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First Flood Risk Management Plans - Member State: Luxembourg

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 FRMP for Luxembourg¹. 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 FRMPs² as per Articles 7 and 15 of the FD: this reporting provides an overview of the plans and details on their measures.
- One FRMP – Luxembourg reported one national FRMP covering the Mosel unit of management (UoM) LU_000.

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 Member States may have altered since then.

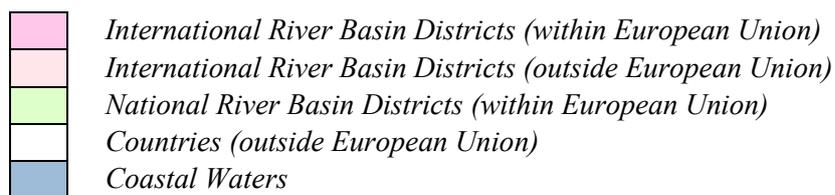
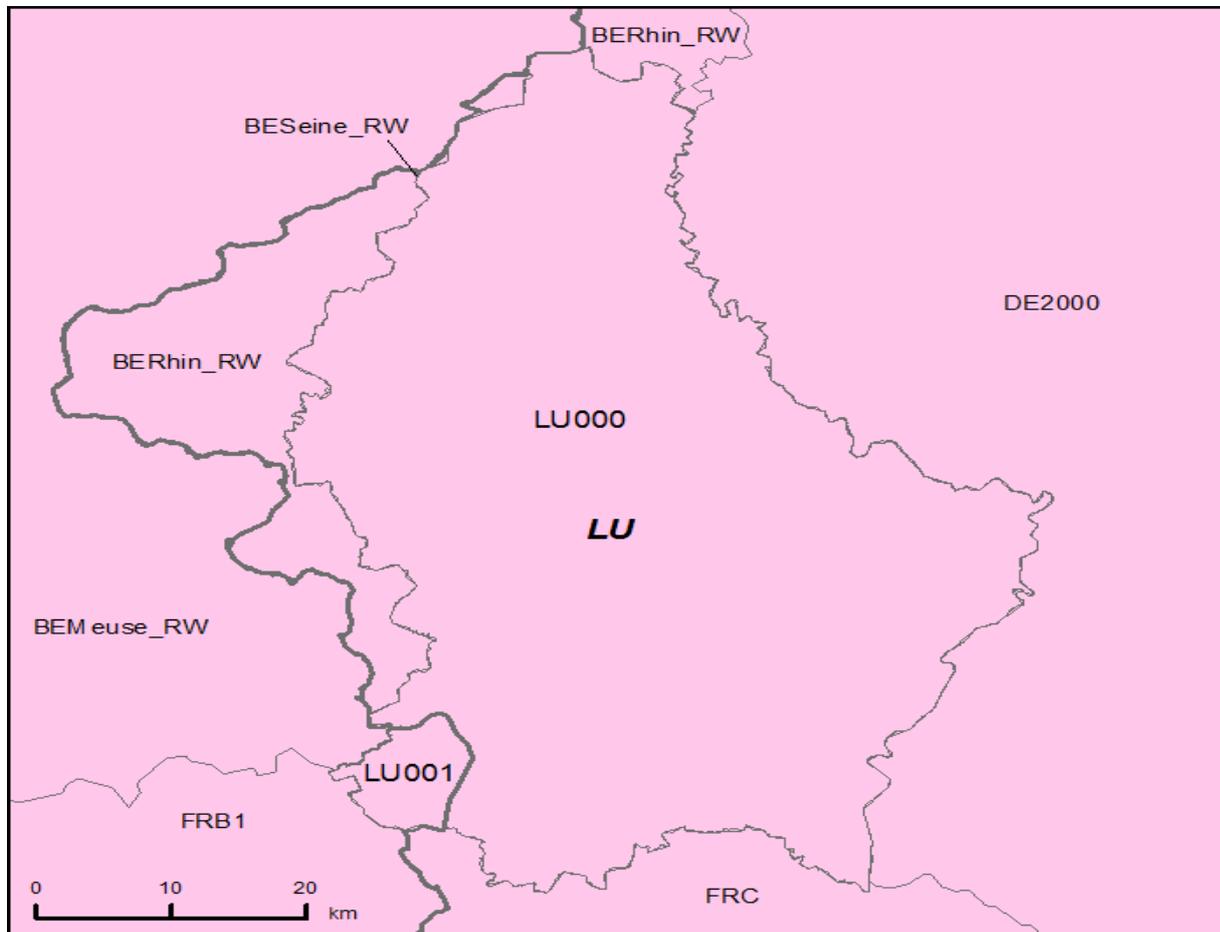
² Referred to as “Reporting Sheets” throughout this report. Data must be reported in a clear and consistent way by all Member States. The format for reporting was jointly elaborated by the Member States and the Commission as part of a collaborative process called the “Common Implementation Strategy”:

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*



Source: WISE, Eurostat (country borders)

Luxembourg has two UoMs, which are both international. These two UoMs correspond in territory to the two River Basin Districts (RBDs) that Luxembourg has established under the Water Framework Directive (WFD). The Mosel UoM (LU000), which is part of the international Rhine UoM, covers 97.3 % of the surface area of the country. The Chiers UoM (LU001), which is part of the international Meuse UoM, covers 2.7 % of the surface area in Luxembourg. The latter is not considered flood risk relevant and no FRMP was prepared. Therefore, Luxembourg reported only one FRMP covering the Mosel UoM.

No information was found concerning the legal status of the FRMP^{3,4}.

The table below gives an overview of all UoMs in Luxembourg, including the UoM code, the name, and the number of APSFRs reported. It also shows if the UoM reported all documents required to the European Environment Agency's (EEA) WISE⁵ – the FRMP as a PDF and the reporting sheet as an XML.

Table 1 **Overview of UoMs in Luxembourg**

UoM	Name	Number of APSFRs	XML Reported	PDF Reported
LU000	RHINE (Mosel)	15	Yes	National level
LU001	MEUSE (Chiers)	-	No	No
TOTAL		15		

The FRMP can be downloaded in French or in German from the following web page:

- https://eau.public.lu/directive_cadre_eau/directive_inondation/1er-cycle/HWRML-PL_final/index.html

³ The FRMPs do mention, however, that the flood hazard and risk maps have legal status under national regulations approved in 2015 (Mémoriales A Numbers 39, 40, 41, 42, 44 and 45, all 2015): FRMP of 22.12.2015, Section 7.2, p.76.

⁴ Luxemburg informed in May 2018 that the FRMP was adopted by the Luxembourgish Government on 16 March 2018 and published as the *Arrêté ministériel du 9 avril 2018 portant publication du plan de gestion des risques d'inondations du Grand-Duché de Luxembourg* in the *Journal officiel du Grand-Duché de Luxembourg*:

<http://legilux.public.lu//eli/etat/adm/amin/2018/04/09/b1010/jo>
⁵ <http://rod.eionet.europa.eu/obligations/603/deliveries?id=603&tab=deliveries&d-4014547-p=1&d-4014547-o=2&d-4014547-s=3>

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.

Table 2 *Overview of the evidence found during the assessment of the FRMP*

Criterion	Evidence	Comments
FRM objectives have been established	Strong evidence	The broad overall objectives for flood management of LAWA (<i>Länder Arbeitsgemeinschaft Wasser und Abwasser – Länder Working Group Water and Wastewater</i>) in Germany have been adopted, to ensure a unified approach within trans-boundary Flood Management Partnerships.
FRM objectives relate to...		
...the reduction of potential adverse consequences	Strong evidence	This is part of the broad overall objectives adopted from LAWA, which includes ‘protecting populations immediately outside flood risk zones to minimise creating new risks’.
...to the reduction of the likelihood of flooding	Strong evidence	This is part of the broad overall objectives adopted from LAWA.
...to non-structural initiatives	Strong evidence	The focus of the objectives lies on non-structural measures for flood preparedness and or minimising the adverse consequences of flooding, such as raising public awareness.

Criterion	Evidence	Comments
FRM objectives consider relevant potential adverse consequences to...		
...human health	Strong evidence	The proposed catalogue of measures (also adopted from LAWA and used for the selection of appropriate measures for Luxembourg) includes in its general framework of objectives the following: (i) Human Health: to reduce the number of people affected by flooding;
...economic activity	Strong evidence	(ii) to reduce the adverse consequences on economic activity (and not to create new ones);
...environment	Strong evidence	(iii) to avoid damage to the environment;
...cultural heritage	Strong evidence	(iv) to protect the cultural heritage by applying the same principles as for protecting the population and the environment.
Measures have been...		
...identified	Strong evidence	Luxembourg has reported 883 measures, which were identified (selected from the LAWA catalogue of measures) by local authorities, river and flood partnerships, citizens, enterprises, and other stakeholders to encourage local, private and corporate initiatives at national level.
...prioritised	Some evidence	An element of prioritisation is embodied in general terms in the overall objectives which include 'defining measures to reduce the risk of flooding, which can be implemented in the short-term', but there seemed to be no specific prioritising of individual measures, except in terms of compatibility with the WFD objectives (i.e. synergy with WFD = high priority).
Relevant aspects of Article 7 have been taken into account such as...		
...costs & benefits	No evidence	It is stated that no cost-benefit analyses have been carried out. However, a semi-quantitative effectiveness analysis was carried out with five categories (scale from zero to +++) for the effects on flood risk, river flow, and WFD relevance.

Criterion	Evidence	Comments
...flood extent	Strong evidence	The flooded areas are shown for three different risk/hazard scenarios on the flood hazard/risk maps (which have legal status) and these were taken into account when selecting measures.
...flood conveyance	No evidence	There is no clear reference to flood conveyance.
...water retention	Strong evidence	Natural water retention measures (NWRMs) have been planned in catchments and in wetlands, as well as reductions in impermeable surfaces, and restoration of flood plains.
...environmental objectives of the WFD	Strong evidence	The relevance of selected measures to the environmental objectives of the WFD was assessed in a semi-quantitative effectiveness analysis resulting in five categories of effectiveness (scale from zero to ++++).
...spatial planning/land use	Strong evidence	A number of spatial planning and land use measures are included/planned, e.g. measures to prevent new buildings, and other land use restrictions are subject to controls and legislation in flood risk/hazard areas, as designated on the maps.
...nature conservation	Some evidence	Protection zones under the Habitats and Birds Directives are indicated on the FHRMs, and reference is made to Natura 2000 sites, but it is not clear if or how these have been taken into account when selecting measures.
...navigation/port infrastructure	Some evidence	Navigation on the Mosel and the port at Mertert are mentioned in relation to a Seveso site and storage/handling of chemicals, but it is not clear if or how these have been taken into account when selecting measures.
...likely impact of climate change	Some evidence	Work is ongoing, e.g. the effect on flooding has been calculated, and the national strategy on climate change is under development.

Criterion	Evidence	Comments
Coordination with other countries ensured in the RBD/UoM	Strong evidence	There has been close collaboration with Germany, France and Belgium in the area of Flood Risk Management (FRM), in particular within the International Commission for the Protection of the Mosel-Saar (ICPMS) (sub-basin of the Rhine). In addition, the preparation of the FHRMs and measures closely follow the German LAWA recommendations.
Coordination ensured with WFD	Strong evidence	Measures have been co-ordinated with the requirements of the WFD. Measures were assessed in terms of their relevance to the WFD objectives and classified as M1 (synergy between the two Directives), M2 (potential conflict, requiring more detailed local assessment) and M3 (not relevant, but may require more detailed local assessment). Measures classified as M1 were considered high priority for implementation. The relevance to the WFD and the effect of each measure on WFD objectives are listed in Annex 1 (as a semi-quantitative assessment with five categories ranging from 0 to ++++).
Active involvement of interested parties	Strong evidence	Public consultation was designed to involve stakeholders and relevant authorities and associations (newly formed Flood Management Partnerships) at an early stage of the planning process (starting in 2010/11) and involved three parts, i.e. (i) dissemination of information, (ii) active participation and (iii) formal hearings. The Flood Management Partnerships and pre-existing River Management Partnerships were actively involved in the selection of measures and continue to be involved in their implementation.

Good Practices

The assessment identified the following good practices in the Luxembourgish FRMP assessed.

Table 3 *Good practices in the Luxembourgish FRMP*

Topic area	Good practices identified
Integration of previously reported information in the FRMPs.	<p>The FHRMs have been refined to include more information on economic activity and measures and are available (on the internet) to the public, providing detail down to street or individual building level, for three different hazard/risk scenarios.</p> <p>The information on the maps include quantitative impacts, such as flood extent and water depth (ranges), and number of people (ranges) affected, whilst economic activities are shown on the maps (separate land use overlay), including old discharges/polluted sites, Seveso and Industrial Emissions Directive (IED) risk sites, sensitive buildings (incl. schools, hospitals) and protected areas (Drinking Water, Habitats and Bird Directives).</p>
Setting of objectives for the management of flood risk.	The overall objectives are clear and comprehensive, developed also through public and international/cross-boundary consultation.
Planning/implementing of measures and their prioritization for the achievement of objectives.	<p>The FRMP (in its Annex I) provides a semi-quantitative effectiveness analysis of measures with five categories (scale from zero to +++) for the effects on: flood risk, river flow, and WFD relevance.</p> <p>The great majority (90 %) of individual measures are NWRMs.</p>
Consideration of climate change in the FRMPs assessed.	Climate change has been investigated and the effects on river flows at the different risk scenarios have been estimated in terms of percentage change in river flows at 10 locations (fluvial flooding is the only type considered relevant).
Public participation.	<p>Public consultation involved a wide range of stakeholders and consisted of (i) provision of information, (ii) active involvement in the preparation of the FRMP and selection of measures and continuing involvement in implementing measures, and (iii) formal hearings.</p> <p>The results of active involvement and wider consultation were largely incorporated into the FRMP.</p>
Flood risk governance.	Whilst overall responsibility for the implementation of both the Floods Directive and the WFD lies with the Administration for Water Management in the Ministry for Sustainable Development, relevant Local Authorities and stakeholders play a large role in flood risk management, including via Flood Management Partnerships.
International issues in flood risk management.	There is good trans-boundary co-operation within the International Commissions for the Protection of the Saar-Mosel and the Rhine,

Topic area	Good practices identified
	including a unified approach with Germany to overall objectives and selection of measures at national level, and consequently covering trans-boundary APSFRs, facilitated by three transboundary Flood Management Partnerships.

Areas for further development

The assessment identified the following areas for further development in the Luxembourgish FRMP assessed.

Table 4 *Areas for further development in the Luxembourgish FRMP*

Topic area	Areas identified for further development
Setting of objectives for the management of flood risk.	There are no specific (measurable) objectives and therefore no quantitative targets to achieve/measure, although it is mentioned that more detailed objectives were developed at local or APSFR level. Whereas Annex 1 of the FRMP lists all measures together with the expected implementation time frame (the majority are planned for 2015-2021), ⁶ it is not clear if or how the objectives are measurable.
Planning/implementation of measures and their prioritization for the achievement of objectives.	There is no clear information on costs and funding sources. There is no clear method for demonstrating how measures will contribute to the objectives of the FRMP (neither objectives nor measures are specific), although links between the 13 measure types and 25 overall objectives are indicated and individual measures are linked to measure types. ^{7 8} There is no clear prioritisation of individual measures, except in terms of compatibility with the WFD objectives.
Consideration of climate change in the FRMPs assessed.	The potential change on flood risk, as a consequence of climate change, does not seem to have been taken into account when defining objectives and measures. No reference to the national climate change adaptation strategy was found.
Use of cost-benefit analysis (CBA) in the FRMPs assessed.	Although a semi-quantitative effectiveness assessment was undertaken, no CBA was carried out.
Flood risk governance.	It is not always clear in the FRMP who is responsible at local level for undertaking specific measures, although a database (LuxMaPro3) has been quoted. It provides details of measures and identifies local

⁶ Luxembourg informed subsequently a clear implementation timetable will be included in the next FRMP.

⁷ In Annex 1 of the FRMP.

⁸ Luxembourg informed subsequently that clear links between measures and objectives will be included in the next FRMP.

Topic area	Areas identified for further development
	responsibilities but is currently only available for administrative purposes.

Recommendations

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

- Specific and measurable objectives should be developed to the extent possible, which would then allow clear targets to be set and achievements of progress to be measured against a baseline. How measures link to objectives should be considered.
- The potential change on flood risk, as a consequence of climate change, should be taken into account to the extent possible when defining objectives and measures; Coordination between the FRMP and the national climate change adaptation strategy should be ensured or elaborated upon.
- Costs of measure estimations and specific funding sources should be included in the FRMP.
- The prioritisation approach in the FRMP should be evaluated with a view to strengthening in the 2nd cycle. A CBA of measures should be developed and undertaken whenever possible.
- The timeline of implementation of measures should be more clearly set out in the FRMP, and/or provide key information from the LuxMaPro database⁹.

⁹ LuxMaPro is a database for measures implemented at local community level, where for each measure the local authority, working group or Flood Management Partnerships responsible for its implementation is named. The FRMP states that at the time of its publication, this database is a restricted administrative tool, but the long term aim is to make it public on the Geoportal (<http://eau.geoportail.lu>).

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

1.1 Reporting of the FRMPs

Luxembourg reported only one FRMP covering the Mosel UoM (LU000), part of the Rhine international UoM/RBD. No FRMP was reported for the other UoM in Luxembourg (Chiers, LU001, part of the Meuse international UoM/RBD) as it was not considered relevant for flood risk. Luxembourg did not use Art. 13(3) of the Floods Directive, which allows Member States to make use of previous flood risk management plans (provided their content is equivalent to the requirements set out in the Directive).

The FRMP can be downloaded in French or in German from the following web page:

- https://eau.public.lu/directive_cadre_eau/directive_inondation/1er-cycle/HWRML-PL_final/index.html

1.2 Assessment of the FRMPs

The sole FRMP reported by Luxembourg has been assessed:

Table 5 *UoM in Luxembourgish FRMP*

UoM code	UoM Name
LU000	Rhine

2. Integration of previously reported information

2.1 Conclusions drawn from the preliminary flood risk assessment

The conclusions of the PFRA are provided in a textual description and summary maps of the APSFRs covered by the FRMP. The history of flood protection in Luxembourg is described at length from the time of significant flooding events in 1983, through to the first collaboration on Flood Risk Management (FRM) with neighbouring EU Member States within the International Commission for the Protection of the Mosel-Saar (ICPMS, sub-basin of the Rhine) in 1995, and the description of various action plans up to 2010. The FRMP then briefly describes the designation of 15 APSFRs (these are along 15 different river courses) reported in 2012; these areas are listed including the four countries the rivers are shared with, together with a very unclear printed map indicating the APSFRs (detailed maps can be accessed on the Geoportal). The designation of the APSFRs has not changed since 2012. The FRMP states that Art.13(1)(b) of the Floods Directive was applied. The method of APSFR designation is described briefly and involved collaboration with neighbouring countries.

Examples of flood hazard and flood risk maps are shown in the FRMP and a link is provided¹⁰, where the public can access maps for any area, town or river, with three different levels of risk or hazard (high, medium or low), different map backgrounds, including overlay of land use maps and legends. Maps can cover the whole of Luxembourg or focused in at street level, but they are not specific to an APSFR. Historic flood events can also be looked up.

The rivers and flooded areas are shown on the flood risk maps, but there seems to be no information on flood conveyance routes, although some may be found when focusing in on locations on the maps where measures are also indicated.

2.1.1 Coordination with neighbouring Member States on shared RBDs/UoMs

There has been close collaboration with Germany, France and Belgium on flood risk management since 1995 within the ICPMS, and the designation of APSFRs was based on an Interreg IIIB project, TIMIS Flood (Transitional Internet Map Information System on Flooding), carried out with France and Germany, together with historical data and in agreement with the relevant authorities of neighbouring countries.

¹⁰ The link provided to the Geoportal is <http://eau.geoportail.lu> and can be accessed by the public. It is necessary to navigate to the Floods Directive area, then choose risk or hazard maps, and provide a location to display the relevant map for the chosen location.

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

There were no major changes other than some adjustments to FHRMs in 2013, following public consultation and reference to updated data. The FRMP reports that some recalculations were performed on the maps for APSFRs Alzette (A01), the Sauer (A03), the Roudbach/Attert confluence (A12/A11) and localised adjustments were made on the Roudbach (A12), Syr (A02), the White Emz (A05), Pall (A13), Mamer (A15) and Our (A08). Recalculations of mapping data involved consideration of additional measures (extended re-naturalisation measures in the Alzette APSFR A01, and ecologically oriented flood protection measures in the Sauer APSFR A03); and in some locations more detailed modelling using a two-dimensional water level model (Nordstad in A01, Roudbach/Attert confluence A12/A11). These updates were undertaken in the maps made available to the public in 2014.

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

Examples of FHRMs are shown in the FRMP and the link for accessing the maps is provided¹¹. The cause of flooding is not specified on the maps¹², but they are fluvial maps as confirmed by the Luxembourg authorities¹³ (with flooding caused by heavy rainfall). Other flood types do not seem to be relevant or have not been assessed (coastal flooding is not relevant as Luxembourg is landlocked).

The information on the maps include quantitative impacts, such as flood extent and water depth (ranges), and number of people (ranges) affected for three different risk/hazard scenarios, whilst economic activities are shown on the maps (separate land use overlay), including old discharges/polluted sites, Seveso and IED risk sites, sensitive buildings (incl. schools, hospitals) and protected areas (Drinking Water, Habitats and Bird Directives).

2.2.1 Maps for shared flood risk areas

The maps are national, but the APSFRs shared with other countries are indicated in the FRMP (text, not as a map)¹⁴. As indicated previously, there has been close co-operation with neighbouring Member States, mainly within the ICPMS, as well as within the European Interreg III project B TIMIS Flood (Transitional Internet Map Information System on

¹¹ The link for maps is: <http://eau.geoportail.lu>. See also the previous footnotes. Examples of maps in the FRMP, version 22.12.2015 (in German), Section 1.2, pp.16-19 and Section 2, p.23.

¹² In May 2018 Luxembourg remarked that this will be addressed in the update of the FHRMs by December 2019.

¹³ Confirmation concerning fluvial maps: 'EU overview of methodologies used in preparation of Flood Hazard and Flood Risk Maps' Report (2015), Table 4.2. p.25.
http://ec.europa.eu/environment/water/flood_risk/pdf/fhrm_reports/EU%20FHRM%20Overview%20Report.pdf

¹⁴ Luxembourg noted in May 2018 that the following hyperlinks will be provided in the next update on mapping and co-operation: <http://www.iksms-cipms.org/servlet/is/66959/>

Flooding). The risk evaluations were agreed with authorities of neighbouring countries (France and Germany), and are to be reviewed and updated where appropriate by the end of 2018 and every six years thereafter. The preparation of the FHRMs and measures also closely follow the German LAWA¹⁵ recommendations and is agreed with the relevant neighbouring MS.

2.2.2 Conclusions drawn from the flood hazard and flood risk maps

The FHRMs were used as a basis for planning and prioritising measures, including the identification of ‘flooding hotspots’ requiring particularly urgent actions to reduce the flood risk. They formed an important tool to promote public participation (beyond the initial public consultation process), including public information, and allowing stakeholders to suggest appropriate measures (from the German LAWA catalogue of measures), which were then examined by experts and allocated to risk areas as appropriate.

2.3 Changes to the APSFRs or other Flood Risk Areas

Any changes in the identification of APSFRs or other Flood Risk Areas since December 2011 should be reflected in the FRMP. There are 15 APSFRs (Codes: A01-A15) and these have not changed since reporting in 2012, although some adjustments were made as detailed above. No changes or updated information concerning the FHRMs after 2013 were found; the FHRMs available on the Geoportal are those produced in 2013.

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

The 2014 FHRM assessment¹⁶ identified the following areas for further development for Luxembourg:

- Economic activity: According to Art.6(5)(b) of the Floods Directive, flood risk maps shall show the potential adverse consequences associated with flood scenario in terms of type of economic activity. Luxembourg did not show the type of economic activities in its FHRMs.
- Links to national maps: Links to national FHRMs were not reported to the European Commission.
- Climate change: Climate change was not included in the analysis.

All the areas for further development identified have been addressed, as follows:

¹⁵ Länder Arbeitsgemeinschaft Wasser und Abwasser – Länder Working Group Water and Wastewater.

¹⁶ Based on: European Commission, Assessment of Flood Hazard and Flood Risk Maps – Member State Report: LU – Luxembourg, 2014. Available at: http://ec.europa.eu/environment/water/flood_risk/pdf/fhrm_reports/LU%20FHRM%20Report.pdf

- Economic activity: The FHRMs can be overlaid with a land-use map which includes details, such as Agricultural areas, Vineyards, Orchards, Urban areas, Industrial/commercial zones, etc. However, the land use map added in 2013 was not the latest version, and the FRMP states that this will be updated in the next cycle. Old discharges/contaminated sites, Seveso sites and IED sites are indicated on the current maps.
- Links to national maps for all UoMs: A link is provided in the FRMP where FHRMs can be called up for any location (the maps had been available to the public, though the link was not provided in previous reporting).
- Climate change: According to the FRMP, this has now been assessed and the effects on river flows at the different risk scenarios have been estimated in terms of percentage change in river flows at 10 locations. They do not, however, seem to have been included in the current maps, as they are predictions for 2021-2050.

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

The following **good practices** have been identified:

- International co-operation and public participation was strong in the previous steps (see also section 7 for details). There is close co-operation with neighbouring Member States (Germany, France and Belgium), mainly within the ICPMS. The preparation of the FHRMs and the selection of measures also closely follow the German LAWA approach and are agreed with the relevant neighbouring Member States.
- The FHRMs have been refined to include more information on economic activity and on measures and are available on the internet to the public, providing detail down to street or individual building level for three different hazard/risk scenarios.
- The information on the maps include quantitative impacts, such as flood extent and water depth (ranges), and number of people (ranges) affected, whilst economic activities are shown on the maps (separate land use overlay), including old discharges/polluted sites, Seveso and IED risk sites, sensitive buildings (incl. schools, hospitals) and protected areas (Drinking Water, Habitats and Bird Directives).

3. Setting of Objectives

3.1 Focus of objectives

The FRMP does not include specific objectives. Instead, the broad overall objectives set out by LAWA¹⁷ in Germany have been adopted and included in the FRMP for Luxembourg. These objectives are:

- reduce flood occurrence (prevent new risks);
- reduce the existing risks (protection);
- reduce the adverse consequences of floods (preparedness); and
- reduce the adverse consequences of floods after the event (recovery and review).

By using the LAWA objectives and preparing the FRMP in line with Germany's approach, a unified approach is ensured within the three transboundary Flood Management Partnerships (Luxembourg created a total of five of these voluntary associations of local authorities, official bodies and other stakeholders, actively involved in the preparation of the FRMP – see more detail in Section 7). The overriding objectives are stated as '*defining measures to reduce the risk of flooding, which can be implemented in the short-term*', and in addition, '*protecting populations immediately outside flood risk zones so as to minimise creating new risks*' (protecting those inside the risk zones is implicit in the first objective).

Consequently, in the FRMP assessed¹⁸:

- The objectives aim to reduce the adverse consequences of floods.
- The objectives aim to reduce the likelihood of flooding¹⁹.
- The objectives aim to coordinate flood risk with neighbouring transboundary countries (e.g. to ensure that measures taken do not increase the flood risk in the neighbouring country).
- The objectives have another focus (reducing adverse consequence after a flood event).

According to the FRMP, more detailed objectives are set at local or APSFR level; it is not clear what these are (and if they are specific/measurable/time-bound) as they are not set out in the FRMP but are used as a basis for developing the measures.

¹⁷ Länder Arbeitsgemeinschaft Wasser und Abwasser – Länder Working Group Water and Wastewater.

¹⁸ These categories are included in Art. 7 of the Floods Directive.

¹⁹ 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.

3.2 Specific and measurable objectives

In Luxembourg, the objectives are neither specific nor measurable. No specific measurable objectives have been set (only some more detailed regional/local objectives, which served as a basis for selecting measures, but have not been published).

3.3 Objectives to reduce adverse consequences from floods

The overall objectives of reducing adverse consequences are explained in terms of human health, economic activity, environment and cultural heritage (see also the following paragraphs).

3.4 Objectives to address the reduction of the likelihood of flooding

The broad overall objectives and the catalogue of measures (status 2013) from the German working group LAWA formed the basis to select more detailed objectives and proposed measures (proposed catalogue of objectives and measures, see below). The more detailed objectives were elaborated at local or APSFR level for each given situation (but not included in the FRMP, although the links between the 13 overall objectives and the 25 measure types are described in the plan), to serve as a basis for developing measures.

The main focus of these proposed catalogues of objectives and measures was to provide guidance to local authorities, river and flood partnerships, citizens and enterprises and to encourage local, private and corporate initiatives under the general framework of: (a) ‘Human Health’: reducing the number of people affected by flooding; (b) ‘Environment’: avoiding damage to the environment; (c) ‘Cultural Heritage’: protecting the cultural heritage by applying the same principles as for protecting the population and the environment; and (d) ‘Economic Activity’: reducing the adverse consequences on economic activity (and not to create new ones). The proposed ‘catalogue of objectives’ is mentioned in the FRMP but not included, as it seems to have served as a working document to develop (through active participation of the public - see section 7 of this report) the final catalogue of measures in Annex 1 of the FRMP, which does not include the detailed objectives, although individual measures are listed against measure types²⁰.

3.5 Process for setting the objectives

Objectives have been co-ordinated at national (various administrations, including local community authorities and the public at large) and international level (Flood Risk and River Management Partnerships, International Commissions for the Protection of the Mosel-Saar, the

²⁰ Luxembourg subsequently clarified clear links between measures and objectives will be included in the next FRMP.

Rhine and the Meuse). Public participation was an integral part of preparing the FRMP, including setting overall objectives, and more detailed local objectives and measures. Whilst effects of climate change have been addressed, the absence of specific objectives means it is not possible to assess how and if they have been addressed in choosing measures, except in a broad overall context.

3.6 Good practices and areas for further development regarding setting objectives

The following **good practices** were identified:

- The overall objectives are clear and comprehensive.
- The process to develop objectives included extensive public consultation (at local community level – see Section 7 of this report) and trans-boundary co-operation, i.e. a unified approach with Germany to overall objectives setting and selection of measures at national level, and consequently covering trans-boundary APSFRs.

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

- Luxembourg's FRMP does not set specific objectives and therefore has no quantitative targets to achieve or measure progress against, although it is mentioned that more detailed objectives were developed at local or APSFR level. Although Annex 1 of the FRMP lists all measures together with the expected implementation time frame, the majority are planned for 2015-2021,²¹ it is not clear if or how the objectives are measurable.

²¹ Luxembourg informed subsequently a clear implementation timetable will be included in the next FRMP.

4. Planned measures for the achievement of objectives

Luxembourg has reported a total number of 813 individual measures to be implemented at local level and 70 aggregated²² measures: the latter, according to the FRMP, can be implemented at national level and include strategic/conceptual measures (see below). In consequence, the total number of measures is 883²³.

Measures are reported for the aspects of flood risk management: Prevention, Protection, Preparedness, Recovery & Review, and “Other Measures”^{24,25}. The Luxembourgish catalogue of Measures is based on the German LAWA Catalogue of Measures, which includes a “300 series” and a “500 series” of measures; the numbering system of the LAWA catalogue has also been adopted, rather than the EU coding (which is found in Annex B below). The 300 series of measures (numbers 301-328) selected for Luxembourg includes measures divided into the five EU aspects. The 500 series are “strategic/conceptual measures” implemented at national level only (see below).

The number of Prevention measures is very low (18 out of 883, 2 % of the total) while the great majority of measures is for Protection (823 of 883, 93 % of the total). However, the 25 “strategic/conceptual measures” and some other aggregated measures, which apply nationwide, relate to overall risk reduction and prevention: see tables A3 and A4 in Annex A of this document, where the 25 strategic/conceptual measures are listed under “other aggregated measures”. Therefore, the overall number of measures for prevention is actually higher than 2%. Among the 25 “strategic/conceptual measures” which apply at national level, the following measures are included: preparation of concepts, studies, assessments and changes in legislation; information and educational measures; advisory measures; setting up or revising promotional programmes; and investigations into climate change. These measures relate to overall risk reduction and prevention in general across Luxembourg and correspond to the 25 “other” aggregated measures, (see Table A4 in Annex A of this report)²⁶.

Please see Annex A for further details and supplementary tables and charts on measures.

²² 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.

²³ 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.

²⁴ For details about all measure aspects and measure types see Annex B.

²⁵ Luxembourg subsequently clarified that these “other measures” are measures that there is no correspondence between the LAWA Codes and the EU Codes.

²⁶ Luxembourg clarified subsequently that these are indeed aggregate measures that are planned to be implemented at the national level.

4.1 Cost of measures

Luxembourg's FRMP and reporting sheets did not provide information on costs or budgets of measures planned.

4.2 Funding of measures

Luxembourg's FRMP and reporting sheets did not provide any information on funding of the measures²⁷, except in relation to 'Preparedness Measures' as follows: "*because it is not possible to take out insurance against flood damage in Luxembourg, funds have to be set aside at national and/or private level. (Funds for recovery can be obtained from the State if a national disaster has been declared)*".

4.3 Measurable and specific (including location)

The measures have no quantitative element and are therefore not measurable, but many are defined at local community level and the locations are indicated on the Flood Risk Maps.

4.4 Measures and objectives

It is not clear how the measures will contribute to the achievement of objectives, nor clear by how much they will contribute. It is also not clear whether the objectives will be achieved when all measures are completed. Since both the objectives and the measures reported for Luxembourg are not specific, it is not possible to make any quantitative assessment of achievement of objectives. However, Annex I of the FRMP (Catalogue of measures) lists measures and includes a semi-quantitative effectiveness analysis for each measure with five categories (scale from zero to +++) for the effect on flood risk and river flow, and WFD relevance.

4.5 Geographic coverage/scale of measures

The FRMP and online flood maps linked to specific layers in the geoportal provide information on the location of measures. The 25 "strategic/conceptual measures" are national (UoM)/implemented at national level (e.g. studies, assessments and legislative matters, information and educational measures, advisory services, programme promotions and studies related to climate change) whereas the majority of the other measures are implemented predominantly at the levels of local community and the seven flood risk hot spots level (this can be seen on the Flood Risk Maps²⁸). In addition, Annex I of the FRMP (Catalogue of

²⁷ Luxembourg subsequently commented that this will be addressed in the update of the FRMP in December 2021.

²⁸ Available at: <http://eau.geoportail.lu>

measures) indicates whether the measures selected for Luxembourg from the LAWA Catalogue are planned or implemented at national or local level, and lists the relevant municipality, community, partnership or APSFR, as appropriate.

Luxembourg reported the geographic coverage of the effects of the measures. The geographic coverage of all individual measures (813) is a single APSFR (i.e. measures are uniquely apportioned to individual APSFRs). For the 70 aggregated measures, the geographic coverage is the UoM (for details see Table A6 and Figure A3 in Annex A below).

4.6 Prioritisation of measures

Luxembourg listed all measures as ‘very high’ priority²⁹; this is in line with the overall objective of selecting measures which can be implemented in the short-term.

No CBA has been made to prioritise the measures. Instead, measures have been selected from the German LAWA Catalogue of measures, in line with the overriding objective of ‘*defining measures to reduce the risk of flooding, which can be implemented in the short-term*’, and ‘*protecting populations immediately outside flood risk zones so as to minimise creating new risks*’. However, the results of the semi-quantitative effectiveness analysis that was carried out was used to prioritise measures that had synergies with the WFD (for details see the section ‘Measures taken under other Community Acts’).

4.7 Authorities responsible for implementation of measures

Luxembourg did not report information about the responsible authorities and level of responsibility for the measures in the reporting sheet. The FRMP states that overall responsibility lies with the Ministry for Sustainable Development and the Administration for Water Management; the latter has responsibility for measures involving research, investigations and administrative acts. Direct responsibility for other national measures lies with various national institutions (not detailed). Local measures and those at APSFR level are with local communities and/or Flood Management or River Management Partnerships. No details are provided, but there is reference to a database (LuxMaPro) for measures implemented at local community level, where for each measure the local authority, working group or Flood Management Partnerships responsible for its implementation is named. The FRMP states that at the time of its publication, this database was a restricted administrative tool, but the long-term aim is to make it public on the Geoportal (<http://eau.geoportail.lu>).

²⁹ Subsequently Luxembourg described this as an error, which will be addressed in the update of the FRMP in December 2021 (there are three levels of priority, see also Annex 1 of this document).

4.8 Progress of implementation of measures

The FRMP (in its Annex I) lists three timeframes for measures: 2009-2015 (for completed measures); 2009-2021 and 2015-2021. The FRMP indicates that 30 measures (3 % of the 883 measures) had been completed by 2015, 88 (10 %) have been adopted and are ongoing (mainly in the timeframe 2015-21), and the great majority – 765 measures, 87 % of the total - are indicated as proposals only (still to be adopted, and to be implemented if adopted), although the timeframe for most is given as 2015-2021 (a small number seems to have no timeframe).

Nearly all the measures completed – 27 out of 30 – were in the area of protection. This, however, is just under 4 % of all 823 protection measures. A further 84 protection measures (10 % of total protection measures) are ongoing, but the great majority had not started (711, 86%).

Only one prevention measure was ongoing, and 17 not started; two preparedness measures had been completed and 14 not started; for recovery and review, there is only one measure and it had not been started (for more details see Table A8 and Figure A5 in Annex A).

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. In Luxembourg, measures have been co-ordinated with the requirements of the WFD. Measures were assessed in terms of their relevance to the WFD objectives and classified as M1 (synergy between the two Directives – 11 measure types), M2 (potential conflict, requiring more detailed local assessment – seven measure types) and M3 (not relevant, but may require more detailed local assessment – seven measure types). Measures classified as M1 were considered high priority for implementation. The relevance to the WFD and the effect of each measure on WFD objectives are listed in Annex I of the FRMP as a semi-quantitative assessment (five categories ranging from zero to ++++).

In the context of assessing the effects on the WFD objectives, the FRMP states that these effectiveness analyses were conducted within the scope of the Strategic Environmental Assessment (SEA), with consideration of the effects on (i) the public and health, (ii) plants, animals and biodiversity, (iii) soil, (iv) water, (v) climate and atmosphere, (vi) landscape, and (vii) culture and property. No further details of the effectiveness analysis are provided.

In addition, IED (Directive 2010/75/EU) and Seveso site risks are indicated on the flood risk maps. The site operators have a mandatory responsibility to take all reasonable actions to secure the installations and to prevent any release of substances from the site in case of flooding. No specific measures are indicated for such sites. Protection zones under the

Drinking Water, Habitats and Bird directives are indicated on the FHRMs, although it is not clear how these affected the selection of measures.

4.10 Monitoring progress in implementing the FRMP

There is reference to a national database (LuxMaPro) which forms the basis for the assessment of progress in the implementation of measures. For each measure those bodies responsible for its implementation (national or local authority, working group, Flood Management or River Management Partnerships) are named together with an agreed estimated implementation timeline; this database can be consulted by those involved in the implementation of measures to check on progress. The information on the database will be reviewed at each reporting cycle (every six years) and will form the basis of future planning.

The baseline (or ‘status quo’) seems to be the finalised flood hazard/risk maps made available to the public in 2015. These include the extent of flooding at different hazard scenarios and the number of people affected. As a minimum, the ‘status quo’ must be maintained, or improvements must be achieved through the implementation of measures.

4.11 Specific groups of measures

With regard to **spatial planning/land use measures**, a number of spatial planning and land use measures are included/planned, including measures to prevent new buildings and establish other land use restrictions in flood hazard areas (low, medium and high, as shown in the FHRMs). The FHRMs have legal status as set out in a regulation issued in 2015 under the Luxembourg Water Law of 9.12.2008. According to this law, it is prohibited to designate new building developments in flood risk areas. In already designated development areas, it is only permitted to proceed with building if there is no flood risk at the site itself and there is no loss of any water retention area. Any building projects in areas covered by the three different flood risk levels (Q_{10} : every 10 years; Q_{100} : every 100 years; and Q_{extrem} : rare extreme events >100 years) on the maps require permission from the Minister responsible for water. To sum up, any building and other land uses in flood risk areas as designated on the maps are subject to controls and legislation and enforcement is under direct responsibility of the national Water Administration (in the Ministry of Sustainable Development and Environment).

Natural water retention measures (NWRMs) have been planned in catchments³⁰ (three measures) and in wetlands³¹ (725 measures), as well as reductions in impermeable surfaces³²

³⁰ NWRM measure type not clear, but believed to include NWRM measure type NO4 and NO5, (see Annex B below).

³¹ NWRM measure type NO2, NO5 and NO4, Wetland restoration and management (see Annex B).

³² NWRM measure type UO3 Permeable surfaces (see Annex B).

(one measure), rainwater management³³ (two measures) and restoration of flood plains³⁴ (16 measures). These measures are listed in Annex 1 of the FRMP, but comparison with the NWRM types indicated in Annex B (below) is not straightforward³⁵ as the classification systems are not the same. Nevertheless, NWRMs comprise the lion's share (about 90 %) of individual measures.

Measures that specifically consider nature conservation. Protected areas under the Habitats and Birds Directives are indicated on the FHRMs, and reference is made to Natura 2000 sites, but it is not clear if or how these have been taken into account when selecting measures.

With regard to **navigation and port infrastructure**, navigation on the Mosel and the port at Mertert are mentioned in relation to a Seveso site and storage/handling of chemicals, but it is not clear if or how these have been taken into account when selecting measures.

Luxembourg has also reported **dredging** measures. One measure (sand removal, Luxembourg measure M320) is being implemented in APSFR A05, and investigations to check whether the measure should be implemented have been proposed for another APSFR, A03.

4.12 Recovery from and resilience to flooding

The role of insurance policies is discussed in the FRMP. The FRMP states that it is not possible in Luxembourg to take out commercial insurance against flood damage³⁶. Consequently, Luxembourg Measure M44 for financial preparedness has been proposed at national level, with the emphasis on public information to encourage the public to put their own measures in place to guard against flood damage; the measure also includes information how to claim funds for recovery from the State, but the latter is possible only if a national disaster has been declared.

There is no information on environmental liability, except for example Seveso sites, for which it is stated that the site operators have a mandatory responsibility to take all reasonable measures to secure the installations and to prevent any release of substances from the site in case of flooding. There is no information whether ecosystem services are considered in

³³ NWRM measure type UO3, UO4, UO5, UO6, UO7 and UO8.

³⁴ NWRM measure type N03 Floodplain restoration and management.

³⁵ Subsequently Luxembourg confirmed that indeed, this comparison was not carried out. This will be addressed in the second FRMP.

³⁶ Luxembourg subsequently informed that since June 2017 it is possible to receive insurance against flood damage.

estimating restoration costs in cases where potentially polluting sites and installations may be flooded³⁷.

4.13 Coordination with the Water Framework Directive

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

Table 6 *Coordination of the development of the FRMP with the development of the second River Basin Management Plan of the WFD*

	LU000
Integration of FRMP and RBMP into a single plan	
Joint consultation of draft FRMP and RBMP	
Coordination between authorities responsible for developing FRMP and RBMP	✓
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	✓ ³⁸
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

As mentioned in the section ‘Measures taken under other Community Acts’, measures have been co-ordinated with the requirements of the WFD, with the emphasis on information exchange, consideration of the effectiveness of measures and shared advantages (win-win situations) for achieving the environmental objectives of the Floods Directive and the WFD (Art.4).

³⁷ Subsequently Luxembourg confirmed that this aspect was not included in the first FRMP, however it will be included in the update of FRMPs.

³⁸ Not described specifically in terms of permitting, but all measures in the FRMP are checked for relevance/compatibility or otherwise with the WFD.

There is no direct reference to WFD KTMs³⁹, but all FRMP measures have been assessed for WFD relevance and effectiveness. An example of synergy between the objectives of the Floods Directive and the WFD is given as keeping flood plains clear of new buildings and measures for increasing natural water retention; which may be covered by KTMs 6, 7 and 23.

In the reporting sheets for the Floods Directive, the field concerning WFD measures was filled with a series of numbers. It is not clear how these numbers relate to WFD measures⁴⁰.

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

The following **good practices** were identified:

- The FRMP (in its Annex I) provides a semi-quantitative effectiveness analysis of measures with five categories (scale from zero to +++) for the effects on: flood risk, river flow, and WFD relevance.
- The majority of individual measures (725 or about 90 %) are NWRMs.

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

- There is no information on costs and budgets for measures, nor on funding sources.
- The FRMP does not have a method for demonstrating how measures will contribute to the objectives of the Floods Directive (as neither objectives nor measures are specific and measurable).
- There is no clear prioritisation of individual measures, except in terms of compatibility with the WFD objectives.

³⁹ According to Luxembourg this will be addressed in the update of the FRMP.

⁴⁰ Luxembourg subsequently acknowledged that the link between these numbers and the KTMs is missing and will address this in the update of the FRMP.

5. Consideration of climate change

Climate change impacts are discussed in the FRMP and the effects on river flows at the different risk scenarios have been estimated in terms of percentage change in river flows at 10 locations. On average the estimated increase in river flow amounted to 7-9 % for the different risk scenarios (High, medium, low risk), with maximum increases of 18-19 %. These increases do not seem to have been included in the current maps (published in 2015), as they are predictions for 2021-2050. These predictions of the river flows for the period 2021-2050 were based on data from the years 1971-2000 and simulations.

There is no reference to the national adaptation strategy⁴¹, adopted in 2011⁴², or information about a shift in the occurrence of extreme events and changes in numerical recurrence times.

Apart from a measure for investigations into the effects of climate change (M509, national level), no specific measures seem to have been planned directly in relation to mitigation of the impact of climate change.

5.1 Specific types of measures planned to address expected effects of climate change

There is no indication that the additional risk due to climate change has been taken into account so far or what specific measures have been planned to mitigate its impacts.

5.2 Good practices and areas for further development concerning climate change

The following **good practice** was identified:

- The effect of climate change on river flows has been investigated and estimated for the period 2021-2050, in terms of percentage change in river flows at 10 locations (as fluvial flooding is the only type considered relevant), and further investigations are planned.

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

- No reference to the national climate change adaptation strategy.
- The potential change on flood risk, as a consequence of climate change, does not seem to have been taken into account when defining objectives and measures.

⁴¹ Luxembourg subsequently described this as an omission which will be addressed in the update of the FRMP in December 2021.

⁴² See <http://environnement.public.lu/fr/klima-an-energie/changement-climatique.html>

6. Cost-benefit analysis

The FRMP states clearly that no CBA has been carried out. Instead a semi-quantitative effectiveness analysis was carried out for each measure in the particular situation of each APSFR, taking into account the effort invested and the benefit of implementing measures. Firstly, economic considerations were included when assessing the effectiveness of each measure in each particular situation. Secondly, the effectiveness in terms of achieving WFD objectives was considered. To evaluate the feasibility of implementing measures, flood risk reductions and improvements in the risk management were taken into account, as well as WFD relevance. The results of the analysis are listed against each measure in Annex 1 of the FRMP, using five categories on a scale of ‘zero to ++++’ for each of the effects on flood risk, river flow, and WFD relevance (this information is also summarised in the main report of the FRMP).

No details concerning trans-boundary cost-benefit or effectiveness analyses are provided, but overall there is close co-operation with the International Commissions for the Protection of the Mosel/Saar (ICPMS) and the Rhine (ICPR), and in particular the application of the German LAWA catalogue of measures.

6.1 Good practices and areas for further development

The following **good practice** was identified:

- A semi-quantitative effectiveness analysis was carried out for each measure in the particular situation of each APSFR, and it included consideration of the relevance of measures to the achievement of WFD objectives.

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

- No CBA was carried out.

7. Governance including administrative arrangements, public information and consultation

7.1 Competent authorities

Based on Luxembourg's FRMP and its reporting sheet, the Competent Authorities and the UoMs identified for the Floods Directive have not been altered. Documents reported to the European Commission on this subject have not been updated since they were reported in 2010. Overall responsibility for the implementation of both the Floods and the Water Framework Directives lies with the Administration for Water Management in the Ministry for Sustainable Development, but relevant local authorities, Flood Management Partnerships, described below, and other stakeholders also play a large part in flood risk management.

7.2 Public information and consultation

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

Table 7 *Methods used to inform the public and interested parties of the FRMP*

	LU000
Media (papers, TV, radio)	✓
Internet	✓
Digital social networking	
Printed material	✓
Direct mailing	
Invitations to stakeholders	
Local Authorities	✓
Meetings	✓

Source: FRMP

For an initial early public consultation from December 2010 to April 2011, the draft FHRMs were made available to the public on the government's Geoportal website, and paper copies as well as digital versions were sent to the relevant Local Community Administrations. Information and discussion fora were held to encourage active involvement by joining Flood Management Partnerships. Following publication of the draft FRMP (with the FHRMs also provided), public consultation continued: the public was informed through four daily newspapers and two government internet sites. In addition, two public meetings were held by invitation of the Environment Minister at two different locations in January 2015.

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

Table 8 *Methods used for the actual consultation*

	LU000
Via Internet	✓
Via digital social networking	
Direct invitation	
Exhibitions	
Workshops, seminars or conferences	✓
Telephone surveys	
Direct involvement in drafting FRMP	✓
Flood Management Partnerships	✓

Source: FRMP

Public consultation was designed to involve stakeholders and relevant authorities and associations at an early stage of the planning process (starting in 2010/11) and involved three parts, i.e. (i) dissemination of information, (ii) active participation and (iii) formal hearings. Flood Management Partnerships were formed for specific river sections to actively participate in drafting the FRMP.

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

Table 9 *Methods used to provide the documents for the consultation*

	LU000
Downloadable	✓
Direct mailing (e-mail)	
Direct mailing (post)	
Paper copies distributed at exhibitions	
Paper copies available in municipal buildings (town hall, library etc.)	✓

Source: FRMP

Downloadable electronic versions and paper copies were provided, and their existence was publicised through government internet pages, daily papers and meetings.

7.3 Active involvement of Stakeholders

As part of the overall consultation, authorities should encourage the active involvement of stakeholders. The table below shows the groups of **stakeholders** that have been actively involved in the development of the FRMP assessed:

Table 10 *Groups of stakeholders actively involved in the development of the FRMP*

	LU000
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)	✓
NGO's including nature protection, social issues (e.g. children, housing)	
Consumer Groups	
Local / Regional authorities	✓
Academia / Research Institutions	
National Administration for Nature and Forestry	✓
Flood and River Management Partnerships	✓

Source: FRMP

In addition to the official bodies listed above in the table, five Flood Management Partnerships (transboundary co-operation on flood risk management via community-based networks) were formed for all main river stretches (three of these are transboundary), through voluntary association of relevant local authorities, official bodies and other stakeholders (e.g. representatives of potentially affected industries, energy providers, local authority planning and waterway maintenance departments, etc.). Information and discussion fora were organised to encourage active involvement within these new partnerships, as well as within the two pre-existing River Management Partnerships. Public participation (including active involvement in the selection of measures) was in part organised through River or Flood Management Partnerships; the latter were supported by the International Support Centre for Flood Partnerships at the ICPMS offices in Trier, Germany. However, the bodies and private individuals could equally have been involved outside of these the Partnerships.

The table below shows the **mechanisms** used to ensure the active involvement of stakeholders:

Table 11 *Mechanisms used to ensure the active involvement of stakeholders*

	LU000
Regular exhibitions	
Establishment of advisory groups	✓
Involvement in drafting	✓
Workshops and technical meetings	✓
Formation of alliances	✓

Source: FRMP

The newly formed Flood Management Partnerships were actively involved in the preparation of the FRMP and remain involved in its implementation and provided community-based advisory groups. By December 2015, 10 workshops on the FRMP had been held for Flood Management Partnerships, each with a specific theme and tasks/programme of work. As part of these workshop programmes, the shortcomings and action requirements were worked out, including proposals for measures. In addition, the list of measures proposed in these workshops was sent to all local authorities in flood risk areas, asking them to comment and if appropriate suggest further measures. Staff from the Regional Water Management Administration were available to advise the Partnerships and local authorities.

7.4 Effects of consultation

The table below shows the **effects** of consultation:

Table 12 *Mechanisms used to ensure the active involvement of stakeholders*

	LU000
Changes to selection of measures	✓
Adjustment to specific measures	✓
Addition of new information	
Changes to the methodology used	
Commitment to further research	
Commitment to action in the next FRMP cycle	
Comments and results of the FHRM consultation were incorporated	✓

Source: FRMP

The proposal/selection of measures was part of the active involvement of the public consultation, particularly through workshops organised for the Flood Management Partnerships, and consultation of local authorities in flood risk areas. The results of these

workshops including proposed measures were largely incorporated in the FRMP. Following the second phase of public consultation in 2014/15, written comments on the draft FRMP were received from 59 local administrations, the Chamber of Agriculture, the River Basin Partnership of the Upper Alzette, the Partnership for the river Syr, and a small number of private individuals. Of the written submissions, 22 were positive without further comments, 40 were positive with comments, and five were negative. All comments were examined and incorporated into the revised FRMP 2015 where relevant. No further details are available.

Comments received as a result of the initial consultation of the draft FHRMs in 2010/11 were also examined and incorporated into the final draft FHRMs which were made available to the public in 2014, together with the draft FRMP. For example, following public consultation and reference to updated data, some recalculations were performed on some of the maps, and localised adjustments were made in some APSFRs. In addition, the legend of the Flood Risk Maps was simplified. The maps were updated accordingly into those made available to the public in 2014.

7.5 Strategic Environmental Assessment

The FRMP has undergone an SEA procedure, particularly to assess the effects on the WFD objectives (for details see section 4), however no further details are provided.

7.6 Good practices and areas for further development regarding Governance

The following **good practices** were identified:

- Overall responsibility for the implementation of both the Floods and the Water Framework Directives lies with the Administration for Water Management in the Ministry for Sustainable Development, but relevant Local Authorities, Flood Management Partnerships and other stakeholders also play a large part in flood risk management.
- The Flood Management Partnerships provided a mechanism for local stakeholder involvement in flood risk management, also promoting transboundary co-operation.
- The public consultation involved a wide range of stakeholders and consisted of (i) provision of information, (ii) active involvement in the preparation of the FRMP and selection of measures and continuing involvement in implementing measures, and (iii) formal hearings.
- The results of active involvement and wider consultation were largely incorporated into the FRMP, and included changes made in response to the public consultation.

Annex A: Supplementary tables and charts on measures

This Annex gives an overview of the data on measures reported by Luxembourg 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)⁴³, 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 done to identify how many different answers were given. If a high number of different answers are given, Member States assessors were asked to refer to the raw data when conducting the assessment, and this Annex does not reflect these observations.
- If a manageable number of answers are given, obvious categories are identified, and raw data sorted.

⁴³ <http://icm.eionet.europa.eu/schemas/dir200760ec/resources>

- 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 authorities), are categorised as “no information”.

Types of measures used in reporting

The following table⁴⁴ 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’.

Types of measures used in reporting

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

⁴⁴ Guidance for Reporting under the Floods Directive (2007/60/EC):
<https://circabc.europa.eu/w/browse/a3c92123-1013-47ff-b832-16e1caaaf9a>

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Measures overview

Table A1 *Total number of measures*

Number of individual measures	813
Number of individual measures including measures which have been allocated to more than one measure type	813
Number of aggregated measures	70
Number of aggregated measures including measures which have been allocated to more than one measure type	70
Total number of measures ⁴⁵	883
Total number of measures including measures which have been allocated to more than one measure type	883
Range of number of measures between UoMs, including measures which have been allocated to more than one measure type (Min-Max)	0 - 883

Table A2: *Number of individual measures per measure type and UoM*

	Prevention			Protection				Preparedness	Recovery & review	Other	Grand Total
	M21	M22	M23	M31	M32	M33	M34	M41			
LU000	1	1	5	733	27	21	24	1			813
Grand Total	1	1	5	733	27	21	24	1	0	0	813

Note: Luxembourg reported information only for one UoM (the second UoM in Luxembourg does not contain APSFRs).

Table A3: *Number of aggregated measures per measure type and UoM*

	Prevention			Protection				Preparedness			Recovery & review	Other	Grand Total
	M21	M22	M23	M31	M32	M33	M34	M41	M42	M43	M51	M61	
LU000	5	1	5	12	3	2	1	8	2	5	1	25	70
Grand Total	5	1	5	12	3	2	1	8	2	5	1	25	70

Note: Luxembourg reported information only for one UoM (the second UoM in Luxembourg does not contain APSFRs).

⁴⁵ Luxembourg reported measures for one UoM, its other UoM does not contain APSFRs

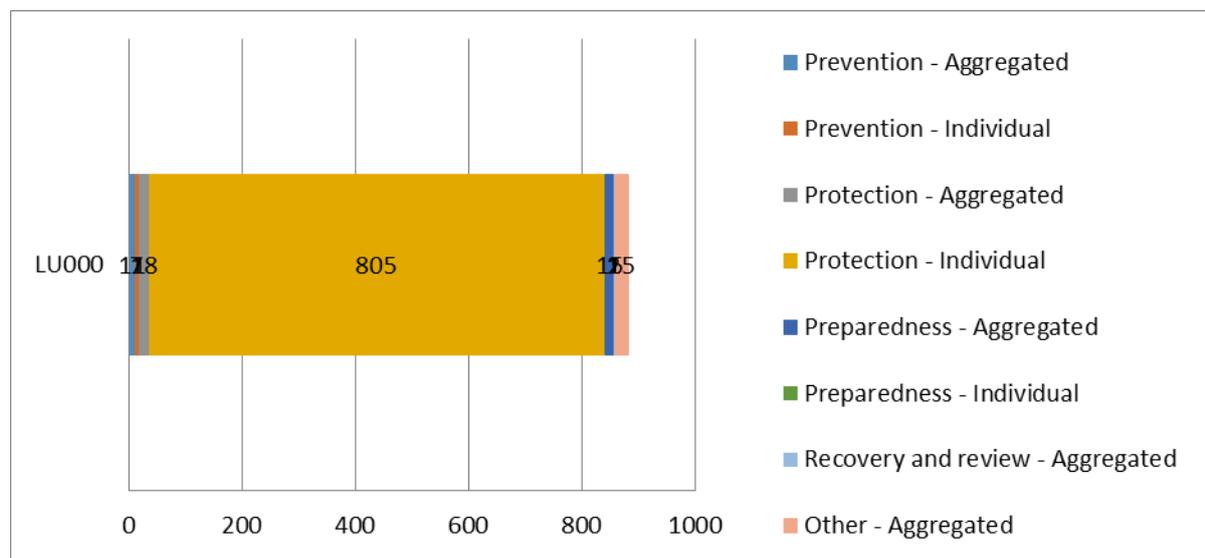
Table A4: Total number of measures (aggregated and individual) per measure type and UoM, including duplicates

	Prevention		Total	Protection		Total	Preparedness		Total	Recovery & review	Total	Other	Total	Grand Total
	Aggregate	Individual		Aggregate	Individual		Aggregate	Individual		Aggregate		Aggregate		
LU000	11	7	18	18	805	823	15	1	16	1	1	25	25	883
Grand Total	11	7	18	18	805	823	15	1	16	1	1	25	25	883

Note: Luxembourg reported information only for one UoM (the second UoM in Luxembourg does not contain APSFRs).

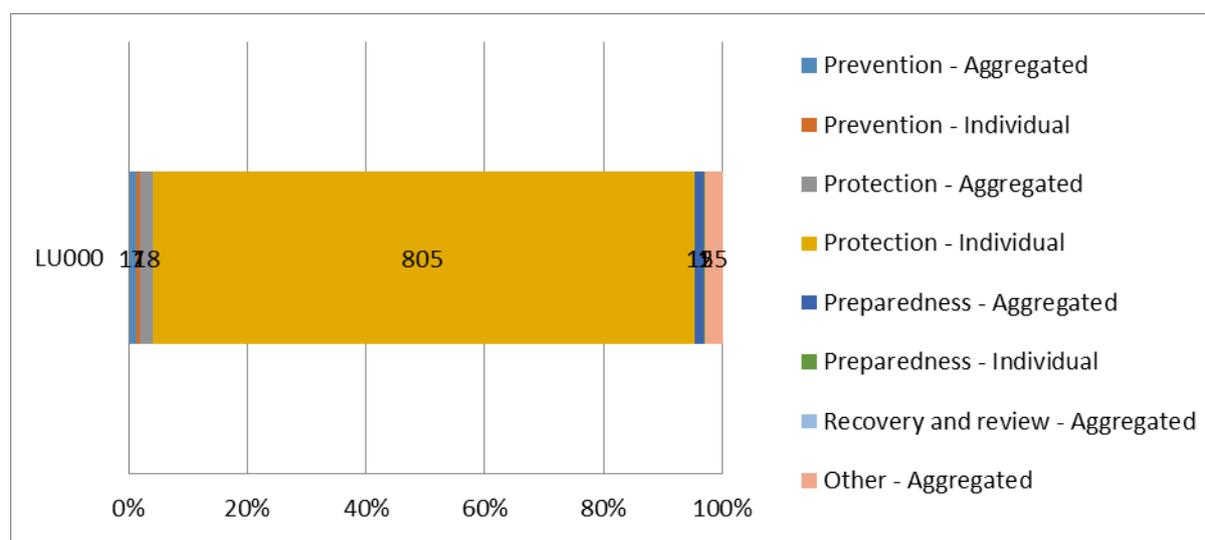
The information in Table A5 is visualised in Figures A1 and A2 below:

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



Note: Luxembourg reported information only for one UoM (the second UoM in Luxembourg does not contain APSFRs).

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



Note: Luxembourg reported information only for one UoM (the second UoM in Luxembourg does not contain APSFRs).

Measure details: cost

Member States were requested to report information on:

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

Luxembourg did not report any costs or cost explanations for the measures in the reporting sheets.

Measure details: name & location

Member States were requested to report information on:

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

Location of measures

Luxembourg provided information for the location of all the measures, however, this was an open question, and as such, a large number of different responses was given. It was thus not practical to aggregate the information.

Geographic coverage

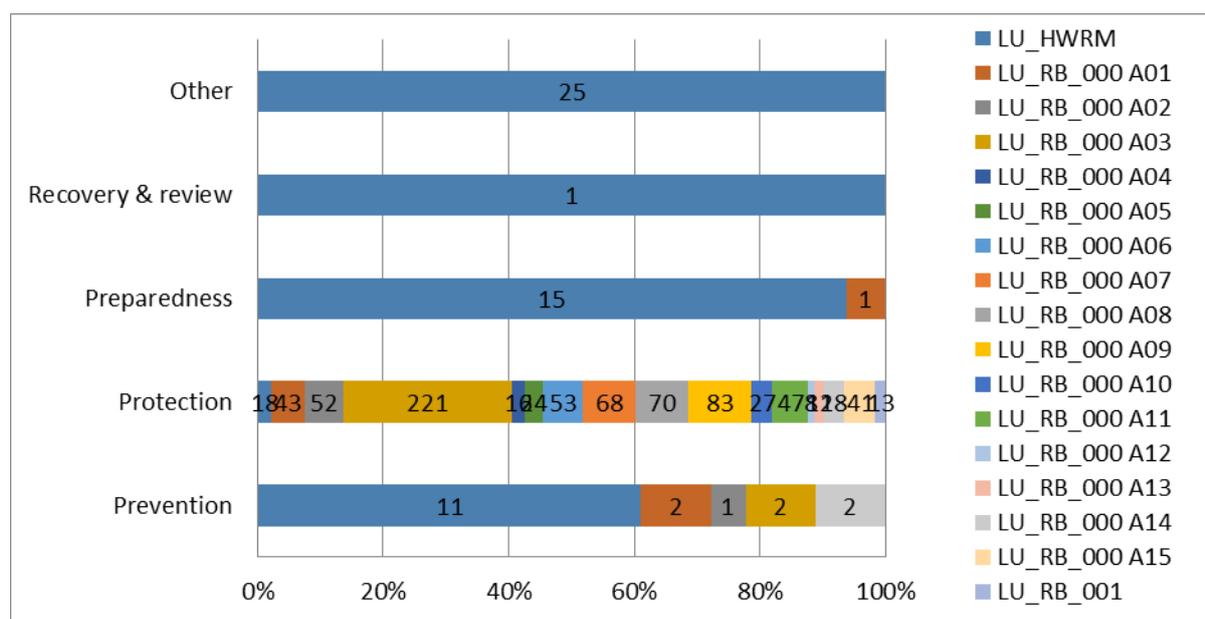
Luxembourg provided information about the geographic coverage of the effects of all measures. The reported coverage concerned primarily different APSFRs as summarised in the following tables.

Table A5: Geographic coverage by measure aspect

	HWR M	RB_000 A01	RB_000 A02	RB_000 A03	RB_000 A04	RB_000 A05	RB_000 A06	RB_000 A07	RB_000 A08	RB_000 A09	RB_000 A10	RB_000 A11	RB_000 A12	RB_000 A13	RB_000 A14	RB_000 A15	RB_000 01	Grand Total
Prevention	11	2	1	2											2			18
Protection	18	43	52	221	16	24	53	68	70	83	27	47	8	11	28	41	13	823
Preparedness	15	1																16
Recovery & review	1																	1
Other	25																	25
Grand Total	70	46	53	223	16	24	53	68	70	83	27	47	8	11	30	41	13	883

Notes: Luxembourg reported information for only one UoM (LU000).

Figure A3: Visualisation of Table A6: Geographic coverage by measure aspect



Notes: Luxembourg reported information for only one UoM (LU000).

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

Luxembourg did not report any information about the objectives of the measures in the reporting sheets.

Category of priority

The following categories are used to classify the priority of the measures in the reporting sheet:

- Critical;
- Very high;
- High;
- Moderate;

- Low.

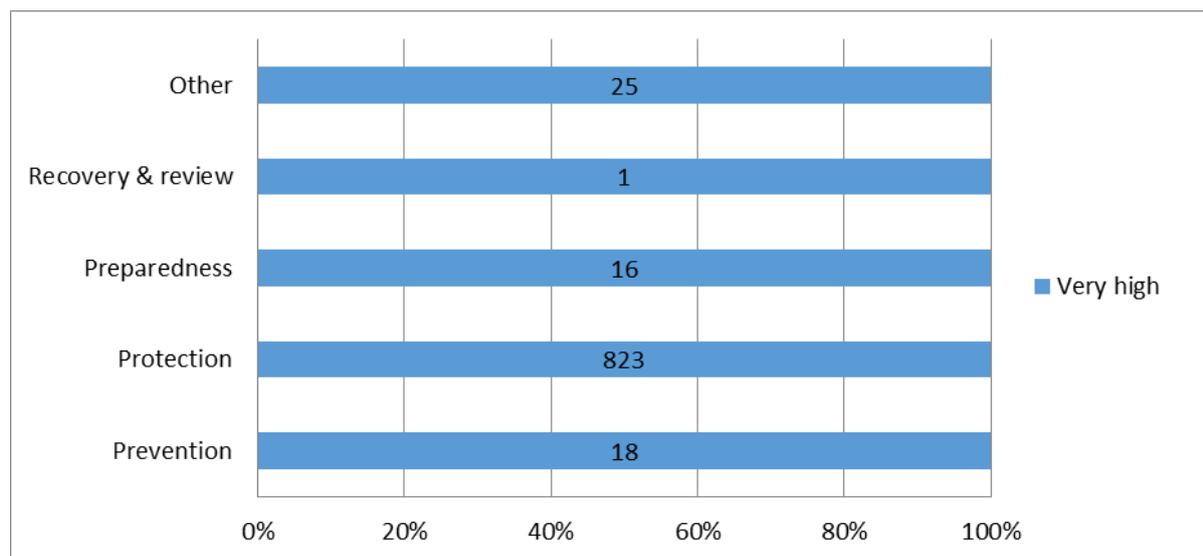
Luxembourg reported the priority of all measures as ‘Very high’⁴⁶, although there are three levels of priority described in the FRMP (one to three and zero for measures already implemented). Annex 1 of the FRMP lists most measures as priority level 1, and some as zero.

Table A6: Category of priority by measure aspect

	Very high	Grand Total
Prevention	18	18
Protection	823	823
Preparedness	16	16
Recovery & review	1	1
Other	25	25
Grand Total	883	883

Notes: Luxembourg reported information for only one UoM (LU000).

Figure A4: Visualisation of Table A7: Category of priority by measure aspect



Notes: Luxembourg reported information for only one UoM (LU000).

⁴⁶ Subsequently Luxembourg described this as an error which will be addressed in the update of the FRMP in December 2021.

Timetable

Luxembourg did not report any information about the timetable of the measures in the reporting sheets.⁴⁷

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).

Luxembourg did not provide any information about the responsible authorities or level of their responsibility for the measures in the reporting sheets⁴⁸, although individual measures are allocated in Annex 1, for example as national, or a specific municipality or partnership.

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 whose answers are not analysed here.

The progress of implementation was reported as⁴⁹:

- 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.

⁴⁷ Luxembourg indicated subsequently that this will be addressed in the next reporting cycle

⁴⁸ Luxembourg indicated subsequently that this information will be updated in the FRMP in December 2021

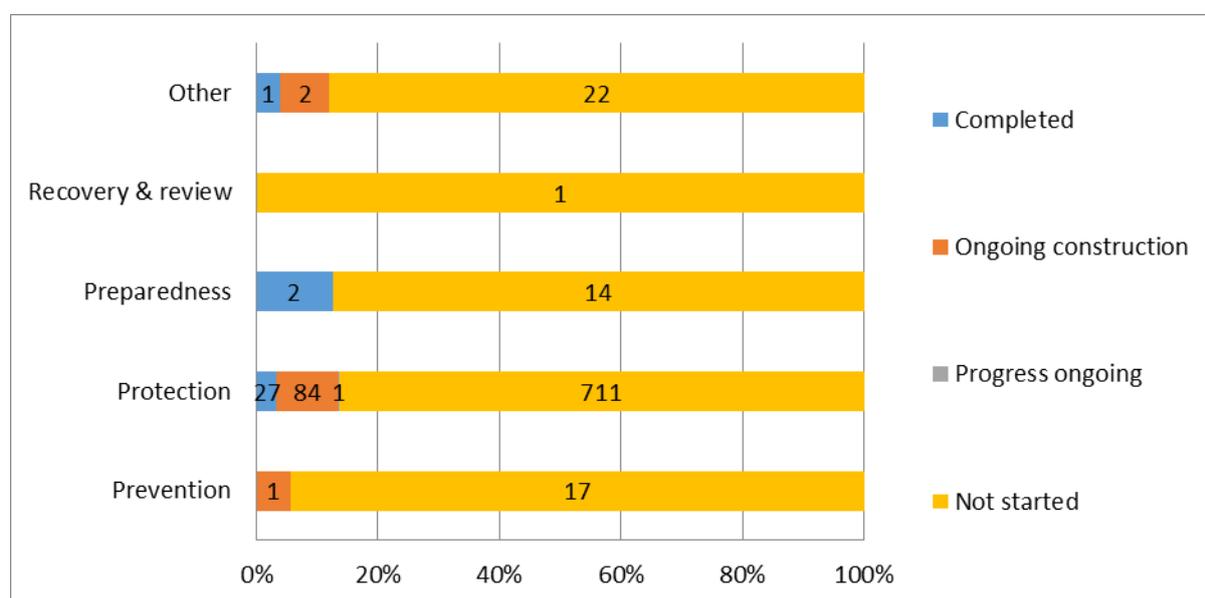
⁴⁹ Guidance for Reporting under the Floods Directive (2007/60/EC):
<https://circabc.europa.eu/w/browse/a3c92123-1013-47ff-b832-16e1caaaf9a>

Table A7: Progress of implementation by measure aspect

	Completed	Ongoing construction	Progress ongoing	Not started	Grand Total
Prevention		1		17	18
Protection	27	84	1	711	823
Preparedness	2			14	16
Recovery & review				1	1
Other	1	2		22	25
Grand Total	30	87	1	765	883

Notes: Luxembourg reported information for only one UoM (LU000).

Figure A5: Visualisation of Table A8: Progress of implementation by measure aspect



Notes: Luxembourg reported information for only one UoM (LU000).

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 report information on:

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

Luxembourg did not report any information for these fields in the reporting sheets.

Annex B: Definitions of measure types

Table B1 *Types of flood risk management measures*⁵⁰

	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 through 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
	Recovery & Review

⁵⁰ Guidance for Reporting under the Floods Directive (2007/60/EC):
<https://circabc.europa.eu/w/browse/a3c92123-1013-47ff-b832-16e1caaaf9a>

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, and 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
A07 Low till agriculture	F07 'Water sensitive' driving	N07 Reconnection of oxbow lakes and similar features	U07 Soakaways

Agriculture	Forest	Hydro Morphology	Urban
A08 Green cover	F08 Appropriate design of roads and stream crossings	N08 Riverbed material re-naturalisation	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