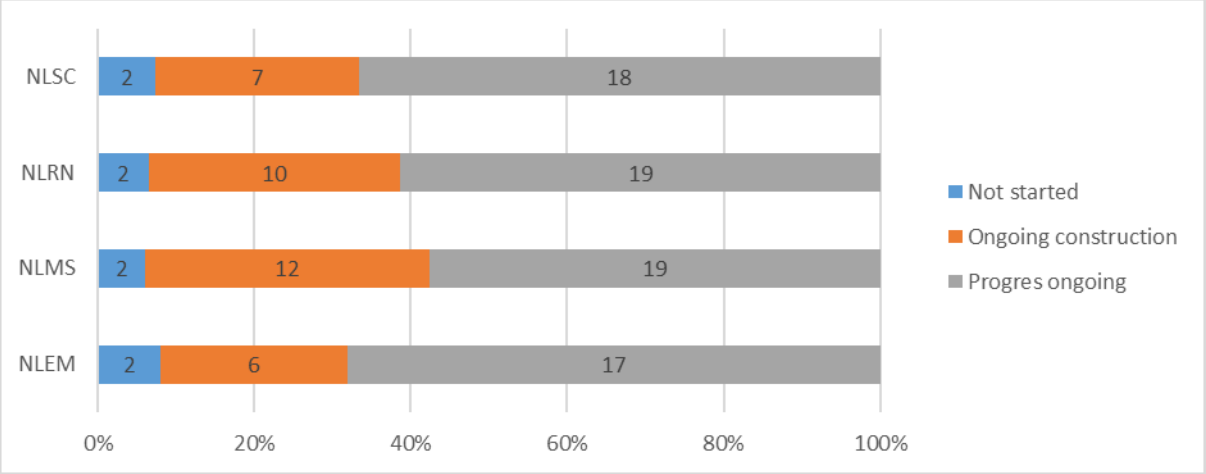


Table A12 – Progress of implementation by UoM

	Not started	Ongoing construction	Progress ongoing	Grand Total
NLEM	2	6	17	25
NLMS	2	12	19	33
NLRN	2	10	19	31
NLSC	2	7	18	27
Grand Total	**8**	**35**	**73**	**116**
Average per UoM	**2**	**9**	**18**	**29**

Figure A12 - Visualisation of Table A12: Progress of implementation by UoM



The categories describing the progress of measures are defined in the EU Reporting Guidance Document on the Floods Directive.

For **measures involving construction or building works** (e.g. a waste water treatment plant, a fish pass, a river restoration project, etc.):

- Not started (NS) means the technical and/or administrative procedures necessary for starting the construction or building works have not started.
- Progress on-going (POG) means that administrative procedures necessary for starting the construction or building works have started but are not finalised. The simple inclusion in the RBMPs is not considered planning in this context.
- On-going construction (OGC) means the construction or building works have started but are not finalized.
- Completed (COM) means the works have been finalised and the facilities are operational (maybe only in testing period in case e.g. a waste water treatment plant).

For **measures involving advisory services** (e.g. training for farmers):

- Not started (NS) means the advisory services are not yet operational and have not provided any advisory session yet.
- Progress on-going (POG) means the advisory services are operational and are being used. This is expected to be the situation for all multi- annual long/mid-term advisory services that are expected to be operational during the whole or most of RBMP cycle.
- On-going construction (OGC): Not applicable
- Completed (COM) means an advisory service that has been implemented and has been finalised, i.e. is no longer operational. This is expected only for advisory services that are relatively short term or one-off, and which duration is time limited in relation to the whole RBMP cycle.

For **measures involving research, investigation or studies**:

- Not started (NS) means the research, investigation or study has not started, i.e. contract has not been signed or there has not been any progress.
- Progress on-going (POG) means the research, investigation or study has been contracted or started and is being developed at the moment.
- On-going construction (OGC): Not applicable
- Completed (COM) means the research, investigation or study has been finalised and has been delivered, i.e. the results or deliverables are available (report, model, etc.).

For measures involving administrative acts (e.g. licenses, permits, regulations, instructions, etc.):

- Not started (NS) means the administrative file has not been opened and there has not been any administrative action as regards the measure.
- Progress on-going (POG) means an administrative file has been opened and at least a first administrative action has been taken (e.g. requirement to an operator to provide information to renew the licensing, request of a permit by an operator, internal consultation of draft regulations, etc.). If the measure involves more than one file, the opening of one would mean already "ongoing".
- On-going construction (OGC): Not applicable
- Completed (COM) means the administrative act has been concluded (e.g. the license or permit has been issued; the regulation has been adopted, etc.). If the measure involves more than one administrative act, "completed" is achieved only when all of

them have been concluded.

Measure details: other

Member States were requested to provide information on:

- Other Community Acts associated to the measures reported (optional field);
- Any other information reported (optional field).

The Netherlands did not provide information about ‘other Community Acts’ in the reporting sheets. Nevertheless, “Other Description” was reported by every measure.

Annex B: Definitions of measure types

Table B1 Types of flood risk management measures[66]

	No Action
M11	No Action, No measure is proposed to reduce the flood risk in the APSFR or other defined area,
	Prevention
M21	Prevention, Avoidance, Measure to prevent the location of new or additional receptors in flood prone areas, such as land use planning policies or regulation
M22	Prevention, Removal or relocation, Measure to remove receptors from flood prone areas, or to relocate receptors to areas of lower probability of flooding and/or of lower hazard
M23	Prevention, Reduction, Measure to adapt receptors to reduce the adverse consequences in the event of a flood actions on buildings, public networks, etc...
M24	Prevention, Other prevention, Other measure to enhance flood risk prevention (may include, flood risk modelling and assessment, flood vulnerability assessment, maintenance programmes or policies etc...)
	Protection
M31	Protection Natural flood management / runoff and catchment management, Measures to reduce the flow into natural or artificial drainage systems, such as overland flow interceptors and / or storage, enhancement of infiltration, etc and including in-channel, floodplain works and the reforestation of banks, that restore natural systems to help slow flow and store water.
M32	Protection, Water flow regulation, Measures involving physical interventions to regulate flows, such as the construction, modification or removal of water retaining structures (e.g., dams or other on-line storage areas or development of existing flow regulation rules), and which have a significant impact on the hydrological regime.
M33	Protection, Channel, Coastal and Floodplain Works, Measures involving physical interventions in freshwater channels, mountain streams, estuaries, coastal waters and flood-prone areas of land, such as the construction, modification or removal of structures or the alteration of channels, sediment dynamics management, dykes, etc.
M34	Protection, Surface Water Management, Measures involving physical interventions to reduce surface water flooding, typically, but not exclusively, in an urban environment, such as enhancing artificial drainage capacities or though sustainable drainage systems (SuDS).
M35	Protection, Other Protection, Other measure to enhance protection against flooding, which may include flood defence asset maintenance programmes or policies
	Preparedness
M41	Preparedness, Flood Forecasting and Warning, Measure to establish or enhance a flood forecasting or warning system
M42	Preparedness, Emergency Event Response Planning / Contingency planning, Measure to establish or enhance flood event institutional emergency response planning
M43	Preparedness, Public Awareness and Preparedness, Measure to establish or enhance the public awareness or preparedness for flood events
M44	Preparedness, Other preparedness, Other measure to establish or enhance preparedness for flood events to reduce adverse consequences

[66] Guidance for Reporting under the Floods Directive (2007/60/EC): https://circabc.europa.eu/w/browse/a3c92123-1013-47ff-b832-16e1caaafc9a

	Recovery & Review
M51	Recovery and Review (Planning for the recovery and review phase is in principle part of preparedness), Individual and societal recovery, Clean-up and restoration activities (buildings, infrastructure, etc), Health and mental health supporting actions, incl. managing stress Disaster financial assistance (grants, tax), incl. disaster legal assistance, disaster unemployment assistance, Temporary or permanent relocation, Other
M52	Recovery and Review, Environmental recovery, Clean-up and restoration activities (with several sub-topics as mould protection, well-water safety and securing hazardous materials containers)
M53	Recovery and Review, Other, Other recovery and review Lessons learnt from flood events Insurance policies
	Other
M61	Other

Catalogue of Natural Water Retention Measures (NWRM)

NWRM cover a wide range of actions and land use types. Many different measures can act as NWRM, by encouraging the retention of water within a catchment and, through that, enhancing the natural functioning of the catchment. The catalogue developed in the NWRM project represents a comprehensive but non-prescriptive wide range of measures; other measures, or similar measures called by a different name, could also be classified as NWRM.

To ease access to measures, the catalogue of measures hereunder is sorted by the primary land use in which it was implemented: Agriculture; Forest; Hydromorphology; Urban. Most of the measures however can be applied to more than one land use type.

Table B2 List of NWRMs

Agriculture	Forest	Hydro Morphology	Urban
A01 Meadows and pastures	F01 Forest riparian buffers	N01 Basins and ponds	U01 Green Roofs
A02 Buffer strips and hedges	F02 Maintenance of forest cover in headwater areas	N02 Wetland restoration and management	U02 Rainwater Harvesting
A03 Crop rotation	F03 Afforestation of reservoir catchments	N03 Floodplain restoration and management	U03 Permeable surfaces
A04 Strip cropping along contours	F04 Targeted planting for 'catching' precipitation	N04 Re-meandering	U04 Swales
A05 Intercropping	F05 Land use conversion	N05 Stream bed re-naturalization	U05 Channels and rills
A06 No till agriculture	F06 Continuous cover forestry	N06 Restoration and reconnection of seasonal streams	U06 Filter Strips

Agriculture	Forest	Hydro Morphology	Urban
A07 Low till agriculture	F07 'Water sensitive' driving	N07 Reconnection of oxbow lakes and similar features	U07 Soakaways
A08 Green cover	F08 Appropriate design of roads and stream crossings	N08 Riverbed material renaturalisation	U08 Infiltration Trenches
A09 Early sowing	F09 Sediment capture ponds	N09 Removal of dams and other longitudinal barriers	U09 Rain Gardens
A10 Traditional terracing	F10 Coarse woody debris	N10 Natural bank stabilisation	U10 Detention Basins
A11 Controlled traffic farming	F11 Urban forest parks	N11 Elimination of riverbank protection	U11 Retention Ponds
A12 Reduced stocking density	F12 Trees in Urban areas	N12 Lake restoration	U12 Infiltration basins
A13 Mulching	F13 Peak flow control structures	N13 Restoration of natural infiltration to groundwater	
	F14 Overland flow areas in peatland forests	N14 Re-naturalisation of polder areas	

Source: www.nwrm.eu