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First Flood Risk Management Plans - Member State: Portugal

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

Introduction

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

This report assesses the FRMPs for Portugal[1]. Its structure follows a common assessment template used for all Member States. The report draws on two main sources:

- Member State reporting to the European Commission on the FRMPs[2] as per Articles 7 and 15 of the FD: this reporting provides an overview of the plans and details on their measures
- Selected FRMP: due to the high number of FRMPs prepared in Portugal, the assessment has focused on a selected set of plans, chosen to cover a range of methodological approaches and geographical contexts. The FRMPs for Portugal's mainland Units of Management (UoMs) were expected to take a similar approach: of these, three were selected, focusing on UoMs with significant historical flooding while also choosing both international and national UoMs. The FRMPs for the autonomous regions of Azores and Madeira were expected to follow different methodologies, and both were selected. On this basis, the following five FRMPs were reviewed:
    - PTRH3 - Douro (part of a transboundary UoM shared with Spain, with historical flooding events in Portugal)
    - PTRH4A - Vouga, Mondego and Lis (a national UoM comprising of Portugal's largest national river, with significant historical flooding events)

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

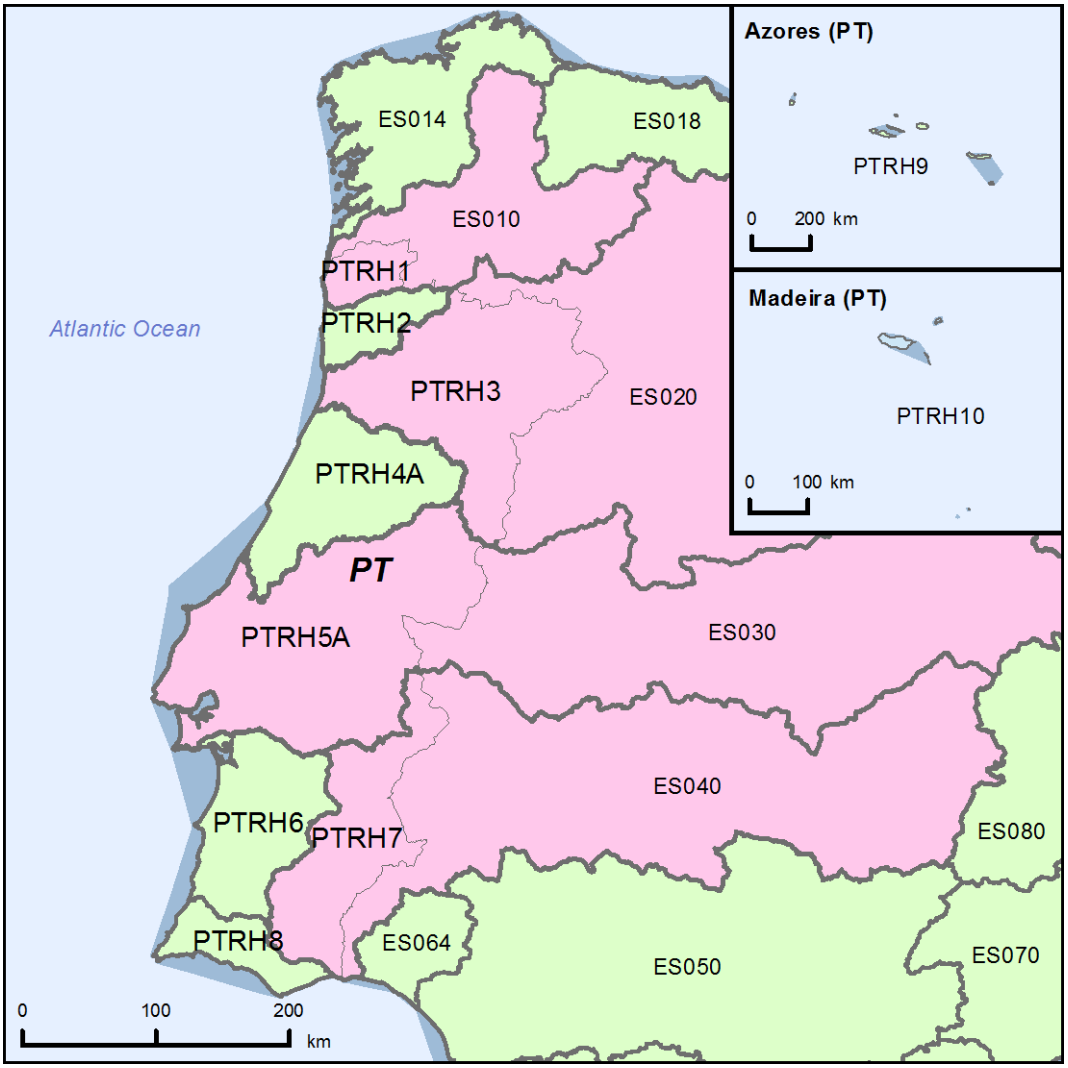
[2] Referred to as "Reporting Sheets" throughout this report. Data must be reported in a clear and consistent way by all Member States. The format for reporting was jointly elaborated by the Member States and the Commission as part of a collaborative process called the "Common Implementation Strategy":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

- PTRH5 - Tagus and West Rivers (a transboundary UoM shared with Spain, comprising the largest river basin within the Portuguese territory and with significant historical flooding events in Portugal)
- PTRH9 - Azores (an autonomous region comprising of nine inhabited islands, with distinct hydrological and institutional characteristics) and
- PTRH10 - Madeira (an autonomous region comprising of two inhabited islands, with distinct hydrological and institutional characteristics and significant historical flooding events).

This selection is expected to cover all the methodological approaches employed in Portugal in terms of flood risks.

Overview

Figure 1 Map of Units of Management/River Basin Districts



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

Source: WISE, Eurostat (country borders)

Portugal is divided into ten Units of Management (UoMs), which correspond to the River Basin Districts (RBDs) under the Water Framework Directive (WFD). At the time of drafting

this report, Flood Risk Management Plans (FRMPs) had been approved and reported for nine of Portugal's ten UoMs, the exception being for the Guadiana UoM (PTRH7)[3].

The approach for developing FRMPs was found to be similar among mainland UoMs: the Portuguese Environmental Agency (APA) coordinated their preparation and developed common methodologies and approaches for the plans. In contrast, the autonomous regions of Azores (PTRH9) and Madeira (PTRH10) each followed their own methodologies. Their FRMPs differ both with regard to some of the contents, and also how they are linked to prior steps (e.g. the Azores FRMP has been developed together with the FHRM, while Madeira's FHRM is presented in a different manner than that of other UoMs). Moreover, these two regions are different from the mainland UoMs (and each other) in terms of flood prone geography, institutional organisation and management approaches. Notably, Madeira has had severe (and life-threatening) floods.

All of Portugal's FRMPs were formally adopted: the FRMPs for mainland Portugal (PTRH1 to PTRH8, except for PTRH7), by a Resolution of the national Council of Ministers, no. 51/2016 of 20 September 2016; the FRMP for PTRH9 (Azores) by Regional Legislative Decree no. 20/2016/A of 10 October 2016; the FRMP for PTRH10 (Madeira) by Resolution of the Presidency of the Regional Government no. 805/2017 of 27 October 2017.

The table below gives an overview of all UoMs in Portugal, including the UoM code and name. Portugal has uploaded documents to the European Environment Agency's (EEA) WISE[4] indicating that it has reported lists of Areas of Potential Significant Flood Risk (APSFRs), which are also presented in the table below by UoM. The table below also shows if all documents related to the FRMP were reported as required to European Environment Agency's (EEA) WISE[5] – each FRMP as a PDF and each reporting sheet as an XML.

Table 1 Overview of UoMs in Portugal

UoM	Name	Number of APSFRs	XML reported	PDF Reported
PTRH1	MINHO AND LIMA	1	Yes	Yes
PTRH2	CAVADO, AVE AND LECA	1	Yes	Yes
PTRH3	DOURO	3	Yes	Yes
PTRH4A	VOUGA, MONDEGO AND LIS	5	Yes	Yes
PTRH5A	TAGUS AND WEST RIVERS	4	Yes	Yes
PTRH6	SADO AND MIRA	3	Yes	Yes

[3] No APSFRs were identified for this UoM; consequently, an FRMP is not required.
[4] http://cdr.eionet.europa.eu/pt/eu/floods/envv_uefa/apsfr.zip/manage_document
[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

UoM	Name	Number of APSFRs	XML reported	PDF Reported
PTRH7	GUADIANA	0	No	No
PTRH8	ALGARVE RIVERS	5	Yes	Yes
PTRH9	AZORES	5	Yes	Yes
PTRH10	MADEIRA	27	Yes	Yes

The FRMPs can be downloaded from the following web pages:

- For all mainland FRMPs (PTRH1 to PTRH8, except PTRH7): https://www.apambiente.pt/index.php?ref=16&subref=7&sub2ref=9&sub3ref=1250
- For Azores (PTRH9): http://www.azores.gov.pt/Gra/srrn-drotrh/conteudos/livres/Plano+de+Gestão+de+Riscos+de+Inundações+da+RAA.htm
- For Madeira (PTRH10): https://www.madeira.gov.pt/drota/Estrutura/DROTA/ctl/Read/mid/2873/InformacaoId/29212/UnidadeOrganicaId/14

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 FRMPs

Criterion	Evidence	Comments
FRM objectives have been established	Strong evidence	All five FRMPs assessed clearly establish, explain and prioritise their objectives. The FRMPs assessed for mainland Portugal and Madeira (PTRH10) provide a common set of objectives; those for Azores (PTRH9) were developed separately.
FRM objectives relate to...		
...the reduction of potential adverse consequences	Strong evidence	The objectives in all five FRMPs assessed seek to reduce the potential adverse consequences of flooding: for example, calling for improved resilience and reduced vulnerability to flooding.
...to the reduction of the likelihood of flooding	No evidence	These aspects are not specified in the definition of objectives in the FRMPs.
...to non-structural initiatives	Strong evidence	All five FRMPs assessed include these aspects, for example calling for increased awareness, better spatial planning and improved flood knowledge and forecasting.
FRM objectives consider relevant potential adverse consequences to...		
...human health	Strong evidence	These aspects are specified in the FRMPs in their presentation of the overall aim of the

Criterion	Evidence	Comments
...economic activity	Some evidence	objectives and the plans themselves; moreover, the main criterion for the identification of APSFRs was the impact on human health. Consequently, these aspects were incorporated in the objectives even if they are not contained within the objectives themselves.
...environment	Some evidence	
...cultural heritage	Some evidence[6]	
Measures have been...		
...identified	Strong evidence	Portugal has reported (for all UoMs excluding PTRH7) 76 individual measures, and 223 aggregated measures: the total number of measures is 299. The measures cover all four aspects – Prevention, Protection and Preparedness and Recovery & Review.
...prioritised	Strong evidence	Measures have been prioritised according to five criteria, namely: 1. Preference to measures that may be financed; 2. Preference for practicable measures within a period compatible with the implementation of the FRMPs (between March 2016 and December 2020); 3. Preference to measures that contribute to the greatest number of objectives; 4. Preference to measures taken in areas with very high risk, to the detriment of high and medium risk; 5. Preference for prevention and preparedness rather than protective measures.
Relevant aspects of Article 7 have been taken into account such as...		
...costs & benefits	No evidence	No cost-benefit assessment was undertaken for the assessed FRMP's measures selection or prioritisation.[7]
...flood extent	Strong evidence	All FRMPs present maps from the FHRM stage showing the flood extent, and this analysis has been used to set priorities and identify measures.

[6] Portugal stated subsequently that for all APSFRs the impact on economic activity (agriculture, industry and services), on the environment (location of IPCC and Seveso facilities and also of other structures like WWTP) and on cultural heritage was evaluated for the exposed elements.

[7] Portugal informed subsequently that during this first cycle, the Portuguese Environment Agency (APA) participated in the international project "Knowledge Platform for Assessing the Costs and Benefits of Flood Prevention Measures". Although a cost-benefit assessment was not carried out, an expert evaluation was done based on experience in this area, the occurrence of more harmful events, the degree of development of the projects and available funds. This allowed for the definition of a hierarchy for the measures.

Criterion	Evidence	Comments
...flood conveyance	No evidence	No reference to conveyance routes is included in the FRMPs.[8]
...water retention	Some evidence	One objective for Azores (PTRH9) calls for the "sustainable use of soil and the improvement of infiltration and water retention". While Portugal's FRMPs do not identify natural water retention measures (NWRMs) per se, Portugal has reported 29 measures for natural flood management[9], a category whose measures in most cases can be considered NWRMs.[10]
...environmental objectives of the WFD	Strong evidence	All five FRMPs assessed include WFD objectives in their own objectives – for example, contributing to the improvement or maintenance of good water body status. The FRMPs moreover refer to the necessity for coordination between the FRMPs and RBMPs. The overlap between Flood Risk Areas and water bodies has been assessed in detail, and in particular a summary of the status of each water body is included.
...spatial planning/land use	Strong evidence	The FRMPs assessed include references to land use, as well as measures to improve their integration with territorial management tools. For example, the FRMPs establish a measure to restrict construction in flood risk areas.
...nature conservation	Some evidence	Biodiversity, nature conservation and environmental improvement measures are not directly or explicitly considered; nonetheless, measures linked with RBMP measures consider the improvement of the water body ecological status.

[8] Portugal clarified subsequently that although no explicit reference is included in the FRMPs, flood conveyance routes were identified whenever possible, in relation to the proposed measures and in accordance to the characteristics of the flood (water velocity, depth).

[9] M31 Protection Natural flood management / runoff and catchment management (Please see Annex B for the full title). Measures in this category can in most cases be considered as NWRMs, though measures in some other categories may as well. Measures in Category M31 were reported for all UoMs except the Algarve Rivers (PTRH8).

[10] Portugal informed subsequently that whereas the FRMP did not identify NWRMs, as a response to a European Court of Auditors audit in November 2017 such identification was done. There are now 66 "green measures" for the seven mainland Plans.

Criterion	Evidence	Comments
...navigation/port infrastructure	No evidence	All FRMPs assessed briefly state that in the next cycle of planning they will take into consideration navigation and port infrastructure.
...likely impact of climate change	No evidence	No climate change scenarios have yet been considered for the development of the FRMPs. All FRMPs include a measure to further develop studies of the effects of climate change on flood risk. This analysis is to take place in the next cycle of planning.
Coordination with other countries ensured in the RBD/UoM	Some evidence	The FRMPs for international UoMs refer to coordination and exchange of information with Spain.
Coordination ensured with WFD	Strong evidence	The FRMPs refer to the need for coordination between the FRMPs and RBMPs, and the obligation to foster the achievement of the WFD objectives. The FRMPs moreover cross-reference geographically flood prone areas with the surface water bodies that may have their status or objectives compromised.
Active involvement of interested parties	Some evidence	Interested parties were actively involved via technical meetings that were held at an early stage of the process to validate information, and public workshops were held. In one UoM, Azores (PTRH9) an advisory group was formed.

Good Practices

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

Table 3 Good practices in the Portuguese FRMPs

Topic area	Good practices identified
Planning/implementing of measures and their prioritization for the achievement of objectives.	Measures have been clearly identified, described and detailed in "measure sheets", using a structured format. The five FRMPs assessed provide estimated costs for all measures as well as indications of the main funding sources. The FRMPs assessed provide specific and measurable information on

Topic area	Good practices identified
	many (though not all) of their measures; moreover, measures are linked to objectives (though the latter are not specific and measurable, and therefore the contribution of the measures to their achievement can't be assessed). Priorities were set for all measures in the five FRMPs assessed, and the plans also set out the criteria used for prioritisation. Portugal's FRMPs include measures to provide a national framework for flood insurance. The water bodies that can benefit from the FRMP's implementation, with regard to WFD objectives, were identified in most of the assessed FRMP's. The overlap between Flood Risk Areas (for the 100 years return period) and water bodies has been assessed, and a summary of the status for each water body concerned is presented in the annex of each FRMP.
Public consultation	Multiple mechanisms were used for informing the public about the consultation processes. Technical meetings were held at an early stage of the process to validate information; Public workshops were held. The establishment of an advisory group in one UoM was used to ensure the active involvement of relevant stakeholders. The effects of consultation on the plans are clearly detailed in publicly available reports.
International issues in flood risk management.	There were efforts to coordinate measures (for example for dam management) with Spain.

Areas for further development

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

Table 4 Areas for further development in the Portuguese FRMPs

Topic area	Areas identified for further development
Integration of previously reported information in the FRMPs.	The internet links provided in the FRMPs for cartography are not operational (the FHRM has been moved)[11]. The FRMPs assessed make no reference to conveyance routes or their relevance for flooding in Portugal[12]. In Portugal – which initially applied Art. 13.1(b) and subsequently carried out a PFRA and reported APSFRs on this basis – flood hazard and risks from seawater, pluvial, groundwater and artificial water bearing infrastructure sources were not considered in any of the UoMs assessed. Whereas the FRMPs summarise previous steps, the FRMPs contain limited information on how the FHRMs have been used to prioritise measures.[13]
Setting of objectives for the management of flood risk.	The objectives are not specific or measurable. Measures and objectives are linked, but it is not clear whether the implementation of measures will lead to the achievement of the objectives.
Planning/implementation of measures and their prioritization for the achievement of objectives.	The FRMPs include mostly effort indicators and few impact indicators: most indicators focus on how much financial, human or other resources will be employed in the implementation of a certain measure, but are not linked to the extent that a measure helps attain a certain objective. Funding sources for measures are not specified in detail. Given their importance for Portugal, there is an apparent lack of attention to measures for ports and navigation.[14]

[11] Portugal subsequently informed that due to geodatabase restructuring there was a need to change the weblink and that the situation has meanwhile been corrected.

[12] Portugal subsequently highlighted that the flood hazard and risk maps identify the pathways affected.

[13] Portugal subsequently clarified that measures were prioritised by taking into account the risk determined in flood hazard maps and flood risk maps.

[14] Portugal subsequently recalled that Flood Risk assessment has been a priority long before the Floods Directive. Thus, multiple flood analysis and planning of measures has been included in several planning instruments. On the basis of the Floods Directive, efforts are on course to articulate these multiple instruments. This is the case, for instance, of the DIW2020 Douro Inland Waterways project, which, together with the RIS Community Directive, River Information Services (2005/44/EC), is intended to increase the safety of navigation. This project promotes the incorporation of data from the Water Resources Monitoring and Alert System (SVARH) into the system for alerting port activity and navigation in the Douro river. This action has not been included in the RH3 PGRI as it was still in preliminary phase.

Topic area	Areas identified for further development
Use of cost-benefit analysis in the FRMPs assessed.	No cost-benefit assessment was undertaken for the selection or prioritisation of measures in the FRMPs assessed.
Climate change	The FRMPs assessed hardly considered climate change[15]. The FRMPs assessed nonetheless include a commitment to consider climate change impacts in the 2018 review of flood risks.
Public consultation	Different timeframes for public consultation between UoMs (ranging from 22 days to 3 months)
International issues in flood risk management.	No maps have been presented for the international UoM, including the flood risk areas in Spain.[16]

Recommendations

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

- To be able to assess progress, the objectives of the FRMP should be measurable to the extent possible. How measures link to objectives, should be considered.
- Seawater, groundwater and pluvial flooding should be addressed, if found significant during the PFRA, at the FHRM stage and reflected accordingly in the second FRMP.
- The FRMPs should explain in further detail how the FHRMs were used to prepare the FRMPs, including the identification and prioritisation of measures. It will be important to ensure that FRMPs, APSFRs, and FHRMs refer to each other as appropriate and that they are continuously available to all concerned and the public in an accessible format, including digitally.

[15] Portugal subsequently informed that the lack of consideration of climate change scenarios was determined by the fact that the available methodologies were considered to require further development, in particular to identify the appropriate scenarios for the national territory, given the uncertainty associated with the characterization of climatic scenarios and, in view of the recent changes in approach by the IPCC (change of scenarios type A1, B1, A2, B23 to Representative Concentration Pathways) in 2014. Also taking into account the non-mandatory consideration of such scenarios, the option was to include these methodologies in the second cycle of implementation of the FD. The necessary studies are already underway and will be duly considered in the second cycle, even though many uncertainties remain.

[16] Portugal subsequently noted that there are no common APSFRs on the Spanish-Portuguese border. Spain identified five APSFRs along the border but, according to Portuguese analysis made for the first cycle of the FD, there was no need to define corresponding APSFRs on the Portuguese side, since these are sparsely populated areas. For the second cycle the situation will be again evaluated. In any case, there is co-operation on floods: Information exchange procedures are in place whenever there are intense rainfall events in shared basins, providing alerts as well as taking coordinated decisions regarding dam operation and other possible flood control.

- Measures should be selected and prioritised considering costs and benefits whenever possible.
- Funding sources for measures should be identified more concretely.
- Greater attention to potential climate change impacts in the second cycle should be given.
- Similar timeframes for consultation should be provided across UoMs.

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

1.1 Reporting of the FRMPs

Portugal has reported nine FRMPs for its ten UoMs. No FRMP was reported for the Guadiana UoM (PTRH7).

Portugal did not make use of Article 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).

Concerning the geographic coverage of the FRMPs, there is one FRMP covering each entire UoM. Annexes to each FRMP play an integral role, for example providing information on measures. The FRMPs for mainland Portugal were prepared centrally[17], following a similar approach; those for the Autonomous Regions of Azores and Madeira, were each prepared separately using different methodological approaches.

1.2 Assessment of the FRMPs

In Portugal there is a difference between the FRMPs prepared for UoMs on the mainland, and the autonomous regions. The Portuguese Environmental Agency (APA) coordinated the preparation of the FRMPs for the mainland UoMs and developed common methodologies and approaches for the plans. In contrast, the autonomous regions of Azores (PTRH9) and Madeira (PTRH10) each followed their own methodologies.

Table 5 Overview of UoMs within mainland Portugal

UoM code	UoM Name
PTRH3	DOURO
PTRH4A	VOUGA, MONDEGO AND LIS
PTRH5A	TAGUS AND WEST RIVERS

Table 6 Overview of UoMs for autonomous regions in Portugal

UoM code	UoM Name
PTRH9	AZORES
PTRH10	MADEIRA

[17] Portugal informed subsequently that whereas the structure of the plans had been harmonised at national level, regional specificities have been taken into account. The regional departments of the APA established the contact with the city councils and the stakeholders of each RBD.

2. Integration of previously reported information

2.1 Conclusions drawn from the preliminary flood risk assessment

As stated in the FRMPs, Portugal initially applied Art. 13.1(b). Nonetheless, Portugal subsequently carried out a PFRA and reported APSFRs on this basis - a total of 54 APSFRs, of which 22 in mainland Portugal (PTRH1 to 8)[18], five in Azores (PTRH9) and 27 in Madeira (PTRH10).

The APSFRs were identified[19] based on the analysis of information collected by national, regional and local bodies. They are presented in a database in the National Water Resources Information System (SNIRH - http://snirh.pt). The information used to identify the APSFRs included studies, reports and articles on floods, hydraulic projects, the River Basin Management Plans, flood reports and hydrometric data (continuous records and flood marks). The data include flood occurrences in the 19th, 20th and 21th centuries and information on their consequences (hydrological information and quantitative or qualitative consequences' assessment). Among the criteria used for the identification of the APSFRs were the identification of loss of human lives and the number of people affected[20]. The information used was also cross-referenced with information from a database of natural disasters of hydro-geomorphological origin for validation. The designated APSFRs are all affected by river floods.

The conclusions of the PRFA are presented in the FRMP for all five FRMPs assessed. This includes a summary map showing areas of potential significant flood risk (APSFRs). All FRMPs assessed also had a summary text, integrating previous information from the PFRAs. For the three mainland FRMPs assessed (Douro, PTRH3; Vouga, Mondego and Lis, PTRH4A; and Tagus and West Rivers, PTRH5A), this information is presented in Part 2 of the FRMPs, where the methodology and the results of previous steps are reviewed. These three FRMPs provide a link to an online map of the APSFRs: but during the assessment period the link was not functional[21].

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[18] APSFRs were identified in all UoMs except PTRH7, Guadiana.

[19] Based on information available on the APSFRs' metadata on the National System of Environmental Information (SNIAmb):(https://sniambgeoportal.apambiente.pt/geoportal/catalog/search/resource/details.page?uuid=%7B342E0B32-6856-4D93-9AC3-2D636A14BB25%7D)
An overview is available in: European Commission, Assessment of data and information reported by Member States on their Preliminary Flood Risk Assessments and identification of Areas of Potentially Significant Flood Risk under the Floods Directive: Member State Report: Portugal, 2015. Available at: http://ec.europa.eu/environment/water/flood_risk/pdf/pfra_reports/PFRA%20Report%20-%20PT.pdf

[20] Among the criteria was at least one person missing or dead and at least fifteen persons affected (evacuated or displaced).

[21] For the mainland FRMPs, a map of the APSFRs can be found at the following link:

The Azores FRMP (PTRH9) describes the steps leading to establishment of the APSFRS, links to maps for each island are provided in the FRMP Annex 4[22]. The Madeira FRMP presents the establishment of the PFRAs done in 2013[23] and also includes links to the maps, but these no longer worked at the time of the assessment[24].

No reference to an analysis of conveyance routes is included in the FRMPs.

2.1.1 Coordination with neighbouring Member States on shared RBDs/UoMs

The Douro (PTRH3) and Tagus and West Rivers (PTRH5A) are transboundary UoMs shared with Spain. Both FRMPs indicate that there is coordination and information exchange with Spain, which is carried out under the Albufeira Convention[25]. The FRMP for PTRH5A indicates that one APSFR wholly in Portugal depends on the coordination of upstream dam management with Spain[26].

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

The mainland FRMPs assessed (PTRH3, PTRH4A and PTRH5A) explain that the elaboration of the FHR maps was based on the PFRA and, through modelling (using MOHID modelling system), the FHRM stage assessed the identified areas in more detail. In the FRMPs of the Azores (PTHRH9) and Madeira (PTRH10), the link between the PFRA and the FHRMs is not clearly described, though for the Azores, the development of the FRMP included preparation of the FHR map.

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

Flood hazard and flood risk maps have been presented in the five FRMPs assessed: all five FRMPs present a graphical and tabular analysis of the FRM and provide the FRMs in

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https://sniamb.apambiente.pt/content/inunda%C3%A7%C3%B5es-diretiva-200760ce?language=pt-pt

22 Flores: http://sig-sraa.azores.gov.pt/SIG/(S(lq4cou454fh4k1zjnbgdhsnw))/MapViewer/Viewer.aspx?id=74
Terceira: http://sig-sraa.azores.gov.pt/SIG/(S(jdyjuu55l41fze45wvqnxh55))/MapViewer/Viewer.aspx?id=75
São Miguel:
http://sig-sraa.azores.gov.pt/SIG/(S(jx1zl5ugmgiqow55rsics3f1))/MapViewer/Viewer.aspx?id=76

23 Implementação da Diretiva nº 2007/60/CE, de 23 de outubro, transposta pelo Decreto-Lei n.º 115/2010, de 22 de outubro (Diretiva sobre a Avaliação e Gestão dos Riscos de Inundações) na Região Autónoma da Madeira

24 PTRH3 /PTRH4A / PTRH5A: https://sniamb.apambiente.pt/Diretiva60CE2007 (as found in the FRMPs p. 38/39). PTRH10: http://sniamb.apambiente.pt/D200760CE_MD/ (as found in FRMP Annex 1). A map of APSFRs in PTRH10 was available (May 2018) at:
https://sniamb.apambiente.pt/content/inunda%C3%A7%C3%B5es-diretiva-200760ce-r-da-madeira

25 The Convention on Cooperation for the Protection and Sustainable Utilization of Waters of the Luso-Spanish Hydrographic Basins.

26 FRMP PTRH3 (p. 29); FRMP PTRH5A (p. 67).

annexes[27]. The maps only show fluvial flooding. Floods from seawater, pluvial, groundwater and artificial water bearing infrastructure sources have not been identified in the UoMs analysed. The FHRMs do not include references to these flood sources, and indicate that they will be studied further in the coming cycle. None of these sources had been identified in the previous FHRM phase. The FHRMs do not show risks with no specific sources identified or the combined effects of more than one source of flooding.

Internet links[28] to the flood hazard and flood risk maps have been provided in the FRMPs in some but not all FRMPs assessed. Specifically:

- For the mainland FRMPs assessed (PTRH3 /PTRH4A / PTRH5A)[29]: https://sniamb.apambiente.pt/Diretiva60CE2007;
- For Madeira (PTRH10)[30]: http://sniamb.apambiente.pt/D200760CE_MD/
- For Azores (PTRH9), maps for each island[31]:
  Flores: http://sig-sraa.azores.gov.pt/SIG/(S(lq4cou454fh4k1zjnbgdhsnw))/MapViewer/Viewer.aspx?id=74
  - Terceira: http://sig-sraa.azores.gov.pt/SIG/(S(jdyjuu55l41fze45wvqnxh55))/MapViewer/Viewer.aspx?id=75
  - São Miguel: http://sig-sraa.azores.gov.pt/SIG/(S(jx1zl5ugmgiqow55rsics3f1))/MapViewer/Viewer.aspx?id=76

The links for PTRH3, PTRH4A, PTRH5A do not appear to be working, but the FHRMs can be found at https://sniamb.apambiente.pt/content/inunda%C3%A7%C3%B5es-diretiva-200760ce?language=pt-pt.

The links for PTRH10 do not appear to be working, but the FHRMs can be found at: https://sniamb.apambiente.pt/content/inunda%C3%A7%C3%B5es-diretiva-200760ce-r-da-madeira

2.2.1 Maps for shared flood risk areas

[27] PTRH3 Annex 10 (p.120); PTRH4A Annex 10 (p.120), PTRH5A Annex 10 (p.122), PTRH9 Annex 7 (p. 75), PTRH10 Annex I (detached document).
[28] Portugal informed subsequently that problems with inaccessible internet links have been resolved.
[29] FRMPs p. 38/39.
[30] FRMP Annex I.
[31] Provided in Annex 4.

Portugal does not share any flood risk areas with other Member States (i.e. with neighbouring Spain).

2.2.2 Conclusions drawn from the flood hazard and flood risk maps

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

- FHRMs are used to set priorities for flood risk management (e.g. locations, economic activities, assets);
- FHRMs are used as a tool in the public participation process;
- Measure types and locations have been defined based on the FHRM.

In general, all FRMPs include a standard text regarding the relevance of the FHRM work and its results for the definition of the FRMP. In four of the FRMPs assessed - PTRH3, PTRH4A, PTRH5A[32], PTRH10[33] – it is clearly stated that the FHRMs have been used to define and prioritise flood risk measures and their type (although it is not clear how the maps inspired the definition of objectives)[34]. The measures were devised and prioritised considering the damages identified in the FHRMs, and in particular addressing the significance of: human lives at jeopardy, potential damage to the environment, potential damage to infrastructure and potential damage to hazardous industry. Three of the FRMPs assessed mention that the FHRM was discussed with relevant stakeholders in preliminary meetings for the FRMPs (for PTRH3, PTRH4A and PTRH5A). However, none of the FRMPs assessed indicate that objectives were developed based on the FHRM.

For the FRMP for Madeira (PTRH10), the FHRM was developed along with the FRMP[35].

2.3 Changes to the APSFRs or other Flood Risk Areas

The FRMP assessment looked for information on changes in the identification of APSFRs since December 2011 or in the FHRMs since December 2013 indicated in the FRMP. None of the five FRMPs assessed provide information regarding possible changes due to increased information, knowledge and understanding.

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[32] For PTRH3, PTRH4A and PTRH5A the information was found on chapter 1.5 of the respective FRMPs (p. 35).

[33] For PTRH10 the information was found on chapter 1.4 (p. 13).

[34] Portugal subsequently confirmed that this methodology was used for all FRMPs in the mainland.

[35] Portugal subsequently informed that the FRMP for Azores (PTRH9) and Madeira (PTRH10) followed the same methodology as those on the mainland.

Four of the five FRMPs do not indicate changes to the FHRMs, either. In contrast, for the Madeira (PTRH10), the FHRM was developed along with the FRMP.

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

The FHRM assessment[36] identified the following area for further development for Portugal:

- According to Art (6)(1) MSs shall prepare FHRMs for the areas identified under Art (5)(1) (APSFRs, Areas of Potential Significant Flood Risks). Portugal's geoportal identifies 27 APSFRs in Madeira, but the map was only reported in 2017.
- Climate change was not considered.
- Other potential sources of flooding, such as tsunamis, are not addressed in the maps.

None of these areas for further development are explicitly addressed within the FRMPs assessed or the reporting sheets in the time period between publication of the FHRMs and the assessment of the FRMPs. Nonetheless, based on the information available:

- FHRMs are now available for Portugal's APSFRs.
- The FRMPs indicate that climate will be addressed in the second cycle.
- No information is found on tsunamis, and it does not appear that they were included in the FHRMs.

Consequently, the first area for further development has been addressed, but not the other two. In addition, it can be noted that the FHRMs do not consider flooding from seawater, pluvial, groundwater and artificial water bearing infrastructure sources in any of the UoMs assessed.

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

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

- The FRMPs assessed make no reference to conveyance routes or their relevance for flooding in Portugal.

[36] European Commission, Assessment of Flood Hazard and Flood Risk Maps – Member State Report: PT – Portugal, February 2015. Available at: http://ec.europa.eu/environment/water/flood_risk/pdf/fhrm_reports/PT%20FHRM%20Report.pdf

- Flood hazard and risks from seawater, pluvial, groundwater and artificial water bearing infrastructure sources were not considered in the first cycle in any of the UoMs assessed.[37]
- The FRMPs contain limited information on how the FHRMs have been used to prioritise measures.
- The internet links provided in the FRMPs for cartography were not operational at the time of the assessment (the FHRM has been moved).

[37] Portugal informed subsequently that the identification of APSFRs was based on the application of the criterion "at least one person missing or dead" and "at least 15 persons affected", i.e. evacuated or made homeless. This criterion appears to be not applicable to the coastal area. However, since there is risk awareness, this matter has been duly considered: Taking precautionary measures in the Coastline Management Plans (adopted between 1998 and 2005) and the associated regime; and in the risk minimisation and prevention action taken under the Action Plan for Protecting and Enhancing the Coast (2007-2013 and 2012-2015). Therefore, Portugal considers, even though applying the APSFR identification criterion meant that no APSFRs were allocated in coastal areas, it is not believed that the non-allocating of APSFRs prevented measures and actions from being taken to protect coastal areas from coastal overtopping and coastal erosion.

3. Setting of Objectives

3.1 Focus of objectives

The FRMPs state that the overall aim is to protect human health, economic activity, the environment and cultural heritage (these aspects, however, are not specified within the objectives themselves).

Four of the five FRMPs assessed – for the Douro (PTRH3), Vouga, Mondego and Lis (PTRH4A), Tagus and West Rivers (PTRH5A) and Madeira (PTHRH10) – set out the following strategic objectives:

1. Increase the awareness of flood risks and the action strategies by the population and social and economic actors;
2. Improve knowledge and forecasting for adequate flood risk management;
3. Improve spatial planning and risk exposure management in flood areas;
4. Improve resilience and reduce vulnerability in areas of possible flooding;
5. Contribute to the improvement or maintenance of the water bodies' good status.

The FRMPs assessed also set more detailed operational objectives. For example, under the first strategic objective on awareness there are four operational objectives:

1.1. Raise citizens' awareness of the risks associated with flooding by advising on safety procedures and appropriate behaviour in case of an extreme event
1.2. Articulate with local authorities the procedures for reducing exposure to the threat
1.3. Disseminate information on risks associated with different return periods in the critical areas identified
1.4. Ensure the operation of monitoring networks

On the other hand, the FRMP for Azores (PTRH9) sets out the following strategic objectives:

1. Establish measures and actions to minimise the likelihood of flooding and the potential consequences;
2. Evaluate the possibility of the installation of a monitoring, forecast and alert system for extreme hydrological situations;
3. Promote practices for the sustainable use of soil and the improvement of infiltration and water retention;
4. Identify areas to be classified as threatened by floods;
5. Establish information and awareness mechanisms for flood risks;

6. Promote coordination with the River Basin Management Plan of the Azores River Basin District and other regional planning instruments;
7. Assess cost-effectiveness of proposed measures and actions and designate responsibilities for their implementation;
8. Identify financing mechanisms for the measures' implementation;
9. Design a program to monitor and control implementation.

The FRMP for the Azores does not have operational objectives but it provides a set of "orientation guidelines" for the strategic objectives. As examples, the first two orientation guidelines are to:

- Ensure strategic articulation with land planning, water resources, emergency and other relevant regional planning instruments.
- Ensure the protection of the population, economic activities, natural and built heritage and the environment in the face of flood events

On this basis, it can be said that in all FRMPs assessed[38]:

- The objectives aim to reduce the adverse consequences of floods
- The objectives refer to measures that will be implemented
- The objectives refer to non-structural measures[39]

3.2 Specific and measurable objectives

In Portugal, objectives are neither specific nor measurable. The strategic objectives included in the FRMPs are non-specific with regard to what they are trying to achieve (this is neither quantitative or measurable), nor where they are to be achieved, nor by when they are expected to be achieved. This is also the case for the operational objectives.

There is some information available on how the objectives are to be achieved, as the measures are formulated based on the strategic and operational objectives. The measures are devised considering the following aspects:

(a) for the exposed elements (i.e. population, economic activities, cultural sites and protected environmental areas), to address the potential harmful consequences;

[38] These categories are included in Art. 7 of the Floods Directive.
[39] Non-structural measures include measures such as flood forecasting and raising awareness of flooding as well as land use planning, economic instruments and insurance.

b) to be undertaken in geographical areas where several exposed elements are or may be located;

c) to reduce the severity of flooding in the APSFRs.

In all FRMPs assessed, indicators are associated with measures and measures relate to the objectives, but no indicators are identified for the objectives themselves.

3.3 Objectives to reduce adverse consequences from floods

In the FRMPs assessed, the objectives seek to reduce adverse consequences from floods, for example by improving resilience and reducing vulnerability. They do not, however, provide further specification of the type of adverse consequences that will be reduced. As mentioned previously, the objectives are rather general and do not specify the targets to be achieved. As noted above, indicators are associated with measures, but they are not associated directly with the objectives.

3.4 Objectives to address the reduction of the likelihood of flooding

Reduction of the likelihood of flooding is not specified in the objectives. Nonetheless, one of the strategic objectives for the mainland FRMPs assessed and for Madeira includes risk exposure management; risk is understood to include the likelihood of flooding[40].

3.5 Process for setting the objectives

The FRMPs for the mainland UoMs assessed – Douro (PTRH3), Vouga, Mondego and Lis (PTRH4A), and Tagus and West Rivers (PTRH5A) – were produced by the Portuguese Environment Agency (APA), resulting in common strategic objectives. The APA coordinated with the National System for Civil Protection in the development of the objectives. Coordination between national authorities and Madeira's regional authorities (PTRH10) led to this FRMP following the same set of strategic objectives. The development of the FRMP for Azores (PTRH9) included some coordination efforts with national authorities, but its objectives were established in accordance with the strategic objectives set out in the Flood Directive's transcription into regional law and are thus different from the other UoMs.

3.6 Good practices and areas for further development regarding setting objectives

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

[40] 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.

- The objectives are not specific or measurable and do not specify achievable targets.

4. Planned measures for the achievement of objectives

Portugal has reported measures for nine of its ten UoMs[41]. The number of individual measures reported is 76, and the number of aggregated[42] measures is 223, resulting in a total of 299 measures[43]. (Neither the FRMPs nor Portugal's reporting sheets explain how individual and aggregated measures are defined). The average number of measures per UoM is 33, with a range between 22 and 50 measures per UoM.

The measures reported cover all four aspects[44] (and no "other" measures are included): there are 51 prevention measures out of the 299 total measures (17 %); 93 protection measures (31 %); 110 preparedness measures (37 %) and 45 recovery and review measures (15 %).

Please see the tables and charts in Annex A for further detail on the measures.

4.1 Cost of measures

Table 7 Estimated overall budget for the measures in the assessed FRMPs

UoM code	Estimated overall budget of planned measures (2015-2021) in EUR
PTRH3	6.8 million
PTRH4A	86.2 million
PTRH5A	70.4 million
PTRH9	5 million
PTRH10	7.2 million

Source: Reporting sheet and FRMPs

Cost estimates for the measures are available in the five FRMPs assessed (Portugal did not provide this information in its reporting sheets, however). The expected budget for implementing the measures is very different among the five UoMs, ranging from EUR 5 m in the Azores (PTRH9) to EUR 86.2 m in the Vouga, Mondego and Lis UoM (PTRH4a).

[41] No information is reported for Guadiana, PTRH7.

[42] 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.

[43] 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.

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

The distribution of costs amongst the four aspects is also very different among the UoMs, with prevention ranging from 0-53 %, protection from 35-99 %, preparedness from 27-68 % and recovery from 0-28 % of the total FRMP budget for the UoMs. Four of the five FRMPs assessed present an overall cost forecast or budget, whilst Madeira (PTRH10) only presents these for the separate measures and does not provide an overview.

- The FRMP for the Douro UoM (PTRH3) provides the following budget distribution[45]: prevention measures, 53 % of the total; protection measures, 42 %; preparedness, 4 %; and recovery, 1 %.
- The FRMP for the Vouga, Mondego and Lis (PTRH4A) includes the following proportional distribution of the total budget[46]: prevention 0.45 %, protection 98.6 %, and preparedness 0.82 % and recovery 0.07 %.
- According to FRMP for the Tagus and West Rivers (PTRH5A)[47] the distribution is: prevention 1 %, protection 97.5 %, preparedness 1.4 % and recovery 0.1 %.
- According to Madeira FRMP (PTRH10)[48] the distribution is: prevention 11 %, protection 35 %, preparedness 27 % and recovery 28 %.
- In the Azores FRMP (PTRH9)[49]: prevention 7 %, protection 68 %, preparedness 10 %, and recovery 14 %.

The FRMPs assessed do not describe in detail the cost elements which are considered (e.g. if operational costs are included along with investment costs). It should be noted that costs are not provided for measures which are already being carried out by authorities in the frame of existing flood-related policies. on the other hand, several measures already being carried out were re-evaluated within the FRMPs.

4.2 Funding of measures

All the FRMPs assessed explain that most of the budgets will be covered by the national and regional competent and cooperating authorities, which will draw in large part on EU funds (structural and cohesion funds, agricultural and fisheries funds or social funds, according to the partnership agreement and its priorities). Some of the measures, including those carried out under existing policies, do not require additional budget[50]. There is no reference to the involvement of local authorities or private investment.

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45 page 75 of the FRMP.
46 page 77 of the FRMP.
47 page 80 of the FRMP.
48 page 39 of the FRMP.
49 Annex II to the FRMP.
50 PTRH3 FRMP (p. 75), PTRH4A FRMP (p. 77), PTHRH5A FRMP (p. 80), PTRH9 FRMP (p. 95), PTHRH10 FRMP (p. 39).

Table 8 Funding of measures

	PTRH3	PTRH4A	PTRH5A	PTRH9	PTRH10
Distribution of costs among those groups affected by flooding					
Use of public budget (national level)	✓	✓	✓	✓	✓
Use of public budget (regional level)	✓	✓	✓	✓	✓
Use of public budget (local level)					
Private investment					
EU funds (generic)					
EU Structural funds	✓	✓	✓	✓	✓
EU Solidarity Fund	✓	✓	✓	✓	✓
EU Cohesion funds	✓	✓	✓	✓	✓
EU CAP funds	✓	✓	✓	✓	✓
International funds					
European Social Fund[51]	✓	✓	✓	✓	✓

Source: Reporting sheet and FRMPs

4.3 Measurable and specific (including location) measures

All five FRMPs assessed include a clear and explicit description of almost all measures with regard to:

- What they are trying to achieve,
- Where they are to be achieved,
- How they are to be achieved, and
- By when they are expected to be achieved.

In general, the five FRMPs assessed include information on measures, referring to: their location (either the whole UoM or other more detailed locations), the implementation timeframe, the budget, the responsible entity and indicators for management. However, not all the information is provided for all measures. There are gaps regarding costs for measures already being carried out by the authorities in the frame of existing flood-related policies. For some measures, the description is brief (examples include: "development and implementation of the river conservation programmes", "legislative proposals", "good practice manuals"). In all the FRMPs assessed (and in all Portuguese FRMPs, it appears), measures are presented in a standard annex table providing key information such as the responsible administration(s), timetable for implementation (start and end), budget allocation, location/geographic scope, objectives to which it contributes, legal framework, execution indicators, priority and

[51] European Social Fund. Mac 2014-2020 (Operational Programme for Territorial Cooperation Between Madeira, Azores and Canarias). Intervir+ (Operational Program for Valorisation of the Economic Potential and Territorial Cohesion of the Autonomous Region of Madeira).

exposed elements (i.e. population, economic activities, cultural sites and protected environmental areas).

Almost all measures are specific and measurable. The measures indicate one of two levels of location: RBD/UoM, or APSFR/other specific risk area. There are no significant differences between the assessed UoMs regarding the level of specificity of the measures[52].

The following table lists all the locations indicated for Portugal's measures:

Table 9 Location of measures

	PTRH3	PTRH4A	PTRH5A	PTRH9	PTRH10
International					
National					
RBD/UoM	✓	✓	✓	✓	✓
Sub-basin					
APSFR or other specific risk area	✓	✓	✓	✓	✓
Water body level					
More detailed than water body					

Source: FRMPs

4.4 Measures and objectives

Across all five FRMPs assessed, it is clear which measures will contribute to the achievement of which objectives; however, it is not clear by how much they will contribute. It is also not clear whether the objectives will be achieved when all measures are completed. The annexed tables on measures include a box describing which strategic and operational objective each measure aims to tackle, thus giving an overall insight into how objectives are to be met: as noted in section 2, the objectives are not specific or measurable; moreover, although the measures are connected to the objectives, the indicators for the measures do not have quantified targets to be achieved and thus do not show how much the measures can contribute to the fulfilment of objectives.

4.5 Geographic coverage/scale of measures

For all nine UoMs reported, nearly 50 different locations were listed in the reporting sheets and it has not been possible to aggregate this information.

The five FRMPs assessed identify the UoM or the APSFR in which the measures shall be implemented.

[52] PTRH9 FRMP (Annex 2), PTRH3, PTRH4A, PTRH5A FRMP (Annex 13), PTRH10 FRMP (Annex 9).

4.6 Prioritisation of measures

Portugal has indicated the priority for the 299 measures reported. Of these, only six measures (2 % of the total) were identified as critical. A total of 97 measures were assigned very high priority (32 % of the total), while 135 measures have high priority (45 %), 45 have moderate priority (18 %) and seven measures have low priority (2 %).

Preparedness measures make up the majority of all measures reported (there are 110 preparedness measures across all nine UoMs); although no preparedness measures were reported as critical, the great majority – 75 % - were reported as very high priority. For prevention measures, the great majority – 84 % - are of high priority. For protection measures, 52 % are of high priority and 29 % of moderate priority.

Among the six critical measures, three are for recovery and review, two for protection and one for prevention.

The breakdown in priority is broadly similar across four of the five UoMs assessed, with the largest share of measures indicated as very high and high priority. In Madeira (PTRH10), however, the majority of measures are of high priority. Moreover, all six measures with critical priority are identified in this UoM.

In detail:

- Douro (PTRH3) – 14 measures have very high priority (41 %), 15 high priority (44 %), five moderate priority (14.7 %);
- Vouga, Mondego and Lis (PTRH4A) - 19 measures very high priority (38 %), 22 high priority (44 %), seven moderate priority (14 %), two low priority (4 %);
- Tagus and West Rivers (PTRH5A) - 18 measures have very high priority (44 %), 15 high priority (36.6 %), five moderate priority (12.2 %), three low priority (7.3 %);
- Azores (PTRH9) – 11 measures have high priority (39 %), 16 moderate priority (57 %), one low priority (3.6 %);
- Madeira (PTRH10) – six measures have critical priority (13 %), three very high priority (6.5 %), 26 high priority (56.5 %), 11 moderate priority (23.9 %).

Four of the five FRMPs - PTHRH3, PTHRH4A, PTHRH5A, PTHRH10 – provide information on a common approach for prioritisation. This has followed five criteria:

1. Preference to measures that may be financed[53];

[53] The FRMPs do not specify, however, how this was determined.

2. Preference for practicable measures within a period compatible with the implementation of the FRMPs (between March 2016 and December 2020);
3. Preference to measures that contribute to the greatest number of objectives;
4. Preference to measures taken in areas of very high risk, over those areas where the risk is high/medium;
5. Preference for prevention and preparedness rather than protection measures.

With regard to the last criterion, when looking at all of Portugal's measures, prevention and preparedness measures indeed are assigned higher priority than protection measures: the distinction is clearest for prevention measures (see above and Table A5 in Annex A). In terms of costs, however, in four of the five FRMPs assessed, protection measures receive the highest share.

The FRMP for Azores (PTRH9) does not provide any information related to prioritisation, either in terms of criteria to be employed or results.

The timetable for the implementation of the measures is provided within the FRMPs. All the measures will be implemented in the 2016-2021 period, with a target to be achieved by 2021. The majority of measures refers to six years of implementation. In the five FRMPs assessed, there is a direct relationship between the timetable and the priority of a measure, as this is one of the prioritisation criteria (see above). The timetable for each measure is split per year and presents how much budget is to be spent each year for each measure.

4.7 Authorities responsible for implementation of measures

Regarding the level of responsibility for the reported measures, national authorities, regional authorities and the local/municipal authorities are reported as being responsible for the implementation of measures. In the five FRMPs assessed, annexed tables on measures include a field for the responsible authorities; for many measures, there are overlapping responsibilities and authorities. Nevertheless, the national authorities are responsible for the highest number of measures for the mainland Portugal FRMPs assessed, particularly those measures with large budgets; the regional authorities are responsible for the highest numbers of measures for the Azores (PTRH9) and Madeira (PTRH10) FRMPs. Local authorities play a more significant role dealing with small scale measures[54].

[54] Portugal's reporting sheets identify responsible authorities for all 299 measures reported. It has not been possible, however, to aggregate the range of information provided.

4.8 Progress of implementation of measures

Portugal has indicated the progress of implementation for the 299 measures reported. Most of these measures have not started (219 measures out of 299, 73 %). Most of the measures that have not started are protection measures (89 measures, 96 % of all protection measures) and recovery measures (43 measures, 96 % of all recovery measures). On the other hand, 77 measures are ongoing (26 % of all measures), and 68 of these are preparedness measures (62 % of all preparedness measures). Three measures were completed at the time of reporting (1 % of the 299 measures).

4.9 Measures taken under other Community Acts

Member States have been asked to report on other Community Acts under which each measure has been implemented: while Portugal did not provide this information in its reporting sheets, all five FRMPs assessed include this information. All five FRMPs refer to the RBMPs under the WFD. Several protection measures refer to national civil protection measures, and some measures are taken under the IPPC Directive.

4.10 Specific groups of measures

Some **spatial planning/land use measures** have been included in the FRMPs (under Measure Types M22[55] and M33[56]). Additionally, some actions are to be taken to assure the integration of the FRMPs into national and regional territorial management instruments. For example, all five FRMPs assessed include a measure for the demarcation of areas where construction is prohibited, corresponding to areas of high probability of flooding occurrence (T = 20 years) in the FHRM; this measure also calls for the demarcation of adjacent zones corresponding to areas with a mean probability of flooding occurrence (T = 100 years) in the FHRM – here, there will be restrictions on construction.

Areas of flood risk will be included in the National Ecological Reserve, a land use planning instrument that sets severe restrictions on construction and land use.

Furthermore, it is stated in the FRMPs that coastal flooding and their land management implications will be included in the next FRMPs cycle.

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[55] 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.

[56] 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.

While Portugal's FRMPs do not identify **natural water retention measures (NWRMs)**[57], Portugal has reported 29 measures for natural flood management[58], a category whose measures in most cases can be considered NWRMs. Within this category, for example, Portugal reported, for the FRMP for the Douro (PTRH3), a measure for the establishment of connectivity between lagoons and the river Tâmega and for stabilisation of the banks and bed in order to minimize the risk of floods[59]; another calls for the restoration of the natural state of the Samaiões riverbank[60].

Measures that specifically consider nature conservation. All FRMPs refer in a generic manner to biodiversity and nature conservation in the text. At a measure-specific level, measures considering the recovery and renaturalisation of water bodies affected by floods consider the WFD's objective of good water status (including ecological status), referring to hydraulic, biophysical and hydromorphological components. Nevertheless, there is no reference to Natura 2000 or other formal conservation Directives or national laws on this subject[61].

There are no specific measure targeting **ports and navigation**, although all FRMPs make a brief statement that coastal flooding and its implications for ports and navigation will be considered in the second planning cycle[62].

Reference has been found in all five FRMPs assessed to **dredging** to increase the river channel capacity and its ability to convey water for flood alleviation purposes. All the FRMPs assessed include measures in their annexes for dredging as part of a strategy for removing sediment in river channels, since silting is a problem for all the Portuguese UoM.

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[57] Portugal informed subsequently that whereas the FRMPs did not identify NWRMs, as a response to a European Court of Auditors audit in November 2017, an identification was carried out. There are 66 "green" measures for the seven mainland Plans. Portugal moreover informed that out of the 67 protection measures included in mainland Portugal FRMPs, 50 (78.1 %) are "green" measures – which are understood as NWRMs within the FRMPs – and 14 (21.9 %) are structural ("grey") measures. In terms of costs, the green measures represent 55.5 % of the total budget for protection measures, while structural or "grey" measures represent the remaining share, 44.4 %.

[58] 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. Measures in this category can in most cases be considered as NWRMs, though measures in some other categories may as well. Measures in Category M31 were reported for all UoMs except the Algarve Rivers (PTRH8).

[59] Potentially, NWRM measure type N02: Wetland restoration and management

[60] Potentially, NWRM measure type N10: Natural bank stabilisation

[61] PTRH3, PTRH4A, PTRH5A FRMPs Annex 13, PTRH9 FRMP Annex 2 and PTRH10 FRMP Annex 9.

[62] PTRH3, PTRH4A, PTRH5A FRMPs and Annex 13, PTRH9 FRMP and Annex 2 and PTRH10 FRMP and Annex 9.

4.11 Recovery from and resilience to flooding

The role of insurance policies is discussed in all five FRMPs assessed with regard to the recovery from, preparedness for and resilience to flood. According to the FRMPs, a recovery measure foresees a national legislative proposal that will provide a framework for insurance in flood prone areas. The Portuguese Environmental Protection Agency (APA) and the Authority for the Supervision of Insurance and Pension Funds (ASF) are to participate in this legislative procedure. The FRMP for Madeira (PTHRH10) also indicates measures to encourage the acquisition of agricultural and natural disaster insurance.

The FRMPs provide little information, however, with regard to the types of insurance currently available for potential flooding areas.

4.12 Monitoring progress in implementing the FRMP

In the five FRMPs assessed, the FRMP measures template provided in the annex includes a space to enter the problem the measure aims to tackle, exposed elements addressed (population, economic activity, etc.), date for completion, budget allocation, as well as the cause addressed. There is, however, no baseline formally established. Although there are impact indicators for some measures, there are no well-defined targets. Most indicators focus on how much financial, human or other resources will be employed in the implementation of a certain measure, but are not linked to the extent that a measure helps attain a certain objective.

The FRMPs indicate that there will be monitoring by the central authority, the Portuguese Environment Agency (APA) and the National Civil Protection Authority is involved – however, further information on plans for monitoring is not provided.

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 of the WFD.

Table 10 Coordination of the development of the FRMPs with the development of the second River Basin Management Plans of the WFD

	PTRH3	PTRH4	PTRH5	PTRH9	PTRH1
Integration of FRMP and RBMP					
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 FRMPs					
The RBMP PoM includes win-win measures in terms of achieving the objectives of the WFD and Floods Directive, drought management and NWRMs [a]	✓	✓	✓	✓	✓
Permitting or consenting of flood risk activities (e.g. dredging, flood defence maintenance or construction) requires prior consideration of WFD objectives and RBMPs					
Natural water retention and green infrastructure measures have been included	✓	✓	✓	✓	✓
Consistent and compliant application of WFD Article 4(7) and designation of heavily modified water bodies with measures taken under the FD e.g. flood defence infrastructure					
The design of new and existing structural measures, such as flood defences, storage dams and tidal barriers, have been adapted to take into account WFD Environmental Objectives [a]	✓	✓	✓	✓	✓
The use of sustainable drainage systems, such as the construction of wetland and porous pavements, have been considered to reduce urban flooding and also to contribute to the achievement of WFD Environmental Objectives					

Notes: [a] based on reporting under the WFD

The FRMPs refer to the necessity of coordination between the FRMPs and RBMPs, and the obligation to foster the achievement of the WFD objectives. The overlap between Flood Risk Areas (for the 100 years return period) and water bodies has been assessed, and a summary of the status for each of the water bodies concerned is presented in the annex of each FRMP.

This is intended to provide coordination with the environmental objectives in Art. 4 of the WFD.

The authorities responsible for developing FRMPs and RBMPs are the same for all UoMs assessed, so coordination should be ensured. Although the WFD objectives are not included as criteria for the prioritisation of FRMP measures, it is stated that they were accounted for in the development of the measures.

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

The following **good practices** were identified:

- The five FRMPs assessed provide estimated costs for all measures as well as indications of the main funding sources.
- The FRMPs assessed provide specific and measurable information on many (though not all) of their measures; moreover, measures are linked to objectives (though the latter are not specific and measurable, and therefore the contribution of the measures to their achievement cannot be assessed).
- Priorities were set for all measures in the five FRMPs assessed, and the plans also set out the criteria used for prioritisation.
- Portugal's FRMPs include measures to provide a national framework for flood insurance.
- The links between APSFRs under the Floods Directive and water bodies (and their good status) and the WFD were detailed in all the FRMPs assessed. The overlap between Flood Risk Areas (for the 100 years return period) and water bodies has been assessed, and a summary of the status for each of the water bodies concerned is presented in the annex of each FRMP.

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

- The FRMPs include mostly effort indicators and few impact indicators: most indicators focus on how much financial, human or other resources will be employed in the implementation of a certain measure but are not linked to the extent that a measure helps attain a certain objective.
- The FRMPs lack attention to measures for ports and navigation, an area for further development given their importance for Portugal.
- Funding sources for measures are defined at a high level lacking specificity.

5. Consideration of climate change

The five FRMPs have not considered climate change in depth. Nonetheless, all FRMPs assessed include a text stating that in the second cycle of the Floods Directive, the implementation of prevention measures will be considered as a response to climate change, according to Portuguese national law (DL No 115/2010); the FRMPs also state that flood risk will be reassessed by 2018, taking into account climate change impacts. Furthermore, the FRMPs state that in the second cycle of the Flood Directive implementation, coastal and estuary territorial management plans, and their land use constraints developed considering climate change, will also be incorporated in the FRMPs.

The FRMPs for both Azores (PTRH9) and Madeira (PTRH10) outline a measure in which the regional strategies against climate change will be integrated on the FRMPs, but without further detail.

The three mainland FRMPs assessed – for PTRH5, PTRH3 and PTRH4 - contain a brief reference to the National Climate Change Adaptation Strategy (ENAAC), although no climate change scenarios were considered in the preparation of the FRMPs. These FRMPs mention that ENAAC and its scenarios will be considered in the second FRMPs.

No information was found in the reporting sheets or the FRMPs with regard to shifts in the occurrence of extreme events, changes in numerical recurrence times or changes in the main sources of flooding under long-term climate change scenarios.

5.1 Specific measures to address expected effects of climate change

Other than the measures noted above for Azores and Madeira, the five FRMPs assessed do not contain specific measures to address climate change. According to the information found, the design of other measures in the five FRMPs assessed has not considered climate change.

5.2 Good practices and areas for further development concerning climate change

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

- The FRMPs assessed hardly considered climate change. The FRMPs assessed nonetheless include a commitment to consider climate change impacts in the 2018 review of flood risks.

6. Cost-benefit analysis

In the five FRMPs assessed, there is no indication that cost-benefit analysis has been used for measures.

While four of the five FRMPs assessed refer to criteria for the selection and prioritisation of measures, cost-benefit considerations are not included. It can be noted that the Azores FRMP (PTRH9) includes the "cost-effectiveness assessment of the measures" as one of its strategic objectives – however, no further information on this is found (this FRMP does not list criteria for the selection and prioritisation of measures). The FRMP for Madeira (PTRH10) includes a measure to carry out a cost/benefit study: measure M02c– "Develop a study of the economic impact of flood events and the cost-benefit analysis of mitigation measures".

There are no measures with transnational effects identified in the FRMPs of PTRH3 and PTRH5A, and thus no cost-benefit analysis was done on transnational effects (the other assessed FRMPs did not have any transboundary areas).

6.1 Good practices and areas for further development

The following **area for further development** has been identified:

- No cost-benefit assessment was undertaken for the selection or prioritisation of measures in the FRMPs assessed.

7. Governance including administrative arrangements, public information and consultation

7.1 Competent authorities

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

7.2 Public information and consultation

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

Table 11 Methods used to inform the public and interested parties of the FRMPs

	PTRH3	PTRH4A	PTRH5A	PTRH9	PTRH10[63]
Media (papers, TV, radio)				✓	✓
Internet	✓	✓	✓	✓	✓
Digital social networking					
Printed material				✓	
Direct mailing	✓	✓	✓	✓	
Invitations to stakeholders	✓	✓	✓	✓	
Local Authorities	✓	✓	✓	✓	
Meetings	✓	✓	✓	✓	✓
SMS messaging	✓				

Source: FRMPs

The three mainland FRMPs assessed – Douro (PTRH3), Vouga, Mondego and Lis (PTRH4A) and Tagus and West Rivers (PTRH5A) – followed a similar approach to public information. The public and stakeholders were informed via Internet[64], as well as direct mailings, invitations to stakeholders and information provided at local authorities and at meetings. In addition, SMS messaging was used to announce meetings for the PTRH3 FRMP[65].

[63] Portugal subsequently informed that for PTRH10 all methods were used to inform the public and interested parties of the FRMPs, except the use of SMS messaging.

[64] https://www.apambiente.pt/index.php?ref=16&subref=7&sub2ref=9&sub3ref=1250 > tab Participação Pública > tab Consulta Pública.

[65] The three FRMPs and Portugal's reporting sheets refer to a public participation report that should be an attachment of the FRMP report. However, that attachment was not included in the documents submitted to

For the FRMPs for Azores (PTRH9), similar approaches were used as well as information via media[66]. For Madeira (PTRH10), the FRMP and the reporting sheet mention specific activities (where and how the FRMP was publicized and available and meetings held), they do not specify further whether stakeholders were directly informed and invited to participate[67].

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

Table 12 Methods used for the actual consultation[68]

	PTRH3	PTRH4A	PTRH5A	PTRH9	PTRH10
Via Internet	✓	✓	✓	✓	✓
Digital social networking					
Direct invitation	✓	✓	✓	✓	
Exhibitions					
Workshops, seminars or conferences	✓	✓	✓		✓
Telephone surveys					
Direct involvement in drafting FRMP	✓	✓	✓	✓	
Other *	✓	✓	✓	✓	

Notes: * "Other" in Portugal included public participation response forms available online[69].

For the three FRMPs assessed in mainland Portugal, a variety of mechanisms were used for consultation, including meetings. A technical meeting was held in an early stage of the FRMP development in each UoM with local authorities, to reinforce the identification and validation of exposed elements to floods (households, economic activities, cultural sites, protected environmental areas). Afterwards, a version of the FRMP was made available during a formal public consultation period (three months), during which a public workshop was held in each

Eionet by Portugal. The public participation reports can be found at the official website of the national authority, and indicate the mechanisms used for informing the public and interested parties. For details, see: FRMPs, Chapter 6; Reporting sheet – Summary of the Consultation; and the Portuguese Environmental Agency's official website (URL: https://www.apambiente.pt/index.php?ref=16&subref=7&sub2ref=9&sub3ref=1250#subnavpanel-5 (tab "Resultados"))

66 The reporting sheet provides information and identifies the active interested parties that were directly consulted along the FRMP development process. It also states how they were informed (meetings, online and media advertisement, etc.). PTRH9 FRMP Chapter 8 and reporting sheet – Summary of the Consultation.

67 PTRH10 FRMP Chapter 6 and reporting sheet - Summary of the Consultation.

68 Portugal subsequently informed that for PTRH10 also direct invitation and direct involvement in the drafting of FRMP was employed.

69 For PTRH3, PTRH4A and PTRH5A there were specific public participation inquiries/forms available online at the UoM authorities' online portal.

UoM to discuss the plan and its contents. During the same period, online inquiries and standard forms for comments were available[70].

For the Azores FRMP (PTRH9), an advisory group with 16 representatives of different public, private and civil society organisations was formed to follow the development of the FRMP. Afterwards, a draft of the FRMP was made available during a formal public consultation period (22 days)[71].

For Madeira (PTRH10) a draft of the FRMP was made available during a formal public consultation period (60 days), and in this period two public workshop were held (at the same location) to discuss the plan and its contents. During the same period, contributions could be sent by post, fax or online[72].

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

Table 13 Methods used to provide the documents for the consultation[73]

	PTRH3	PTRH4A	PTRH5A	PTRH9	PTRH10
Downloadable	✓	✓	✓	✓	
Direct mailing (e-mail)					
Direct mailing (post)				✓	✓
Paper copies distributed at exhibitions					
Paper copies available in municipal buildings (town hall, library etc.)					
Paper copies at the main office of the competent authority				✓	
Paper Copies at the Portuguese Environment Agency main office			✓		

Source: FRMPs

For the mainland FRMPs assessed, the draft FRMPs were made available online - both at the Portuguese Environment Agency website and in a Public Participation Portal (www.participa.pt)[74]. For Azores (PTRH9) as well, the documents were made available both

[70] PTRH3, PTRH4A and PTRH5A: FRMP's Chapter 6, Reporting sheet - Summary of the Consultation and the Portuguese Environmental Agency's official website (URL: https://www.apambiente.pt/index.php?ref=16&subref=7&sub2ref=9&sub3ref=1250#subnavpanel-5 (tab "Resultados"))

[71] PTRH9 FRMP CHAPTER 8 and reporting sheet - Summary of the Consultation.

[72] PTRH10 FRMP Chapter 6 and reporting sheet - Summary of the Consultation.

[73] Portugal subsequently informed that for PTRH10 the documents for consultation were provided also as downloadable,, by direct mail (email) and as paper copies in the main office of the competent authority.

[74] PTRH3, PTRH4A and PTRH5A: FRMP's Chapter 6, Reporting sheet - Summary of the Consultation and the Portuguese Environmental Agency's official website (URL:

online (on website of the regional authority) and also in hardcopy at the main office of the regional authority and in each island's specific service offices and the nine island offices of the UoM management authority[75]. For PTRH9 and PTRH10 it was also possible to receive documents via fax or post, though further information on methods for providing documents was not found[76].

7.3 Active involvement of Stakeholders

The table below shows the groups of **stakeholders** that have been actively involved in the development of the five FRMPs assessed:

Table 14 Groups of stakeholders [77]

	PTRH3	PTRH4A	PTRH5A	PTRH9	PTRH10
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	✓	✓	✓		✓
Other *	✓				✓

Notes: * In Portugal, "Other" comprises the following stakeholders: in PTRH3, waste management, insurance companies; in PTRH9, Regional Civil Engineering Laboratory.

https://www.apambiente.pt/index.php?ref=16&subref=7&sub2ref=9&sub3ref=1250#subnavpanel-5 (tab "Resultados"))

75 PTRH9 FRMP Chapter 8 and Reporting sheet - Summary of the Consultation.

76 Both PTRH10 FRMP Chapter 6 and the Reporting sheet – Summary of the Consultation were reviewed.

77 Portugal subsequently informed that in PTRH10 all groups of stakeholders listed in table 14 were actively involved.

The information available shows that for at least three of the five FRMPs assessed, a broad range of stakeholders were actively involved (see the table above). For the other two FRMPs assessed, similar information was not found.

For two of the three mainland FRMPs assessed – Douro (PTRH3) and Vouga, Mondego and Lis (PTRH4A) – the Portuguese Environmental Agency website identifies the stakeholders that were actively involved in the development of the FRMPs: government bodies at different levels and for different sectors, economic interests and civil society associations were all involved. For the Douro, other groups involved included solid waste management companies and insurance companies. For the Tagus and West Rivers (PTRH5), the FRMP provides information on the main groups of stakeholders that were actively involved, but not in detail - e.g. "regional authorities" can cover a range of different sectors[78].

For Azores (PTRH9), in the FRMP chapter 8 there is a list of the entities that were involved in the development of the FRMP, including the entities that were involved in the advisory group [79].

For Madeira (PTRH10), although the stakeholders considered for implementation of FRMP measures are identified, it is not clear which of them were actively involved in the FRMP's development[80].

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

Table 15 Mechanisms used to ensure the active involvement of stakeholders[81]

	PTRH3	PTRH4A	PTRH5A	PTRH9	PTRH10
Regular exhibitions					
Establishment of advisory groups				✓	
Involvement in drafting	✓	✓	✓		
Workshops and technical meetings	✓	✓	✓		
Formation of alliances					
Other[82]					

Source: FRMPs

[78] FRMPs PTRH3, PTRH4A and PTRH5A: FRMP's Chapter 6, Reporting sheet - Summary of the Consultation and the Portuguese Environmental Agency's official website: https://www.apambiente.pt/index.php?ref=16&subref=7&sub2ref=9&sub3ref=1250#subnavpanel-5 (tab "Resultados")

[79] PTRH9 FRMP Chapter 8 and Reporting sheet - Summary of the Consultation.

[80] PTRH10 FRMP Chapter 6.2 and Reporting sheet - Summary of the Consultation.

[81] Portugal subsequently informed that in PTRH10 involvement in drafting and workshops and technical meetings were used to ensure the active involvement of stakeholders.

Stakeholders participated via technical meetings and workshops and were involved in drafting for the mainland FRMPs assessed. As noted above, an advisory group was formed for the preparation of the FRMP, with 16 representatives of different public, private and civil society organisations supported the development of the Azores FRMP (PTRH9).

7.4 Effects of consultation

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

Table 16 Effects of consultation

	PTRH3	PTRH4A	PTRH5A	PTRH9	PTRH10
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	✓	✓	✓		✓
Other[83]		✓	✓		✓

Source: FRMPs

Information was found regarding the effects of consultation on the three mainland FRMPs assessed: adjustments were made to specific measures, to the cartography (with the addition of more detailed information), and to the information on exposed elements (such as population and economic activities) to flooding risks. In addition, the consultation resulted in a commitment to integrate climate change assessments in the next FRMP, as well as integrating coastal and groundwater flood risks and consideration of potential new ASPFRs. For the Tagus and West Rivers (PTRH5A), this commitment extended also to the integration of a pluvial drainage assessment[84]. In addition, for this FRMP and for the Vouga, Mondego and Lis (PTRH4a), the consultation led to adjustments and clarifications on the explanation of the methodology.

No information was found about the effects of consultation for Azores (PTRH9) or Madeira (PTRH10).

[83] PTRH4A, PTRH5A and PTRH10: Adjustments and clarifications on the methodology explanation.

[84] PTRH3, PTRH4A and PTRH5A: FRMPs Chapter 6, Reporting sheet - Summary of the Consultation and the Portuguese Environmental Agency's official website https://www.apambiente.pt/index.php?ref=16&subref=7&sub2ref=9&sub3ref=1250#subnavpanel-5 (tab "Resultados")

7.5 Strategic Environmental Assessment

All the FRMPs assessed have undergone an SEA procedure[85]. For the three mainland FRMPs assessed (PTRH3, PTRH4A and PTRH5A), a joint SEA process was undertaken for the FRMPs and the RBMPs under the WFD.

For these three FRMPs as well as that for Madeira (PTRH10), the FRMPs do not mention the SEA reports; however, it is possible to consult them at websites of the national and regional authorities. For Azores (PTRH9), the FRMP refers to the SEA and a preliminary version of its report can be found on the regional authority's website.

7.6 Good practices and areas for further development regarding Governance

The following **good practices** were identified:

- Multiple mechanisms were used for informing the public and relevant stakeholders about the consultation process in all the assessed FRMP;
- Technical meetings were held at an early stage of the process to validate information (for PTRH3, PTRH4A and PTRH5);
- The establishment of advisory groups were used to ensure the active involvement of stakeholders (for PTRH9);
- Consultation's effects were detailed in publicly available reports (for PTRH3, PTRH4A and PTRH5).

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

- The effects of consultation are not clear for two of the FRMPs assessed (Azores, PTRH9, and Madeira, PTRH10)
- Different periods for public consultation were used in different UoMs (ranging from 22 days to three months); none of them reached six months, the minimum for RBMPs under the WFD, and in at least one UoM, less than one month was provided.

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[85] PTRH3, PTRH4A, PTRH5A: national authority's official website: https://www.apambiente.pt/index.php?ref=16&subref=7&sub2ref=9&sub3ref=1250#subnavpanel-5; tab "Planos > Documentos"
PTRH9: FRMP's Chapter 8 and regional authority's official website: http://www.azores.gov.pt/Gra/srrn-drotrh/conteudos/livres/Plano+de+Gest%C3%A3o+de+Riscos+de+Inunda%C3%A7%C3%B5es+da+RAA.htm
PTRH10: regional authority's official website: https://drive.google.com/drive/folders/0BxPHHom7Ioe6RHQyalViOE1FUkE; folder "Avaliação Ambiental Estratégica"

Annex A: Supplementary tables and charts on measures

This Annex gives an overview of the data on measures provided by Portugal 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)[86], not all fields are mandatory, and, as such, not all Member States reported information for all fields.

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

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

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

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

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

Types of measures used in reporting

The following table[87] is used in the reporting on the types of measures. Each type of measures is coded as an M-number. Measures are grouped in an 'aspect'.

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

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

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Measures overview

Table A1 - Total number of measures

Number of individual measures	76
Number of individual measures including measures which have been allocated to more than one measure type	76
Number of aggregated measures	223
Number of aggregated measures including measures which have been allocated to more than one measure type	223
Total number of measures	299
Total number of measures including measures which have been allocated to more than one measure type	299
Range of number of measures between UoMs including measures which have been allocated to more than one measure type (Min-Max)	2-35
Average number of measures across UoMs including measures which have been allocated to more than one measure type	33

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

	Prevention		**Protection**				**Preparedness**			**Recovery & review**		**Other**	**Grand Total**
	M22	**M24**	**M31**	**M32**	**M33**	**M34**	**M41**	**M42**	**M44**	**M52**	**M53**	**M65**	
PTRH1			5					1					6
PTRH2			2		1								3
PTRH3			2		4								6
PTRH4A	1		6	1	5	2							15
PTRH5A			8			1							9
PTRH6			1		1								2
PTRH8					2								2
PTRH9		3		1		4	1		1	1			11
PTRH10	1		1	7			3	7		1	2		22
Grand Total	**2**	**3**	**25**	**9**	**13**	**7**	**4**	**8**	**1**	**2**	**2**	**0**	**76**
Average per UoM	**<1**	**<1**	**3**	**1**	**1**	**1**	**<1**	**1**	**<1**	**<1**	**<1**	**0**	**8**

Table A3 - Number of aggregated measures per measure type and UoM

	Prevention				Protection					Preparedness				Recovery & review			Other	Grand Total
	M21	**M22**	**M23**	**M24**	**M31**	**M32**	**M33**	**M34**	**M35**	**M41**	**M42**	**M43**	**M44**	**M51**	**M52**	**M53**	**M61**	
PTRH1			2	2		1	2			5				2	1	1		16
PTRH2		1	2	2		1	2	1		5	2			2	1	1		20
PTRH3		3	2	2		3	1	1		9	3			2	1	1		28
PTRH4A			2	2	3	4	2	3		11	4			2	1	1		35
PTRH5A		4	2	2		1	2	1		11	5			2	1	1		32
PTRH6			2	2		3		1		9	3			2	1	1		24
PTRH8			2	2		2	1	1		13	2			2	1	1		27
PTRH9	3	1	1	2	1					3	2	1	2	1				17
PTRH10	2	1				1			1	1	1	5		10	1	1		24
Grand Total	**5**	**10**	**15**	**16**	**4**	**16**	**10**	**8**	**1**	**67**	**22**	**6**	**2**	**25**	**8**	**8**	**0**	**223**
Average per UoM	**1**	**1**	**2**	**2**	**<1**	**2**	**1**	**1**	**<1**	**7**	**2**	**1**	**<1**	**3**	**1**	**1**	**0**	**25**

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	Grand Total
	Aggregated	**Individual**		**Aggregated**	**Individual**		**Aggregated**	**Individual**		**Aggregated**	**Individual**			
PTRH1	4		4	3	5	8	5	1	6	4		4		22
PTRH2	5		5	4	3	7	7		7	4		4		23
PTRH3	7		7	5	6	11	12		12	4		4		34
PTRH4A	4	1	5	12	14	26	15		15	4		4		50
PTRH5A	8		8	4	9	13	16		16	4		4		41
PTRH6	4		4	4	2	6	12		12	4		4		26
PTRH8	4		4	4	2	6	15		15	4		4		29

	Prevention		Total	Protection		Total	Preparedness		Total	Recovery & review		Total	Other	Grand Total
	Aggregated	**Individual**		**Aggregated**	**Individual**		**Aggregated**	**Individual**		**Aggregated**	**Individual**			
PTRH9	7	3	10	1	5	6	8	2	10	1	1	2		28
PTRH10	3	1	4	2	8	10	7	10	17	12	3	15		46
Grand Total	**46**	**5**	**51**	**39**	**54**	**93**	**97**	**13**	**110**	**41**	**4**	**45**	**0**	**299**
Average per UoM	**5**	**1**	**6**	**4**	**6**	**10**	**11**	**1**	**12**	**5**	**<1**	**5**	**0**	**33**

The information in Table A4 is visualised in Figures A1 and A2 below:

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

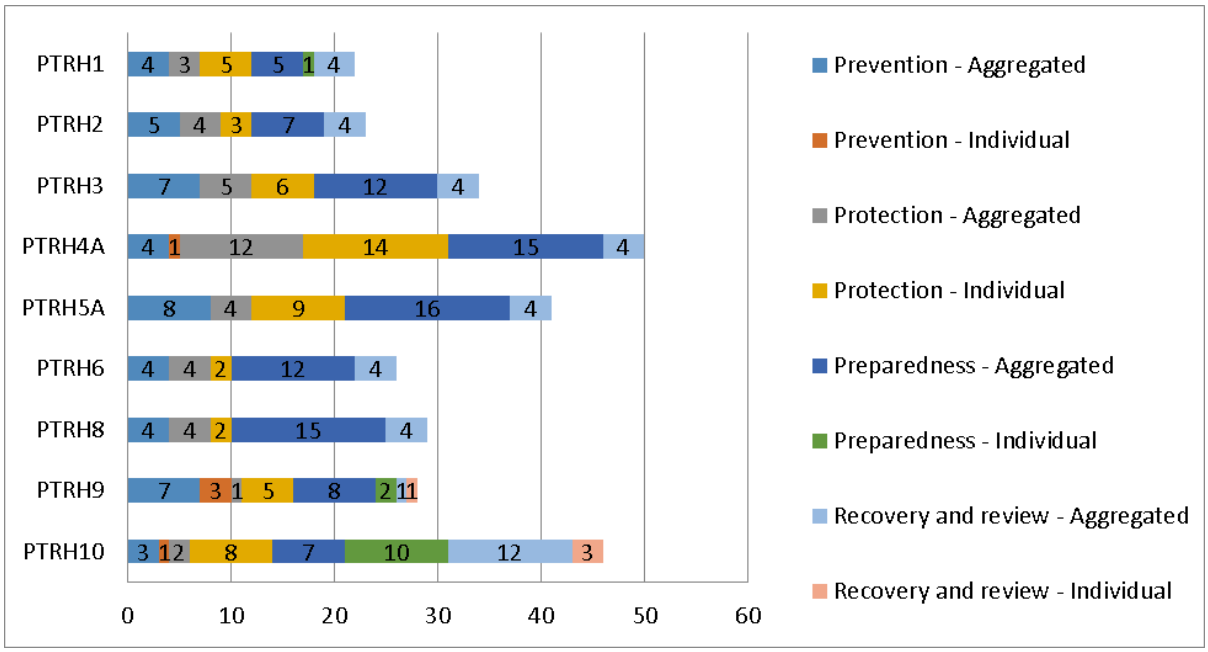
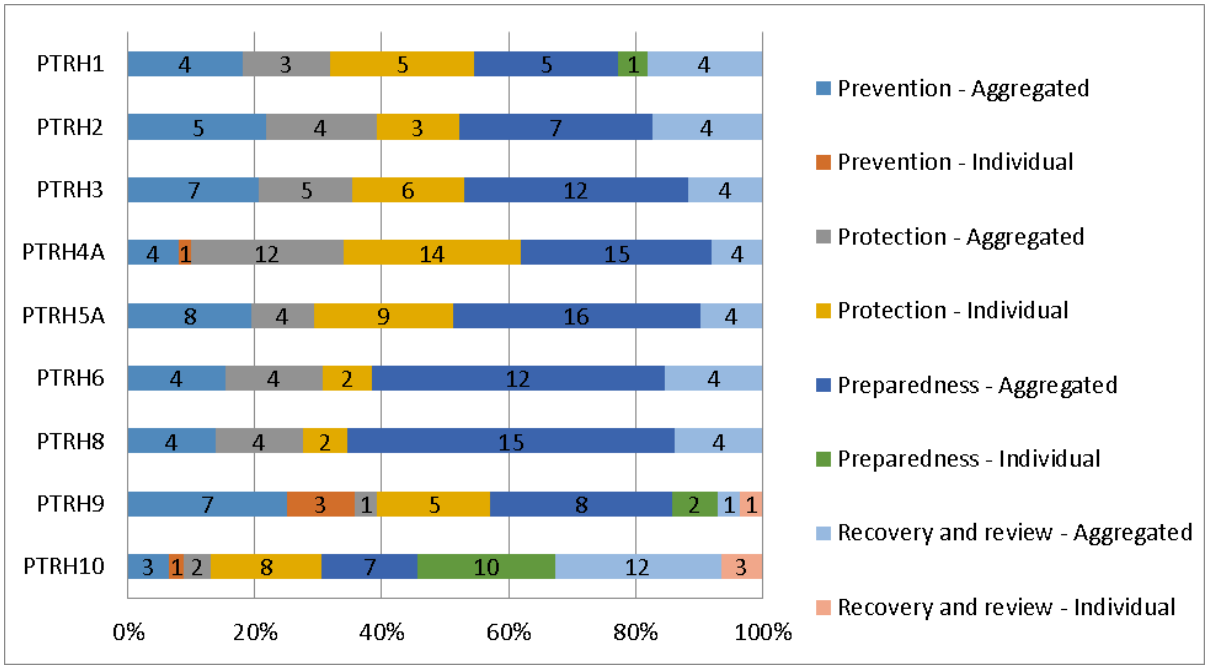


Figure A2 - Share of total measures (aggregated and individual) by measure aspect



Measure details: cost

Member States were requested to report information on:

- Cost (optional field);

- Cost explanation (optional field).

Portugal did not report any information about costs or cost explanations for the measures in the reporting sheets.

Measure details: name & location

Member States were requested to report information on the following:

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

Location of measures

Portugal provided information about the location of all measures in the reporting sheets, however, this was an open question, and nearly 50 different responses were given. It was thus not practical to aggregate the information.

Geographic coverage

Portugal did not report any information about the geographic coverage of the effects of the measures in the reporting sheets.

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

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

Category of priority

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

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

Table A5 - Category of priority by measure aspect

	Critical	Very high	High	Moderate	Low	Grand Total
Prevention	1		43	7		51
Protection	2	7	48	29	7	93
Preparedness		82	17	11		110
Recovery & review	3	8	27	7		45
Grand Total	**6**	**97**	**135**	**54**	**7**	**299**

Figure A3 - Visualisation of Table A5: Category of priority by measure aspect

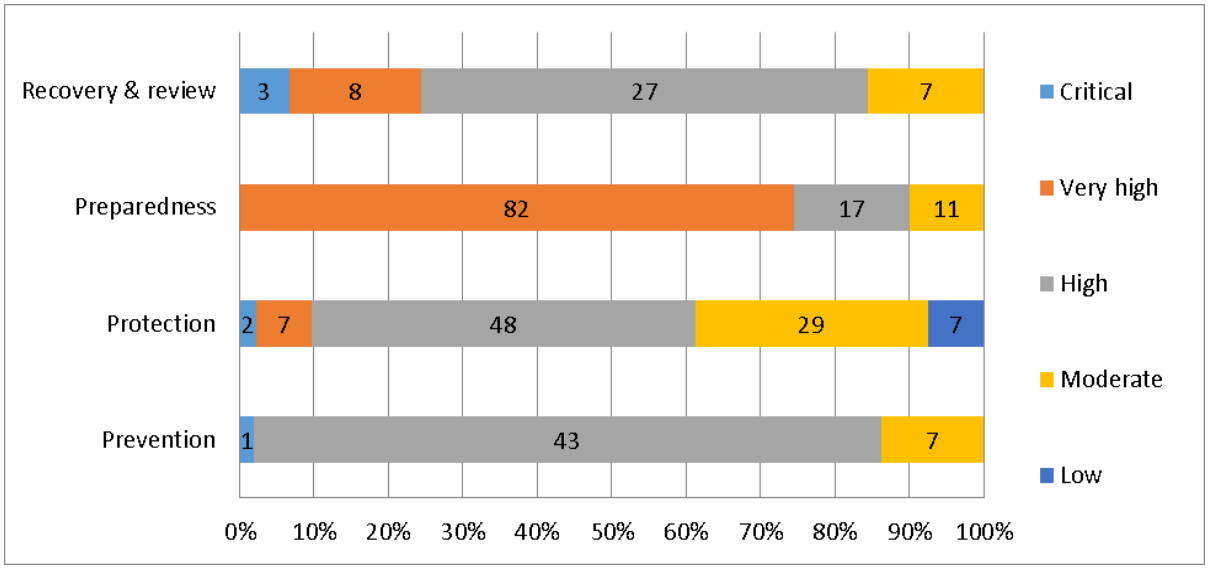
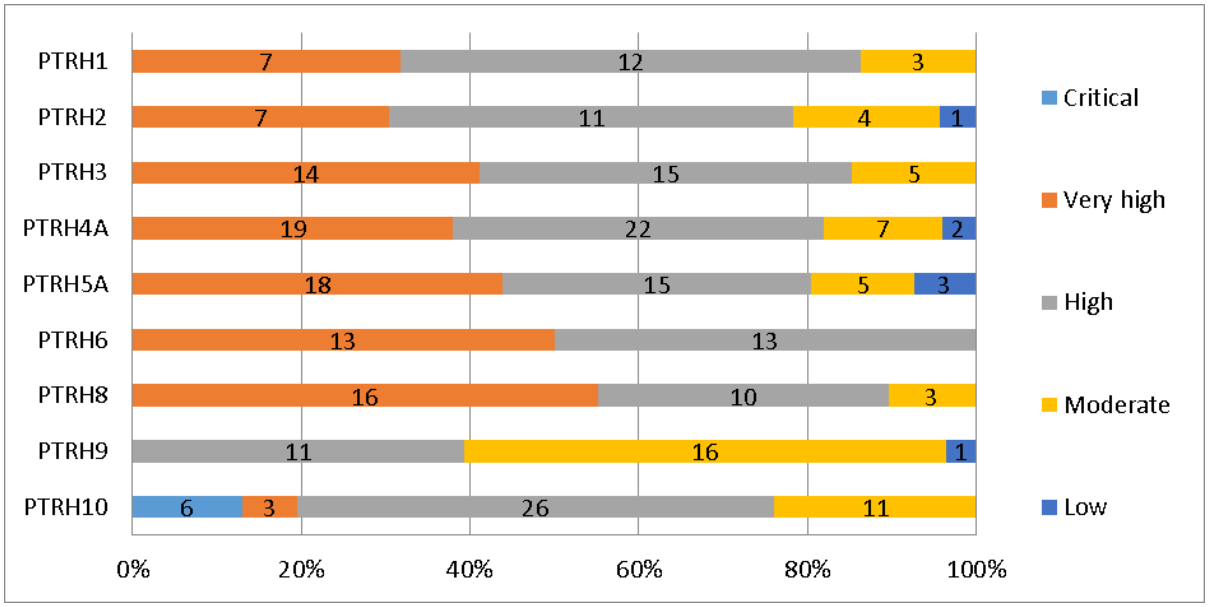


Table A6 - Category of priority by UoM

	Critical	Very high	High	Moderate	Low	Grand Total
PTRH1		7	12	3		22
PTRH2		7	11	4	1	23
PTRH3		14	15	5		34
PTRH4A		19	22	7	2	50

	Critical	Very high	High	Moderate	Low	Grand Total
PTRH5A		18	15	5	3	41
PTRH6		13	13			26
PTRH8		16	10	3		29
PTRH9			11	16	1	28
PTRH10	6	3	26	11		46
Grand Total	**6**	**97**	**135**	**54**	**7**	**299**
Average per UoM	**1**	**11**	**15**	**6**	**1**	**33**

Figure A4 - Visualisation of Table A6: Category of priority by UoM



Timetable

Portugal provided information about the timetable of all measures in the reporting sheets, however, this was an open question, and very diverse responses were given. It was thus not practical to aggregate the information.

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).

Portugal reported the responsible authorities for the majority of the measures (292 measures) in the reporting sheets. However, as this was an open question the responses varied greatly in detail and content and it was not practical to aggregate the information.

Portugal did not provide information about the level of responsibility of the responsible authorities in the reporting sheets.

Measure details: progress

Member States were requested to report information on:

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

Portugal reported information about the progress of implementation of the measures. The Progress of implementation was reported as[88]:

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

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

Table A7 – Progress of implementation by measure aspect

	Completed	Ongoing construction	Progress ongoing	Not started	Grand Total
Prevention		1	5	45	51
Protection	2	2		89	93
Preparedness			68	42	110
Recovery & review	1		1	43	45
Grand Total	**3**	**3**	**74**	**219**	**299**

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

Figure A5 - Visualisation of Table A7: Progress of implementation by measure aspect

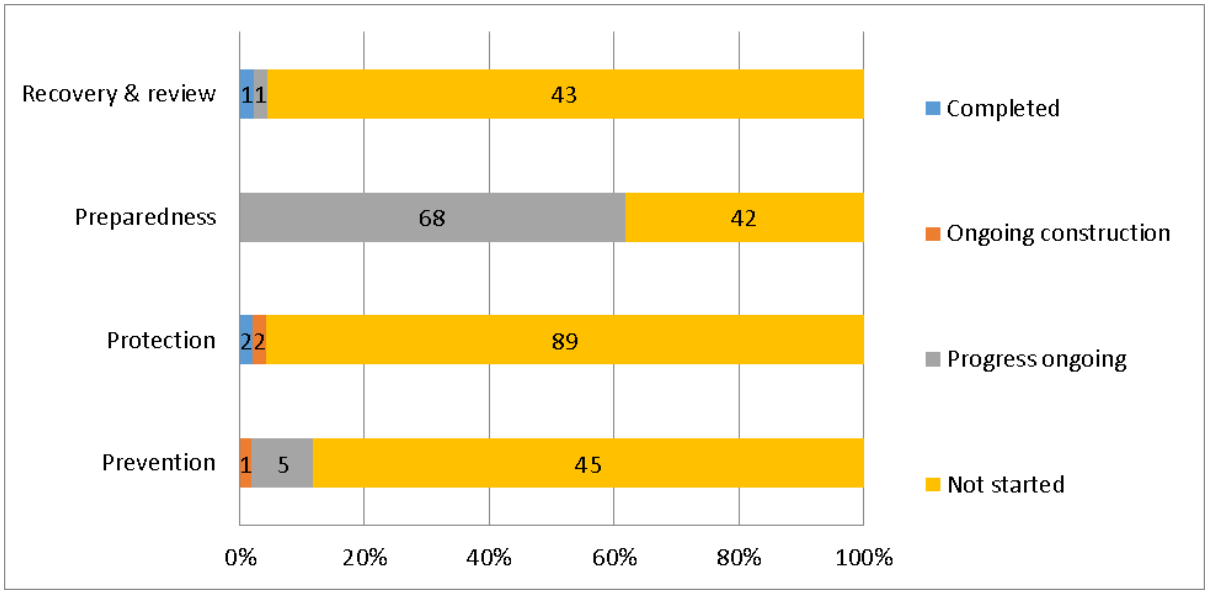
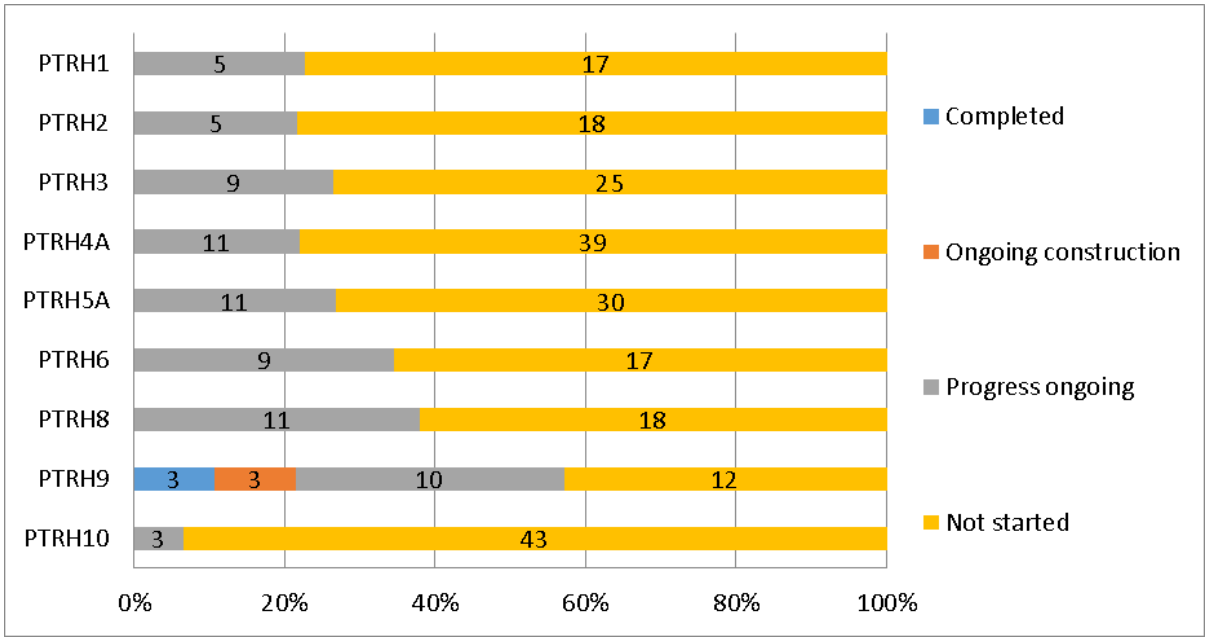


Table A8 – Progress of implementation by UoM

	Completed	Ongoing construction	Progress ongoing	Not started	Grand Total
PTRH1			5	17	22
PTRH2			5	18	23
PTRH3			9	25	34
PTRH4A			11	39	50
PTRH5A			11	30	41
PTRH6			9	17	26
PTRH8			11	18	29
PTRH9	3	3	10	12	28
PTRH10			3	43	46
Grand Total	**3**	**3**	**74**	**219**	**299**
Average per UoM	**<1**	**<1**	**8**	**24**	**33**

Figure A6 - Visualisation of Table A8: Progress of implementation by UoM



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

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

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

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

- Not started (NS) means the advisory services are not yet operational and have not provided any advisory session yet.
- Progress on-going (POG) means the advisory services are operational and are being used. This is expected to be the situation for all multi- annual long/mid-term advisory services that are expected to be operational during the whole or most of RBMP.

- 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.

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

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

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

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

Measure details: other

Member States were requested to provide information on:

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

Portugal did not report information about any of these fields in the reporting sheets.

Annex B: Definitions of measure types

Table B1 Types of flood risk management measures[89]

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

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

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

Catalogue of Natural Water Retention Measures (NWRM)

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

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

Table B2 List of NWRMs

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

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

Source: www.nwrm.eu