

Brussels, 26.2.2019
SWD(2019) 69 final

COMMISSION STAFF WORKING DOCUMENT

First Flood Risk Management Plans - Member State: Croatia

Accompanying the document

**REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND
THE COUNCIL**

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

{COM(2019) 95 final} - {SWD(2019) 30 final} - {SWD(2019) 31 final} -
{SWD(2019) 32 final} - {SWD(2019) 33 final} - {SWD(2019) 34 final} -
{SWD(2019) 35 final} - {SWD(2019) 36 final} - {SWD(2019) 37 final} -
{SWD(2019) 38 final} - {SWD(2019) 39 final} - {SWD(2019) 40 final} -
{SWD(2019) 41 final} - {SWD(2019) 42 final} - {SWD(2019) 43 final} -
{SWD(2019) 44 final} - {SWD(2019) 45 final} - {SWD(2019) 46 final} -
{SWD(2019) 47 final} - {SWD(2019) 48 final} - {SWD(2019) 49 final} -
{SWD(2019) 50 final} - {SWD(2019) 51 final} - {SWD(2019) 52 final} -
{SWD(2019) 53 final} - {SWD(2019) 54 final} - {SWD(2019) 55 final} -
{SWD(2019) 56 final} - {SWD(2019) 57 final} - {SWD(2019) 58 final} -
{SWD(2019) 59 final} - {SWD(2019) 60 final} - {SWD(2019) 61 final} -
{SWD(2019) 62 final} - {SWD(2019) 63 final} - {SWD(2019) 64 final} -
{SWD(2019) 65 final} - {SWD(2019) 66 final} - {SWD(2019) 67 final} -
{SWD(2019) 68 final} - {SWD(2019) 70 final} - {SWD(2019) 71 final} -
{SWD(2019) 72 final} - {SWD(2019) 73 final} - {SWD(2019) 74 final} -
{SWD(2019) 75 final} - {SWD(2019) 76 final} - {SWD(2019) 77 final} -
{SWD(2019) 78 final} - {SWD(2019) 79 final} - {SWD(2019) 80 final} -
{SWD(2019) 81 final} - {SWD(2019) 82 final} - {SWD(2019) 83 final} -
{SWD(2019) 84 final}

Table of contents

Acronyms	4
Introduction	5
Overview	6
Overview of the assessment	8
Good Practices	11
Areas for further development	12
Recommendations	13
1. Scope of the assessment and sources of information for the assessment	15
1.1 Reporting of the FRMPs	15
1.2 Assessment of the FRMPs	15
2. Integration of previously reported information	16
2.1 Conclusions drawn from the preliminary flood risk assessment	16
2.2 Presentation of Flood Hazard and Risk Maps (FHRMs) in the FRMPs	17
2.3 Changes to the APSFRs or other Flood Risk Areas	18
2.4 Areas for further development in the earlier assessment of the flood hazard and risk maps	18
3. Setting of Objectives	20
3.1 Focus of objectives	20
3.2 Specific and measurable objectives	20
3.3 Objectives to reduce adverse consequences from floods	21
3.4 Objectives to address the reduction of the likelihood of flooding	21
3.5 Process for setting the objectives	21
3.6 Good practices and areas for further development regarding setting objectives	21
4. Planned measures for the achievement of objectives	22
4.1 Cost of measures	23
4.2 Funding of measures	25
4.3 Measurable and specific (including location) measures	26
4.4 Measures and objectives	27
4.5 Geographic coverage/scale of measures	27

4.6	Prioritisation of measures	28
4.7	Authorities responsible for implementation of measures	28
4.8	Progress of implementation of measures	29
4.9	Measures taken under other Community Acts	29
4.10	Specific groups of measures	29
4.11	Recovery from and resilience to flooding	33
4.12	Monitoring progress in implementing the FRMP	33
4.13	Coordination with the Water Framework Directive	34
4.14	Good practices and areas for further development with regard to measures	35
5.	Consideration of climate change	36
5.1	Good practices and areas for further development concerning climate change	37
6.	Cost-benefit analysis	38
6.1	Good practices and areas for further development	38
7.	Governance including administrative arrangements, public information and consultation	39
7.1	Competent authorities	39
7.2	Public information and consultation	39
7.3	Active involvement of Stakeholders	41
7.4	Effects of consultation	42
7.5	Strategic Environmental Assessment	43
7.6	Good practices and areas for further development regarding Governance	44
	Annex A: Supplementary tables and charts on measures	45
	Background & method	45
	Types of measures used in reporting	46
	List of Annex A tables & figures	47
	Measures overview	48
	Measure details: cost	49
	Measure details: name & location	50
	Measure details: objectives	50
	Measure details: authorities	52
	Measure details: progress	54

<u>Measure details: other</u>	57
<u>Annex B: Definitions of measure types</u>	58
<u>Catalogue of Natural Water Retention Measures (NWRM)</u>	59

Acronyms

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

Introduction

The Floods Directive (FD) (2007/60/EC) requires each Member State 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 Croatia¹. It assesses the FRMPs and MS reporting to the European Commission in 2016. Its structure follows a common assessment template used for all Member States. The report draws on two main sources:

- Member State reporting to the European Commission on the FRMPs² as per Articles 7 and 15 of the FD: this reporting should provide an overview of the plans and details on their measures;
- Croatia’s Flood Risk Management Plan: Croatia reported one national FRMP for the country’s two Units of Management (UoMs).

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

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

http://ec.europa.eu/environment/water/water-framework/objectives/implementation_en.htm

Whereas a key role of the Commission is to check compliance with EU legislation, the Commission also seeks information to allow it to determine whether existing policies are adequate. It also requires certain information to create a European-wide picture to inform the public.

Overview

Figure 1 Map of Units of Management/River Basin Districts



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

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

Croatia has designated two Units of Management (UoMs) under the Floods Directive: the Danube (HRC) and the Adriatic (HRJ). These two UoMs correspond to the two River Basin Districts (RBDs) designated under the Water Framework Directive (WFD).

Croatia has integrated its national FRMP³ under the Floods Directive into its national River Basin Management Plan 2016-2021, prepared under the WFD⁴. This national FRMP covers both Croatian UoMs.

The Government of the Republic of Croatia approved the national River Basin Management Plan 2016-2021 (and consequently, the FRMP as part of it) in 6th of July 2016.

The table below gives an overview of UoMs in Croatia, including the UoM codes, the name, and the number of APSFRs reported. It also shows if all documents required for each UoM were submitted to European Environment Agency's (EEA) WISE⁵ – the FRMP as a PDF and the reporting sheet as an XML. Across the two UoMs, a total of 2 976 Areas of Potentially Significant Floods Risk (APSFRs) have been identified.

Table 1 **Overview of UoMs in Croatia**

UoM	Name	Number of APSFRs	XML reported	PDF Reported
HRC	DANUBE	2 058	Yes	Yes ⁶
HRJ	ADRIATIC	918	Yes	Yes

The FRMP can be downloaded (as part of Croatia's RBMP) from the following web page:

- <http://www.voda.hr/hr/plan-upravljanja-vodnim-podrucjima>

³ Plan upravljanja rizicima od poplava in Croatian.

⁴ The FRMP is a section of about 50 pages in the overall document of over 500 pages.

⁵ <https://rod.eionet.europa.eu/obligations/603/deliveries?id=603&tab=deliveries&d-4014547-p=1&d-4014547-o=2&d-4014547-s=3>

⁶ Croatia uploaded its national RBMP, which includes the single FRMP for both UoMs.

Overview of the assessment

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

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

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

Criterion	Evidence	Comments
FRM objectives have been established	Strong evidence	The FRMP has set two overall objectives and also presents two aims for flood protection. The objectives call for: (1) a complete and harmonised water regime vis-à-vis international objectives; and (2) integrating water management to protect people and material goods from floods and other harmful effects of water. The aims refer to flood protection levels to be attained in 2023 and 2038.
FRM objectives relate to...		
...the reduction of potential adverse consequences	Some evidence	The FRMP states that the objectives aim to reduce adverse impacts of floods on people, valuable assets and property and on the aquatic and terrestrial environments.
...to the reduction of the likelihood of flooding	Some evidence	The objectives include targets for Croatia’s flood protection systems.
...to non-structural initiatives	No evidence	The objectives do not refer to non-structural initiatives (however, the measures do).
FRM objectives consider relevant potential adverse consequences to...		
...human health	Some evidence	The objectives are intended to reduce adverse impacts of floods on the health and safety of people.

Criterion	Evidence	Comments
...economic activity	Some evidence	The objectives are intended to reduce adverse impacts on valuable assets and property.
...environment	Some evidence	The FRMP indicates that the objectives are aimed, among others, to protect the aquatic and terrestrial environment; the objectives also refer to the ecological status of waters.
...cultural heritage	No evidence	The objectives do not include a reference to cultural heritage (however, some of the measures do).
Measures have been...		
...identified	Strong evidence	The FRMP has identified 54 measures, of which 53 are national measures (applicable for both UoMs) and one that is valid only for the coast and only in the Adriatic UoM (HRJ). Croatia has reported these measures to WISE by UoM, so its reporting presents 107 measures, 53 in each UoM plus one only in the Adriatic UoM. The FRMP states that each measure will be implemented through a series of activities and projects: consequently, one measure is equivalent to several activities or projects.
...prioritised	Some evidence	Croatia has reported all measures as ‘moderate’ priority (except four protection measures for which no category is provided). However, it is not clear how the priority of measures was established ⁷ .
Relevant aspects of Article 7 have been taken into account such as...		
...costs & benefits	No evidence	The FRMP indicates that a cost-benefit analysis (CBA) was not made during the development of the FRMP. According to the plan, CBA will be implemented for the next planning cycle (2022 to 2027). The FRMP also notes that some CBA elements will be carried out at project level.
...flood extent	Strong evidence	FRMP indicates that flood extent has been identified

⁷ Croatia subsequently informed that the prioritisation of structural measures was carried out under the “Multi-annual programme for the construction of regulation and protection water facilities and amelioration facilities” (Official Gazette/OG 117/15). It was further clarified that the prioritisation of non-structural measures was not carried out because, due to their diversity and potential parallel implementation, the need for their prioritising was not evident. Croatia reasoned that there could be a risk for the slowing down of implementation of other measures if, for some reason, problems occurred in the implementation of an individual measure (presumably a non-structural one) with a higher priority.

Criterion	Evidence	Comments
		for the Areas of Potential Significant Flood Risk (APSFs).
...flood conveyance	No evidence	The FRMP does not mention conveyance routes (and the prior assessment of Croatia's PFRA did not find a reference to conveyance routes either).
...water retention	Strong evidence	The FRMP takes natural water retention account. The plan sets out several natural water retention measures (NWRMs), referring among others to floodplains and alluvial forests and to awareness raising on natural water retention measures.
...environmental objectives of the WFD	Strong evidence	The FRMP's objectives refer to the ecological status of water and the plan includes win-win and no-regret measures such as NWRMs.
...spatial planning/land use	Strong evidence	Several measures address spatial planning and land use, such as to include NWRMs in spatial planning documents and to raise awareness of land-use restrictions for flood-prone areas.
...nature conservation	Strong evidence	The FRMP includes measures that address nature conservation, including nature protection in the maintenance of water courses and for water works, as well as measures to address flood management issues in administrative activities connected to forestry and hunting.
...navigation/port infrastructure	Some evidence	Little evidence was found that navigation and port infrastructure have been taken into consideration. There is a short mention of it in the body of the FRMP, but no reference was found in the measures ⁸ .
...likely impact of climate change	Strong evidence	The FMRP has taken into account climate change, indicating potential changes in flood risks and citing Croatia's national climate adaptation strategy in preparation. Several measures will address climate change, including one to analyse its impacts on flood risks and then possibility to amend the program of FRMP measures with climate change adaptation measures. Another measure refers to climate risks in relation to flood management and biodiversity, and

⁸ Croatia stated subsequently that this part of the Flood Risk Management Plan will be reinforced in the second cycle.

Criterion	Evidence	Comments
		third refers to wider public participation with regard to the implementation of FRMP, including in relation to climate change.
Coordination with other countries ensured in the RBD/UoM	Strong evidence	The reporting sheets and the FRMP indicate that Croatia has cooperated on flood risk management via the international commissions for the Danube and Sava basins and also via bilateral contacts with neighbouring Member States and third countries.
Coordination ensured with WFD	Some evidence	The FRMP was developed along with the RBMP and is part of it; the overall plan is coordinated by Croatia's water management authority, Hrvatske vode. Part A of the 2016-2021 RBMP states that flood risk management is fully integrated with other water management activities (thus with the RBMP too) and that the FRMP is an integral part of the RBMP. Nonetheless, the FRMP provides few details on the coordination itself ⁹ .
Active involvement of interested parties	Strong evidence	The FRMP indicates that a range of stakeholders were actively involved via round tables; however, it appears that this took place during the Strategic Environmental Assessment of the plan and not during the WFD consultation period ¹⁰ .

Good Practices

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

Table 3 *Good practices in the Croatian FRMP*

Topic area	Good practices identified
Planning/implementing of measures and their prioritization for the achievement of objectives	<p>The FRMP includes measures for spatial planning and land use and for natural water retention. Moreover, several measures address nature conservation.</p> <p>The Plan sets out an approach for monitoring the implementation of measures, including indicators.</p>

⁹ Croatia subsequently noted that 153 measures from the RBMP relate to flood protection.

¹⁰ Croatia subsequently noted that the Report on the consultation with the interested public on the draft River Basin Management Plan was published here: http://www.voda.hr/sites/default/files/izvjesce_o_provedenom_savjetovanju_sa_zainteresiranom_javnoscu_o_nacrtu_plana_upravljanja_vodnim_podrucjima_2016._-2021.pdf

Topic area	Good practices identified
Consideration of climate change in the FRMPs assessed	<p>The FRMP presents potential impacts of climate change on flooding and its preparation considered the national climate change Adaptation Strategy and Action Plan, which were under development at the time.</p> <p>The FRMP includes measures to study potential impacts of climate change and incorporate them as well as carry out awareness-raising on climate change and floods.</p>
Public participation	<p>Several methods of consultation were used – from written submissions to a dedicated round table consultation.</p> <p>A report annexed to the RBMP/FRMP clearly presents how public and stakeholder comments were taken into consideration.</p>
International issues in flood risk management.	<p>During the process of FRMP development, cross-border consultations on FRMP (and associated FHRMs) took place through bilateral commissions with neighbouring states.</p>

Areas for further development

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

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

Topic area	Areas identified for further development
Setting of objectives for the management of flood risk.	<p>The FRMP presents both main objectives and also strategic aims. The main objectives are not specific or measurable.</p>
Planning/implementation of measures and their prioritization for the achievement of objectives.	<p>While a budget is provided for infrastructure measures, this comes from a pre-existing plan and it does not reflect the FRMP's planning period; there is no budget information for other types of measures.</p> <p>The FRMP does not link measures to objectives, which are for the most part very general.</p> <p>The measures are lacking information on location and geographical coverage. The FRMP does not explain how the nationally set measures will address the differences between Croatia's UoMs.</p> <p>Croatia has reported moderate priority for almost all its measures, and the FRMP provides no information on prioritisation of measures (the FRMP states that 71 % of investments are going to areas considered as having very high and high potential risk of flooding, implying that some</p>

Topic area	Areas identified for further development
	<p>form of prioritisation was carried out).</p> <p>The FRMP does not indicate a baseline for monitoring the implementation of measures¹¹.</p>
Use of CBA in the FRMPs assessed.	Croatia did not carry out an analysis of the costs and benefits (CBA) of its measures.
Public participation.	The FRMP provides little detail on the steps for public consultation and the active involvement of stakeholders. The FRMP and reporting sheets provide information on active involvement of stakeholders that took place during the consultation on the Strategic Environmental Assessment of the RBMP/FRMP and not during the six-month WFD consultation period.
Flood risk governance.	The FRMP (a small part of Croatia's RBMP) and its measures (each represents a series of actions and projects), do not provide detail on how differences in geography and flood risks will be addressed, both within and across Croatia's two UoMs. Despite the FRMP and RBMP being parts of the same document, there is little information on how the two Plans were coordinated.

Recommendations

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

- Objectives should be clearly presented and should be specific and measurable to the extent possible. To be able to assess progress, measures should be clearly linked to the objectives. The FRMP should indicate the baseline against which progress can be monitored.
- The FRMP should provide further information on coordination between the FRMP and RBMP.
- Croatia's flood risk management planning should better address any differences in flood management issues between the country's two UoMs, either within a single plan or via separate plans for each UoM.

¹¹ Croatia subsequently clarified that the "Multi-annual programme for the construction of regulation and protection water facilities and amelioration facilities" (OG 117/15), which was adopted before the River Basin Management Plan 2016-2021 (OG 66/16) (and consequently also before the FRMP), is currently being revised and that in the future it will fully be integrated into the framework of flood risk management under the Floods Directive. According to Croatia, structural measures that are both in the "Multi-annual programme" and FRMP provide the monitoring baseline.

- The FRMP should explain the prioritisation of measures and incorporate wherever possible an analysis of the costs and benefits of measures and use the results for the selection and prioritisation of measures.
- The next FRMP should integrate the ongoing studies of potential impacts of climate change.
- The FRMP should provide information on the costs and funding sources of all measures.
- The FRMP should provide further details on the approach to public consultation and the active involvement of stakeholders.

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

1.1 Reporting of the FRMPs

Croatia has reported one nationwide FRMP covering both of Croatia's UoMs. The national FRMP is part of the national River Basin Management Plan¹² (the main body of FRMP – Part D of the RBMP, makes up only a small part of the overall document, approximately 50 pages out of the 567 in total). Several sections of the Plan - Section A on the Water Management Framework; B, the Executive Summary; and E, the Documentation Register – relate to both the RBMP and the FRMP.

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

1.2 Assessment of the FRMPs

In Croatia, the one national FRMP was assessed; the two UoM reporting sheets were consulted for additional information.

Table 5 *UoMs in Croatian National FRMP*

UoM code	UoM Name
HRC	DANUBE
HRJ	ADRIATIC

¹² The RBMP is available on the web site of Hrvatske vode:
http://www.voda.hr/sites/default/files/plan_upravljanja_vodnim_podrucjima_2016._-2021_0.pdf
The RBMP can also be accessed via EEA's CDR: <http://cdr.eionet.europa.eu/hr/eu/frmp/>

2. Integration of previously reported information

2.1 Conclusions drawn from the preliminary flood risk assessment

The conclusions of the preliminary flood risk assessment (PFRA) are presented in Croatia's national FRMP. This includes a summary map showing areas of potential significant flood risk (APSFs). The FRMP also contains a short textual description and a summary map showing flood risk areas shared with other Member States in international UoMs. The FRMP has a graph and table representing the total surface of the APSFs' areas (2 823 km²) and the percentage of areas shared with other Member States and third countries (about 8 % of the area, mostly in the Danube UoM, HRC)¹³.

Several maps are provided within the FRMP (and thus in PDF format); in addition, high resolution online maps are available on the web site of Hrvatske vode, the national water management authority. The FRMP provides the link to the maps: <http://korp.voda.hr/>¹⁴.

The FRMP does not mention conveyance routes (and a prior assessment did not find a reference to conveyance routes in Croatia's PFRA¹⁵).

2.1.1 Coordination with neighbouring Member States on shared RBDs/UoMs

Cooperation and cross-border consultation on the FRMP is mentioned on several instances in the FRMP; however, there is no information specifically on cooperation at the PFRA stage. The FRMP¹⁶ states that flood risk management of shared flood risk areas will be managed in accordance with Croatia's international agreements^{17,18}.

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

¹³ FRMP 2016-2021, Sl. D4, p. 486.

¹⁴ Three main categories of maps are presented: preliminary flood risk assessment (PFRA) maps, flood hazard maps, and flood risk maps. It should be noted that high resolution maps were not available during the RBMP/FRMP public consultation process (only low resolution maps in the body of the document were available).

¹⁵ 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: [HR] - [Croatia]. Available at: http://ec.europa.eu/environment/water/flood_risk/pdf/pfra_reports/PFRA%20Report%20-%20HR.pdf

¹⁶ FRMP p. 486.

¹⁷ International FRMPs were prepared under both the Danube and Sava River processes. For example, an international FRMP for the Sava River Basin (a sub-basin of the Danube) was published in December 2014, at the same time as the FRMP for the Danube international basin. Croatia participates in coordination for both international basins. The FRMP does not, however, provide details on coordination within these processes.

¹⁸ Croatia informed subsequently that the PFRA was presented to Slovenia and Bosnia-Herzegovina at bilateral meetings. This element is included in the PFRA at the levels of the International Commission for the Protection of the Danube River (ICPDR) and the Sava Commission. Hungary and Serbia are members of the ICPDR, while Serbia is also a member of the Sava Commission. The FRMP, as part of the RBMP, was subject to the procedure according to the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) with all neighbouring countries.

According to the FRMP, the preparation of the flood hazard and flood risk maps (FHRMs) used the PFRA as a basis along with further data from flood observations¹⁹.

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

The FRMP provides summary flood hazard and flood risk maps. The FRMP indicates that the FHRMs cover pluvial floods, seawater floods, floods from artificial water bearing structures and floods from no specific sources, as well as the combined effects of more than one source of flooding. There is no indication whether groundwater floods were taken into account²⁰.

Links to the flood hazard and flood risk maps are provided in the FRMP. The maps are available on the web site of Hrvatske vode, where they can be visualised on an online GIS platform, available via the following web pages: <http://korp.voda.hr/> (main page) and <http://www.voda.hr/hr/plan-upravljanja-vodnim-podrucjima>²¹.

2.2.1 Maps for shared flood risk areas

Flood hazard and flood risk maps have been prepared for flood risk areas shared with other Member States. The FRMP and the reporting sheets state that consultations were held with neighbouring countries, that maps were presented, and comments incorporated into the final maps²².

¹⁹ FRMP 2016-2021, p.487-497.

²⁰ Subsequently Croatia noted that the issues of groundwater and surface waters and the determination of the accurate source of floods in karstic areas (which cover a major part of Croatia) are very complex, if not impossible. For this reason, the manifestations of this complex phenomenon on the surface were taken into account (although, in most cases, it also means significant flows into the ground), so it can be stated that the most important phenomena of groundwater flows were taken into consideration in the karstic parts of Croatia. In the alluvial parts of Croatia, however, the phenomenon of floods caused by groundwater was generally not taken into account.

²¹ At the time of the assessment, the maps were also available directly at the following link: <http://voda.giscloud.com/map/321490/karta-opasnosti-od-poplava-po-vjerojatnosti-poplavljivanja>.

²² Cross-border coordination has been described in the reporting sheets HRC/HRJ under Summary of Coordination. Cross-border consultation is also mentioned in the FRMP.

2.2.2 Conclusions drawn from the flood hazard and flood risk maps

The Flood Risk Management Plan provides the results of the FHRMs in table and graphic format²³. The assessment of potential damages²⁴ was performed based on these maps as well.

2.3 Changes to the APSFRs or other Flood Risk Areas

The 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. There is no information in the FRMP that the APSFRs have changed since 2013²⁵. However, the FRMP states that Flood Hazard Maps were updated with information obtained from floods observations since 2013²⁶.

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

The FHRM assessment²⁷ identified the following areas for further development in Croatia:

- There appear to be numerous APSFRs crossing borders with Serbia (HRC) and Bosnia and Herzegovina (both HRC and HRJ). The reporting did not specify how they are being coordinated;
- It was not clear how the hazard elements will be shown on the map for the low probability scenario without assigning a probability (information was not provided on the probability of low-probability floods²⁸);
- According to Article 6(5)(c) of the Floods Directive, Member States should report potentially affected protected areas: in particular, drinking water abstraction areas, recreational and bathing waters and areas for the protection of habitats and species including Natura 2000 sites²⁹. No potential adverse consequences on the environment are shown in the maps.

²³ See for example Table D.4, Table D.5, Figure D14

²⁴ Section D, ch. 2.3

²⁵ Croatia subsequently confirmed that APSFRs did not change.

²⁶ FRMP 2016-2021, p.480.

²⁷ European Commission, Assessment of Flood Hazard and Flood Risk Maps – Member State Report: HR – Croatia, March 2015. Available at:

http://ec.europa.eu/environment/water/flood_risk/pdf/fhrm_reports/HR%20FHRM%20Report.pdf

²⁸ Croatia subsequently explained that traditionally, the low probability scenario of occurrence is considered the 1/1000 event probability (flood protection of major cities), and this probability was generally used for hydrological processing in the development of maps. Absence of details about the low probability scenario on the published maps is believed to make the maps easier understandable to the public. For expert applications information can be obtained upon request from the competent body, i.e. Hrvatske vode.

²⁹ Croatia subsequently stated that additional sites will be included in the next cycle.

- Climate change was not been included in the analysis.³⁰
- The FHRMs were apparently not considered as finalised.

Based on the FRMP and Croatia's reporting sheets, some but not all of these areas for further development have been addressed:

- The FHRMs have been finalised, though as noted above, they were subsequently updated to take into account recent flood information.
- The FHRMs indicate protected areas and the potential adverse consequences of flooding for the environment.
- The FRMP refers to coordination of cross-border APSFRs with neighbouring countries but does not provide details on the process³¹.

Nevertheless,

- The maps show events for three categories: for low, medium and high probability of occurrence, a definition of the low-probability scenario was not found.
- Climate change impacts and vulnerabilities have not been addressed in the FHRMs.

Consequently, while the maps have been finalised and now indicate protected areas, it appears that other areas for further development identified in the prior assessment, including a lack of treatment of climate change and an indication of the definition of the low-probability scenario, have not been addressed yet.

³⁰ Croatia subsequently clarified that at the time when the maps were developed, there was no reliable regional model of climate change, and no reliable results could be obtained based on available data, so Croatia decided not to incorporate climate change impacts and vulnerabilities into the maps. At the end of 2017, a national climate change adaptation strategy project was completed within which a reliable regional model was developed and there is an ongoing project of Hrvatske vode to interpret these results for purposes of water management, including flood risk management.

³¹ Croatia subsequently clarified that the PFRA was presented to Slovenia and Bosnia-Herzegovina at bilateral meetings. It is included in the PFRA at the levels of the International Commission for the Protection of the Danube River (ICPDR) and the Sava Commission. Hungary and Serbia are members of the ICPDR, while Serbia is also a member of the Sava Commission. The FRMP as part of the RBMP was subject to the information and consultation procedure according to the Espoo Convention with all neighbouring countries. Supporting documents can be found at: <http://www.voda.hr/hr/plan-upravljanja-vodnim-podrucjima>.

3. Setting of Objectives

3.1 Focus of objectives

Croatia's FRMP presents two main objectives:

- Achieving a complete and harmonised water regime with respect to international obligations;
- Integrating water management to protect people and material goods from floods and other forms of harmful effects of water: i.e., to achieve economically justified levels of protection of population, material goods and other values, encouraging the preservation and improvement of the ecological status of water and floodplains to create preconditions for further economic development³².

It also states that the objectives of flood risk management are primarily aimed at "reducing adverse impacts of flood events on the health and safety of people, on valuable assets and on property and on the water and terrestrial environment".

An additional focus is the setting of two strategic aims for Croatia's flood protection system for waters of category I and II³³. These aims are the following:

- Achieving a level of 87 % flood protection before the end of year 2023;
- Achieving a level of 100 % of flood protection before the end of year 2038.

These targets are actually set outside of the FRMP timeline (2016-2021) and therefore it is not clear how they relate to the FRMP. Moreover, definition of these aims was not found.

Consequently, in the FRMP assessed³⁴:

- The objectives aim to reduce the adverse consequences of floods; and
- The objectives aim to reduce the likelihood of flooding³⁵.

3.2 Specific and measurable objectives

The main objectives of the FRMP are neither specific nor measurable.

³² RBMP/FRMP, p. 500-501.

³³ Waters of category I: interstate waters, coastal waters, other larger water and canals, and torrent waters of greater power; waters of category II: all other surface water.

³⁴ These categories are included in Art. 7 of the Floods Directive.

³⁵ 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 two strategic aims also included in the FRMP appear to be specific and measurable – however, the FRMP does not clearly define these aims.

3.3 Objectives to reduce adverse consequences from floods

In the FRMP assessed, the objectives include a reference to the reduction of the adverse consequences of floods on human health, cultural heritage and the environment.

3.4 Objectives to address the reduction of the likelihood of flooding

The objectives aim to reduce the likelihood of flooding (though they do not address this topic directly).

3.5 Process for setting the objectives

The FRMP does not provide details on the process followed for setting the objectives³⁶. The objectives were presented for public and stakeholder comment as part of the FRMP, and along with the RBMP (see section 7).

3.6 Good practices and areas for further development regarding setting objectives

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

- The FRMP presents both main objectives and also strategic aims. The main objectives are not specific or measurable. The strategic aims need clearer definition.

³⁶ Croatia subsequently clarified that the objectives were taken from the Water Act (OG 153/09, 63/11, 130/11, 56/13, 14/14 and 46/18), into which EU water Directives were transposed, and from the Water Management Strategy (OG 91/08).

4. Planned measures for the achievement of objectives

Croatia has reported 107 aggregated³⁷ measures and no individual measures (see Annex A)³⁸. The measures cover the four aspects of flood risk management³⁹:

- Prevention (20 measures, 19 % of all measures)
- Protection (nine measures, 8 %)
- Preparedness (43 measures, 39 %)
- Recovery and review (two measures, 2 %)

In addition, Croatia reported 34 “other” measures, representing 32 % of the total number of measures reported⁴⁰.

The measures are almost evenly divided between Croatia’s two UoMs: 53 measures for the Danube (HRC) and 54 for the Adriatic (HRJ).

It should be noted that Croatia’s FRMP presents a different number of measures: a total of 54 measures across the country, of which 53 cover both UoMs and one measure is implemented only in the Adriatic UoM (HRJ)⁴¹. In effect, Croatia has reported the same measures set out in the FRMP but did so on a UoM rather than a national basis.

All 54 measures from the FRMP are ‘aggregated’ measures. There is no definition of “aggregated” in the FRMP. Nonetheless, the FRMP states that each measure will be implemented through a series of activities and projects. Croatia has a varied geography: the Danube UoM includes the Pannonian plain and hilly and mountainous terrain, while the Adriatic UoM contains the Dinaric Alps, a generally narrow coastal area and a high number of

³⁷ 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.

³⁸ 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.

³⁹ See Annex B for the list of measure aspects and measure types

⁴⁰ It appears that these ‘other’ measures each cover more than one aspect.

⁴¹ Measure N26, measure code HRJ_5_2_26: "Development of flood risk management concept for areas under sea influence".

islands. The FRMP's measures, almost all at national level, do not provide detail on this diversity and the differences in flood risks that arise⁴².

Croatia's FRMP identifies the EU measure types (see Annex B) for its 54 measures; however, it also presents the measures in terms of the following four national categories:

- Measures to improve Flood Risk Management (16 measures)
- Implementing measures to reduce the risk of flooding (19 measures)
- Strengthening capacity and implementation of preventive preparatory actions, direct measures of regular and extraordinary⁴³ flood defence, and actions after the end of regular flood defence (11 measures)
- Measures for reduction of flood risks by involving the public (eight measures)

4.1 Cost of measures

The FRMP provides some information on costs for physical infrastructure measures; the time periods presented do not correspond to the FRMP (2016 to 2021).

⁴² Croatia subsequently informed that the measures are spatially distributed, i.e. the location for each structural measure under the “Multi-annual programme for the construction of regulation and protection water facilities and amelioration facilities” is known.

Non-structural measures mostly relate to both river basin districts (UoMs); however, their implementation is different in individual UoMs. E.g.:

- M 11, 25, 29 –water bodies according to the Water Framework Directive;
- M 6, 32 – public water estate;
- M 30 – flood protection water facilities;
- SM2 – protected areas according to the Water Framework Directive;
- M 9 – regulation and protection water facilities are defined under the “Main Implementation Flood Protection Plan”, Attachment 1, etc.;
- management of waters, water estate and water management facilities (M 40) is implemented according to annual programmes that include specificities of each individual location and that are harmonised with a body competent for nature protection.

Some of the measures are included in the RBMP 2016-2021 in accordance with the requirements of the Water Framework Directive and they are related to specific water bodies.

⁴³ Croatia's “National Flood Defence Plan” (OG 84/210) defines extraordinary flood defence measures as those taken “at extremely high water levels”.

Table 6 *Estimated overall budget of infrastructure construction measures in HRK*

UoM code	Estimated overall budget of infrastructure construction measures in HRK
Danube (HRC)	2013 – 17: 1 732.24 million 2018 – 22: 1 505.17 million
Adriatic (HRJ)	2013 – 17: 594.29 million 2018 – 22: 782.32 million

Source: FRMP

The FRMP provides estimated preliminary costs of construction for physical infrastructure for water regulation and safety as well as for drainage⁴⁴. The FRMP takes this information from the ‘Multi-annual Program for the Construction of Water Structures for Regulation and Protection and Structures for Amelioration’⁴⁵ (based on the Croatia’s Water Act), and the information is for two time periods that do not correspond to the FRMP cycle (2016-2021): 2013-2017 and 2018-2022⁴⁶. The following investment costs for infrastructure construction are presented in the FRMP:

Period 2013 – 2017:

- UoM Danube total (HRC): 1 731.24 m HRK
- Costs by sub-basin –
 - Drava and Danube (HRC 1/2): 553.30 m HRK
 - Sava (HRC 2/2): 1 177.94 m HRK
- UoM Adriatic (HRJ): 594.29 m HRK
- National total (HRC + HRJ): 2 325.53 m HRK

Period 2018 – 2022:

- UoM Danube total (HRC): 1 505.17 UoM m HRK
 - Costs by sub-basin –
 - Sub-basin Drava and Danube (HRC 1/2): 880.41 m HRK
 - Sub-basin Sava (HRC 2/2): 624.77 m HRK
- Adriatic (HRJ): 782.32 m HRK
 - Total HRC + HRJ= 2 287.49 m HRK

⁴⁴ FRMP 2016-2021, Tab.D.9, p.526.

⁴⁵ Multi-annual Program for the Construction of Water Structures for Regulation and Protection and Structures for Amelioration: <http://www.voda.hr/hr/visegodisnji-programi-gradnje>

⁴⁶ Croatia subsequently clarified that the “Multi-annual programme for the construction of regulation and protection water facilities and amelioration facilities” (OG 117/15) was adopted before the River Basin Management Plan 2016 - 2021 (OG 66/16). The programme is currently being revised so that in the future it will be fully integrated into the new framework of flood risk management according to the Floods Directive.

As noted, these costs refer to infrastructure construction and thus are likely to fall mainly under prevention, though the FRMP does not specify the breakdown by measure aspect..

4.2 Funding of measures

The FRMP indicates that Hrvatske vode will provide the main source of funding for measures. Hrvatske vode revenues in turn come mainly from water charges. There are four types:

1. Water contributions (Vodni doprinosi): paid by any legal or physical person who is responsible for a building (e.g. investor) for which a construction permit is issued⁴⁷;
2. Compensations for water regulation (*Naknada za uređenje voda*): paid by all legal or physical persons who own a real-estate;
3. Compensations for water use (*Naknada za korištenje voda*): paid by all legal or physical persons who use water (surface or ground water) for various purposes;
4. Compensations for water protection (*Naknada za zaštitu voda*): paid by all legal or physical persons who discharge water in sewers, septic tanks, collection pits or land or coastal waters.

Revenues from these water charges (in particular the second type listed above) will be used to finance the construction of flood protection infrastructure, along with possible co-financing from the state budget and other sources. The FRMP notes that other sources of financing can include:

- Hrvatske vode resources from the national budget (i.e. separate from the revenue from charges);
- A potential loan from the Development Bank of the Council of Europe;
- EU funds, including for cross-border co-operation programmes;
- Other available domestic and European sources of funding (including EU Funds and the Development Bank of the Council of Europe).

Consequently, the following sources of funding are identified:

⁴⁷ Or an application for an illegally built building to be made legal.

Table 7 Funding of measures

	Both UoMs
Distribution of costs among those groups affected by flooding	
Use of public budget (national level)	✓
Use of public budget (regional level)	
Use of public budget (local level)	
Private investment	
EU funds (generic)	✓
EU Structural funds	✓
EU Solidarity Fund	
EU Cohesion funds ⁴⁸	
EU CAP funds	
International funds *	✓
Other: water charges	✓

Notes: * International funds refer to a loan from the Development Bank of the Council of Europe

The FRMP specifies⁴⁹ that 71 % of investments will go to areas which are considered at very high and high preliminary risk of flooding (according to the FHRMs).

4.3 Measurable and specific (including location) measures

Croatia's FRMP does not include a clear and explicit description of the measures with regard to⁵⁰:

- What they are trying to achieve,
- Where they are to be achieved⁵¹,
- How they are to be achieved, and
- By when they are expected to be achieved.

In general, measures lack information on the objectives which they are trying to achieve, cost and explanation of costs. (As noted above, the FRMP states that the measures will be implemented via more detailed activities and projects.)

⁴⁸ Croatia added subsequently that also the Cohesion Fund will be utilised.

⁴⁹ RBMP/FRMP, p. 511.

⁵⁰ Croatia subsequently informed that the programme for “management of waters, water estate and water management facilities (preventive flood protection)” changes every year and that it is implemented wherever it is necessary. In addition, there are several competent bodies for some measures, so it is difficult to say in advance how the measures will be implemented. On top there are different deadlines for the implementation of individual measures. Reporting problems are cited too. Croatia concludes that efforts will be made to present and report the measures part more clearly in the next Flood Risk Management Plan.

⁵¹ Croatia clarified subsequently that the legislative measures apply to the entire country.

For all measures, the location is given as both UoMs. In addition, the following specific information is provided on the location of measures⁵²:

Table 8 *Location of measures*

	Both UoMs
International	✓
National	✓
RBD/UoM	✓
Sub-basin	
APsFR or other specific risk area	
Water body level	✓
More detailed than water body	
Other	✓

Source: Reporting sheet and FRMPs

4.4 Measures and objectives

It is not clear how measures will contribute to the achievement of objectives, nor clear by how much they will contribute to a specific objective. It is also not clear whether it is foreseen that the objectives will be achieved when all measures are completed, as the objectives themselves are not specific or measurable. Moreover, the FRMP does not link the measures to individual objectives.

4.5 Geographic coverage/scale of measures

Croatia has reported that location of all 107 measures to be in one of the two UoMs. The FRMP instead states that 53 of the 54 measures presented are considered to be implemented nationwide (and the 54th, in the Adriatic UoM, HRJ).

Croatia did not provide information about the geographic coverage of the expected effects of any of the measures in the reporting sheets.

As noted above, the measures are to be implemented through more detailed activities and projects, many of which are likely to take place in specific locations.

⁵² As noted above, Croatia's measures each represent a series of activities and projects, which could take place at specific locations.

4.6 Prioritisation of measures

Croatia has indicated that 103 of the 107 measures reported in WISE are of moderate priority⁵³, and did not provide information on the remaining four measures (as explained above, Croatia's FRMP refers to 54 measures)⁵⁴.

The FRMP and the reporting sheets do not provide information about the priority of measures. Nonetheless, the FRMP states that measures will be implemented according to the *Multi-annual Programme for the Construction of Water Structures for Regulation and Protection and Structures for Amelioration*⁵⁵; measures will be amended in accordance with the RBMP (of which the FRMP is part), including based on the funds available⁵⁶. In addition, the FRMP states that the priority of measures will be influenced by the upcoming national Climate Change Adaptation Strategy and Action Plan⁵⁷.

Croatia did not provide information about the timetable of the measures in the reporting sheets. As mentioned above, the FRMP sets out construction costs for infrastructure measures in two periods: 2013-2017 and 2018-2022. The FRMP does not provide cost information for measures that do not involve construction of infrastructure (e.g. awareness-raising measures, modelling, improvement of early-warning systems).

4.7 Authorities responsible for implementation of measures

Croatia indicated the authorities responsible for measures reported. Hrvatske vode, the national water management authority, is responsible for the great majority of measures, often together with other bodies, as many measures fall under the responsibility of multiple authorities:

- Hrvatske vode is the sole authority for 44 % of measures, including all prevention and all recovery and review measures;
- Hrvatske vode together with local authorities are responsible for 3 % of measures (all preparedness measures);
- Hrvatske vode together with other national agencies are responsible for 13 % of measures (mainly for preparedness): the other national agencies listed include, depending on the measure, the State Administration for Protection and Rescue, the State

⁵³ Member States had a five-point scale for reporting priority to WISE: critical; very high; high; moderate and low.

⁵⁴ Croatia subsequently informed that there had been a problem in reporting this information.

⁵⁵ Croatia subsequently noted that the prioritisation of structural measures was carried out under the Multi-annual programme (OG 117/15).

⁵⁶ FRMP 2016-2021, p512.

⁵⁷ FRMP 2016-2021, p503-504, p512.

Hydrometeorological Institute, the Croatian Electricity Company and the Croatian Environmental and Nature Agencies;

- Hrvatske vode together with national ministries (ministries for water, nature, environment, spatial planning and culture are mentioned) are responsible for 17 % of measures (mainly other measures);
- Hrvatske vode together with waterusers are responsible for 2 % of measures (all “other” measures);
- National ministries for water and energy are responsible for 4 % of measures;
- Finally, for 17 % of the measures, there are other combinations of the authorities listed above.

4.8 Progress of implementation of measures

Croatia reported information about the progress of implementation of all measures. Almost two-thirds of measures are reported as 'progress ongoing' (64 %), with the remainder reported as 'not started' (36 %). All prevention and recovery and review measures are indicated as progress ongoing; the other aspects have measures in both categories.

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: Croatia did not provide any information about other Community Acts associated with the measures in the reporting sheets.

The RBMP (of which FRMP is part) briefly mentions the Seveso Directive and EIA Directive (within the RBMP part, describing an obligation of the Ministry of Environment and Energy), but there is no reference to measures under these Directives⁵⁸.

4.10 Specific groups of measures

With regard to **spatial planning/land use measures**, the following types of measures are included in the FRMP:

- FRMP measure no. 1⁵⁹: Continuation of activities on the formalisation and introduction of a special level of protection and conservation of natural retention and wetland areas

⁵⁸ Croatia subsequently noted that in the part related to the Water Framework Directive, of the RBMP 2016-2021, there are planned measures according to the Water Framework Directive, Nitrates Directive, Birds Directive, Habitats Directive, Drinking Water Directive, Urban Wastewater Treatment Directive, etc. However, it should be noted that these measures are primarily related to water quality management (as part of the RBMP) and not to flood risk management.

⁵⁹ 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...).

and boundaries of the water quality of a given area in the preparation of spatial planning documents;

- FRMP measure no. 22⁶⁰: Adjustment of the Programme of Measures for flood risk management with Spatial Planning Documentation.
- FRMP measure no. 47⁶¹: Establishment of regular public education system on issues of understanding the needs of land-use restrictions and restriction of other activities in flood prone areas.

Other relevant measures include the continuation of the registration of public water resources in land registers (measure 2). The FRMP and the reporting sheets do not, however, contain an overview of the framework for halting or controlling buildings/development-in floodplains since 2000.

The FRMP also includes several **Natural water retention measures (NWRMs)**. These include measure no. 1, which includes water retention and wetland areas in spatial planning. Other examples of NWRMs include the following⁶²:

- Measure no. 17⁶³: Encourage the selection of technical solutions that ensure preservation, renovation and expansion of the areas that have the potential to retain flood water, such as natural retention, marshes and inundation areas.
- Measure no. 20⁶⁴: Encourage the selection of technical solutions at the sites of former floodplains that apply the concept of the continuation of the construction of lowland retentions for large water discharges to protect against flooding of the downstream area.
- Measure no. 21⁶⁵: Encourage the selection of technical solutions that enable existing lowland retentions to be used primarily as meadows and pastures or for the restoration of alluvial forests.
- Measure no. 24⁶⁶: Identification, preparation of the protection program and management plan of registered floodplain and retention areas, with identification, protection program and management plan of areas that could be used for natural water retention if necessary.

⁶⁰ 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.

⁶¹ M43: Preparedness, Public Awareness and Preparedness, Measure to establish or enhance the public awareness or preparedness for flood events.

⁶² FRMP 2016-2021, p.504-517.

⁶³ 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...).

⁶⁴ 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...).

⁶⁵ 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...).

⁶⁶ 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

- Measure no. SM2⁶⁷: A set of administrative and technical activities related to flood management issues connected with biodiversity, ecological networks and protected areas.
- FRMP measure no. 46⁶⁸: Establishment of a system of regular public education on issues of understanding the concept of natural retention of flood waters, retention areas, the need to preserve and extend natural retention in flood areas: wetlands and forests.

In addition, Croatia's reporting sheet refers to ecosystem services in the context of taking such services into consideration during flood extent control as part of ecosystem-based disaster risk reduction.

Several measures in the FRMP specifically consider **nature conservation**. This includes measure no. 1, described above (under land use and spatial planning) and measures 24, 46 and SM2, described above under NWRMs. Other examples include the following:

- FRMP measure no. 10⁶⁹: Improving the process of obtaining necessary conditions of nature protection for regular maintenance of watercourses, water resources and water works.
- FRMP measure no. MS1⁷⁰. (This measure is specifically oriented towards consideration to biodiversity, ecological network and protected areas): While harmonising operational flood protection plans with the National Protection and Rescue Directorate, as much as possible to put emphasis on the Ecosystem-based Disaster Risk Reduction (biodiversity, ecological networks, nature protection).
- FRMP measure no. 34⁷¹: Amend management plans of flood defence systems and operational plans of flood defence (the main implementation plan of flood defence and implementation plans of flood defence for defended areas), which includes alignment with the RBMP among elements to address;
- FRMP measure SM4⁷²: (a complex measure of mostly administrative activities related to flood management issues connected with forestry and hunting).

infiltration, etc and including in-channel, floodplain works and the reforestation of banks, that restore natural systems to help slow flow and store water.

⁶⁷ No EU measure type is provided.

⁶⁸ M43: Preparedness, Public Awareness and Preparedness, Measure to establish or enhance the public awareness or preparedness for flood events.

⁶⁹ M61: other

⁷⁰ No EU measure type is provided.

⁷¹ M42: Preparedness, Emergency Event Response Planning / Contingency planning, Measure to establish or enhance flood event institutional emergency response planning.

⁷² No EU measure type is provided.

The FRMP does not include measures that consider or refer to **navigation and port infrastructure**.

No reference has been found in the FRMP assessed to measures for **dredging** to increase the river channel capacity and its ability to convey water for flood alleviation purposes⁷³.

⁷³ Croatia noted subsequently that dredging is not considered environmentally friendly and is therefore avoided.

4.11 Recovery from and resilience to flooding

The role of insurance policies is not discussed in the FRMP. In the reporting sheets, insurance is mentioned in terms of recovery after a flood but no details are provided. Neither the FRMP nor the reporting sheets provide information on the type/s of insurance currently available or envisaged for flood risk areas.

4.12 Monitoring progress in implementing the FRMP

The FRMP has very limited information on monitoring. According to Croatia's reporting sheets, monitoring of the effectiveness and impact of the implementation of measures is the responsibility of Hrvatske vode, which should report on implementation of the RBMP and FRMP:

- after the first half of the planning period;
- in the "Summary of Significant Water Management Issues"⁷⁴; and
- in the next FRMP and RBMP (i.e. the River Basin Management Plan 2022-2027)

This reporting will be based on a set of indicators agreed among the institutions responsible for the implementation of the measures. It is not clear if reporting on flood measures is separate from or integrated with reporting on RBMP/WFD measures. Moreover, it is noted that, for example:

- Implementation of infrastructure measures also follows the monitoring established for the implementation of the 'Multi-annual Programme for the Construction of Water Structures for Regulation and Protection and Structures for Amelioration',
- For monitoring of both the RBMP/FRMP and the Multi-Annual Programme of measures, a special indicator system has been developed, agreed with the reporting needs of institutions involved in co-financing the realization of these two programmes). The performance indicators are identified at programme level and project level and for individual activities⁷⁵.

⁷⁴ Intermediate step in the preparation of draft RBMP/FRMP is the drafting of the document "Summary of Significant Water Management Issues" under the provisions of Article 39 of the national Water Act. Report is prepared by Hrvatske vode and given to the Ministry of Agriculture. The last such report was prepared and published on the website of the Croatian Water in February 2015.

⁷⁵ FRMP, limited information on p. 512-514. Reporting sheets (HRC/HRJ), section Summary of the Progress. More on indicators found in the document [Multi-annual Program for the Construction of Water Structures for Regulation and Protection and Structures for Amelioration](#)

There is no information in the FRMP on a baseline against which the progress will be monitored⁷⁶.

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 9 *Coordination of the development of the FRMPs with the development of the second River Basin Management Plans of the WFD*

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

Notes: ^a based on reporting under the WFD

The FRMP provides information on the coordination and interconnections between the RBMP and the FRMP. The two plans were developed together as one document by the same organisation, Hrvatske vode, which is responsible for the implementation of both⁷⁷. Part A of the common document, which provides the Water Management Framework, states that flood risk management is fully integrated with other water management activities (thus also with the RBMP)⁷⁸. Part B, the Executive Summary, and Part E, the Documentation Register, are shared

⁷⁶ Croatia subsequently clarified that the monitoring baseline for structural measures is contained in the Multi-annual programme for the construction of regulation and protection water facilities and amelioration facilities.

⁷⁷ FRMP (opening remarks and throughout the text), HRC/HRJ reporting sheets (Summary of Development)

⁷⁸ RBMP 2016-2021, text box in section A, ch. 3, p. 15.

common sections as well. Still, it is difficult to assess the level of coordination between the two Plans as there is no clear information in the text⁷⁹.

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

The following **good practices** were identified:

- The FRMP includes measures for spatial planning and land use and for natural water retention, and several measures address nature conservation.
- The Plan sets out an approach for monitoring the implementation of measures, including indicators.

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

- While a budget is provided for infrastructure measures, this comes from a pre-existing plan and it does not reflect the FRMP's planning period; there is no budget information for other types of measures.
- The FRMP does not link measures to objectives (the objectives are for the most part very general).
- The measures are lacking information on location and geographical coverage. The FRMP does not explain how the nationally set measures will address the differences between Croatia's UoMs.
- Whereas the FRMP states that 71 % of investments are going to areas with very high and high potential risk of flooding (implying that some form of prioritisation was carried out), Croatia has reported moderate priority for almost all its measures, and the FRMP provides no information on prioritisation of measures.
- The FRMP does not indicate a baseline for monitoring the implementation progress of measures.

⁷⁹ Croatia subsequently clarified that 153 measures from part "C" of the RBMP 2016-2021 document (effectively those are RBMP measures) "relate to activity of flood protection". In addition, Croatia stated that those measures are harmonised with programmes of other authorities (i.e. the authority competent for nature protection; with the interested public through provision of information and through environmental impact assessment studies).

5. Consideration of climate change

The FRMP indicates that climate change will affect hydrological conditions in Croatia and that its consequences on flooding should be further explored.

The FRMP takes into account results in the 'Sixth National Communication of the Republic of Croatia under the United Nation Framework Convention on the Climate Change (UNFCCC)' which considered climate change projections for several scenarios to near future (2011-2040), middle of century (2041-2070) and end of century (2071-2099)⁸⁰. The FRMP refers to possible shifts in the occurrence of extreme events and changes in numerical time frames; in addition, the FRMP presents trends for temperature change in the last 100+ years and also a textual review of temporal wet and dry periods⁸¹. The FRMP states that changes in the frequency and quantity of precipitation events over an annual period will have consequences for flood hazards and risks. These trends include: less summer precipitation; less precipitation in the central, mountainous part of Croatia and southern Adriatic and trends of higher precipitation in eastern areas; changes in dry and wet weather periods by location and season; a steady trend of sea level rise)⁸².

The FRMP refers to the on going development of Croatia's national climate change adaptation strategy⁸³ and states that in due time it will be necessary to incorporate measures related to flooding from the strategy into the FRMP (a time frame is not specified)⁸⁴.

Three measures in the FRMP call for further study and awareness-raising related to climate change. Measure no. 27⁸⁵ calls for further analysis of the impact of climate change in terms of flood protection and then possibly to amend the FRMP programme of measures by adding climate change adaptation measures. Similarly, a call for attention to the adverse effects of climate change is also given within measure no. SM2⁸⁶ in relation to flood management and biodiversity, ecological networks and protected areas (the measure refers specifically to the design of the protection program and management plan of floodplain and retention areas and an elaboration of a concept of seawater flood control). Measure no. 42⁸⁷ involves wider public

⁸⁰ FRMP 2016-2021, footnotes 133 and 134.

⁸¹ FRMP 2016-2021, p.502-503.

⁸² FRMP 2016-2021, p.504.

⁸³ <https://climate-adapt.eea.europa.eu/countries-regions/countries/croatia> (visited November 2018)

⁸⁴ FRMP 2016-2021, p.503-504, p.517, p.524. The most recent draft of the Strategy, which as of May 2018 had not been approved yet by the Government, is available at: <http://prilagodba-klimi.hr/dokumenti/>

⁸⁵ EU measure type M61: other: Analysis of climate change impacts on the concepts of protection from harmful water activities and flood risk management and amendment of a Programme of FRMP measures with measures of climate change adaptation.

⁸⁶ No type designation has been provided.

⁸⁷ M43: Preparedness, Public Awareness and Preparedness, Measure to establish or enhance the public awareness or preparedness for flood events.

participation in the implementation of the FRMP, especially due to effects of climate change, i.e. due to projected changes of water cycle patterns. Although measures no. 27, SM2 and 42 call for awareness of climate change, none of measures was designed to actually take into account the impacts of climate change⁸⁸.

The FRMP⁸⁹ also indicates that Hrvatske vode is in the process of submitting project proposals for EU structural funds which will address, among other things, the safety level of existing flood infrastructure works to take into account future floods challenges especially in light of climate change⁹⁰. The FRMP moreover refers to extreme weather events as the main reason to continue with construction and measures to improve flood infrastructure safety in the future⁹¹.

5.1 Good practices and areas for further development concerning climate change

The following **good practices** were identified:

- The FRMP presents potential impacts of climate change on flooding and its preparation considered the national climate change Adaptation Strategy (and Action Plan), which was under development at the time.
- The FRMP includes measures to study potential impacts of climate change and incorporate them, including in awareness-raising on floods.

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

- None of the FRMP measures were designed to take into account impacts of climate change.

⁸⁸ Croatia subsequently noted that, at the time the Plan was developed, there was no reliable regional model of climate change and no reliable results could be obtained based on available data. At the end of 2017, a project was completed within which a reliable regional model was developed, and there is an ongoing project that should interpret these results for purposes of water management, including flood risk management. Also, climate change is considered in the feasibility studies.

⁸⁹ FRMP 2016-2021, p.517.

⁹⁰ FRMP 2016-2021, p.517 (point II).

⁹¹ FRMP 2016-2021, p.524.

6. Cost-benefit analysis

Croatia's reporting sheets state that CBA was not used in the development of the FRMP. Furthermore, the reporting sheet and the Economic Analysis (a background study to RBMP/FRMP) specify that a CBA will be implemented for the next planning cycle (2022 to 2027). Until then, some CBA elements are going to be used at the level of projects undertaken under measures⁹².

6.1 Good practices and areas for further development

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

- Croatia did not carry out an analysis of costs and benefits for its FRMP measures.

⁹² Croatia subsequently clarified that, considering the manner in which flood defence is financed in Croatia, the cost-benefit analyses (CBA) means a detailed analysis of all costs of infrastructure development, operation and maintenance and costs of operational flood defence - and also of environmental and resource costs (ERC). As a step in this direction, the model NACER was developed, which is a methodology for the assessment of potential flood damages. Croatia further clarified that CBA is planned within the revision of the Multi-annual programme for the construction of regulation and protection water facilities and amelioration facilities (OG 117/15). Moreover, CBAs are carried out within feasibility studies.

7. Governance including administrative arrangements, public information and consultation

7.1 Competent authorities

Until 2017, the competent authority for the FRMP was the Ministry of Agriculture and the main implementing body, Hrvatske vode, was under the umbrella of this ministry. In 2017 Hrvatske vode was moved to go under the Ministry of Environment and Energy⁹³. However, as of May 2018, Croatia had not reported new information to WISE since 2014.

7.2 Public information and consultation

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

Table 10 *Methods used to inform the public and interested parties of the FRMP*

	Both UoMs
Media (papers, TV, radio)	✓
Internet	✓
Digital social networking	
Printed material ⁹⁴	
Direct mailing	✓
Invitations to stakeholders	✓
Local Authorities	✓
Meetings	✓

Source: FRMP

It should be noted that these information activities and all information on consultation and active involvement refer to the joint consultation of the RBMP and FRMP.

The table below shows how the actual **consultation** on RBMP/FRMP was carried out:

Table 11 *Methods used for the actual consultation*

	Both UoMs
Via Internet	✓
Digital social networking	
Direct invitation	✓

⁹³ Ministry of Environment and Energy was previously (until 2017) called Ministry of Environmental Protection and Nature.

⁹⁴ Croatia subsequently informed that the draft River Basin Management Plan was available for public inspection in printed form at the headquarters of all Water Management Departments of Hrvatske vode.

	Both UoMs
Exhibitions	
Workshops, seminars or conferences	✓
Telephone surveys	
Direct involvement in drafting FRMP ⁹⁵	
Postal written comments ⁹⁶	

Source: FRMP

According to information in the FRMP and the reporting sheets, public consultation was coordinated by the Ministry of Agriculture, Directorate of Water Management⁹⁷. According to the reporting sheets (as well as Croatia's reporting under the WFD), the consultation on the RBMP and FRMP lasted for six months, from April to October 2015.

The table below shows how the **documents** for the consultation were provided⁹⁸:

Table 12 *Methods used to provide the documents for the consultation*

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

Source: FRMP

Some complaints were made concerning the availability of documents. According to some stakeholders⁹⁹, not all background data and studies were publicly available during the public consultation process: they were made available only upon request and one needed to know exactly what to look for¹⁰⁰. Another contention is that the maps were presented in the

⁹⁵ Croatia subsequently informed that Hrvatske vode cooperated with several institutions during the development of the draft FRMP, for example to develop supporting studies (e.g. on seawater floods and modelling for assessment of potential flood damages) which were published on the website of Hrvatske vode at: <http://www.voda.hr/hr/registar-dokumentacije>

⁹⁶ Croatia subsequently informed this possibility was provided, as well as paper copies in competent authority offices.

⁹⁷ Since 2017 Directorate for Water Management has been moved from Ministry of Agriculture to Ministry of environment and Energy.

⁹⁸ Croatia subsequently noted that distribution of paper copies by any means was not considered as appropriate due to the large volume of the document.

⁹⁹ Croatia subsequently noted that distribution of paper copies by any means was not considered as appropriate due to the large volume of the document.

¹⁰⁰ Croatia subsequently clarified that in some cases, parts of the supporting studies were integrated into the document before the studies were fully completed. All supporting studies have been made publicly available at the link: <http://www.voda.hr/hr/registar-dokumentacije>.

documents in low definition, making it difficult to see the exact delineation of water bodies and their designated status (this includes flood risk maps), while electronic high resolution versions were not available at the time of consultation¹⁰¹.

7.3 Active involvement of Stakeholders

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

Table 13 *Groups of stakeholders*

	<i>Both UoMs</i>
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 ¹⁰²	
Fisheries / aquaculture	
Private business (Industry, Commerce, Services)	
NGOs including nature protection, social issues (e.g. children, housing)	✓
Consumer Groups	
Local / Regional authorities	✓
Academia / Research Institutions	✓
Meteorological Institute	✓
Climate Change Office	
Geological Institute ¹⁰³	✓
Agrarian Insurance Body	

Source: FRMP

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

¹⁰¹ Croatia subsequently clarified that it was not physically possible to show detailed maps within the printed document. The maps are available on the internet as WEB-GIS at: <http://korp.voda.hr/>. The data and overview maps in .pdf format can be obtained upon request from Hrvatske vode. The maps are also available as WMS services and published on NIPP Inspire.

¹⁰² Croatia subsequently informed that stakeholders from navigation/ports were included.

¹⁰³ Croatia informed subsequently that the Croatian Geological Survey, Faculty of Mining, Geology and Petroleum Engineering and Faculty of Geotechnical Engineering of the University of Zagreb were included in the development of the River Basin Management Plan 2016 – 2021 (which includes the FRMP) on the processing and development of all chapters related to groundwater.

Table 14 *Mechanisms used to ensure the active involvement of stakeholders*

	Both UoMs
Regular exhibitions	
Establishment of advisory groups	
Involvement in drafting ¹⁰⁴	✓
Workshops and technical meetings	✓
Formation of alliances	
Information days	

Source: FRMP

A set of meetings, referred to as round table consultations, took place for the RBMP and FRMP. The consultations were relevant for the preparation of the River Basin Management Plan and for the Flood Risk Management Plan. The FRMP does not, however, provide information regarding the nature of the consultation (for example whether it involved the public or focused on key stakeholders), how many participants were present, where it took place or when. Moreover, based on information in the reporting sheets, it appears that active involvement of stakeholders took place mainly during the consultation on the Strategic Environmental Assessment of the RBMP/FRMP and not during the six-month consultation period. However, some of the stakeholders' comments are included in the published report on consultations¹⁰⁵.

7.4 **Effects of consultation**

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

Table 15 *Effects of the consultation*

	Both UoMs
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	

¹⁰⁴ Croatia informed subsequently that Hrvatske vode cooperated with several institutions during the development of the draft FRMP for the development of supporting studies (marine floods, model for assessment of potential flood damages) that were published on the website of Hrvatske vode at the link: <http://www.voda.hr/hr/registar-dokumentacije>.

¹⁰⁵ Hrvatske vode web page has a link to the official report (unfortunately with no place and date or the participants' list(s) of the consultation): 'Report on the consultations with the interested public' (*Izvešće o savjetovanju sa zainteresiranom javnošću*), see: http://www.voda.hr/sites/default/files/izvjesce_o_provedenom_savjetovanju_sa_zainteresiranom_javnoscju_o_nacrtu_plana_upravljanja_vodnim_podrucjima_2016._-_2021.pdf

	Both UoMs
Comments and results of the consultation "were considered in the formulation of the plan"	

Source: FRMP

Hrvatske vode's web page has a link to the official report "Report on the consultations with the interested public" (covering the consultation of the SEA and RBMP/FRMP), although there is no date or information as to where the consultations were carried out¹⁰⁶. The majority of consultation suggestions (i.e. requests for changes to selection of measures, adjustment to specific measures, addition of new information, changes to the methodology used or commitment to further research, etc.) were fully or partially accepted, although there were a number of suggestions that were not accepted. According to the report, the dedicated round table consultation mentioned above resulted in additions and clarifications to the plan and some measures were adjusted to suggestions.

Since many of the comments received were very precise, it is not possible to summarise them here, but some comments (in particular from civil society and NGOs) criticised the absence of the openness of the process.

7.5 Strategic Environmental Assessment

A Strategic Environmental Assessment was carried out for Croatia's combined RBMP and FRMP.

The draft Strategic Environmental Impact Study and the draft RBMP and FRMP were open for public consultation for 30 days, (the legal minimum for SEA procedures according to Croatian law) in the period 21 January and 19 February 2016¹⁰⁷. In this period the documents were physically available at the Ministry of Agriculture and were available for download on the internet pages of Ministry of Agriculture and Hrvatske vode. A public presentation and roundtable discussion took place on 10 February 2016.

Cross-border consultations were held as part of the SEA: these were initiated in January 2016¹⁰⁸ with neighbouring Member States and countries. The FRMP indicates that written

¹⁰⁶ Ibid

¹⁰⁷ Notice on Public Consultation on Strategic Environmental Impact Study for the River Basin Management Plan for the period 2016-2021 and the Draft River Basin Management Plan for the period 2016-2021: http://www.voda.hr/sites/default/files/obavijest_o_javnoj_raspravi_za_nacrt_plana_upravljanja_vodnim_podrucjima_za_razdoblje_2016._-_2021.pdf

¹⁰⁸ Based on the Opinion of the Ministry of Environmental Protection and Nature, received on January 5, 2016.

comments were received from Bosnia and Herzegovina, Hungary, Italy and Montenegro, and a meeting held with Bosnia and Herzegovina¹⁰⁹.

7.6 Good practices and areas for further development regarding Governance

The following **good practices** were identified:

- Several methods of consultation were used – from written submissions (using various mediums) to a dedicated round table consultation.
- A report annexed to the RBMP/FRMP clearly presents how public consultations were taken into consideration.

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

- The FRMP provides relatively little detail on the steps for public consultation and on the active involvement of stakeholders. The FRMP and reporting sheets refer to active involvement that took place mainly during the consultation on the Strategic Environmental Assessment of the RBMP/FRMP and not during the six-month consultation period.

¹⁰⁹ FRMP 2016-2021 (p.486, p. 501, p.519).

Annex A: Supplementary tables and charts on measures

This Annex gives an overview of the data on measures provided by Croatia in the reporting sheets. These tables and charts were used for the preparation of section four 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 MS 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)¹¹⁰, not all fields are mandatory, and, as such, not all MS 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, MS assessors were asked to refer to the raw data when conducting the assessment, and this Annex does not reflect these observations.
- If a manageable number of answers are given, obvious categories are identified, and raw data sorted.

¹¹⁰ <http://icm.eionet.europa.eu/schemas/dir200760ec/resources>

- Measures missing information may be assigned categories based on other fields (for example, if the level of Responsibility Authority is missing, the information may be obvious from the field “name of Responsible Authority”).
- Measures where obvious categories cannot be defined based on other available information (as in the example above on the name of the Responsible Authority), are categorised as “no information”.

Types of measures used in reporting

The following table¹¹¹ 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

¹¹¹ Guidance for Reporting under the Floods Directive (2007/60/EC):
<https://circabc.europa.eu/w/browse/a3c92123-1013-47ff-b832-16e1caaafc9a>

List of Annex A tables & figures

Figure A1 - Number of total measures (individual and aggregate) by measure aspect	48
Figure A2 - Share of total measures (aggregated and individual) by measure aspect	48
Figure A3 - Visualisation of Table A3: Category of priority by measure aspect	50
Figure A4 - Visualisation of Table A4: Category of priority by UoM	51
Figure A5 - Visualisation of Table A5: Level of responsibility by measure aspect	52
Figure A6 - Visualisation of Table A6: Level of responsibility by UoM	53
Figure A7 - Visualisation of Table A7: Progress of implementation by measure aspect	54
Figure A8 - Visualisation of Table A8: Progress of implementation by UoM	55
Table A1 - Total number of measures	47
Table A2 – Total number of measures per measure type and UoM	47
Table A3 - Category of priority by measure aspect	50
Table A4 - Category of priority by UoM	50
Table A5 - Level of responsibility by measure aspect	52
Table A6 - Level of responsibility by UoM	52
Table A7 – Progress of implementation by measure aspect	54
Table A8– Progress of implementation by UoM	54

Measures overview

Table A1 - Total number of measures

Number of individual measures	0
Number of individual measures including measures which have been allocated to more than one measure type	0
Number of aggregated measures	107
Number of aggregated measures including measures which have been allocated to more than one measure type	107
Total number of measures	107
Total number of measures including measures which have been allocated to more than one measure type	107
Range of number of measures between UoMs including measures which have been allocated to more than one measure type (Min-Max)	53-54
Average number of measures across UoMs including measures which have been allocated to more than one measure type	54

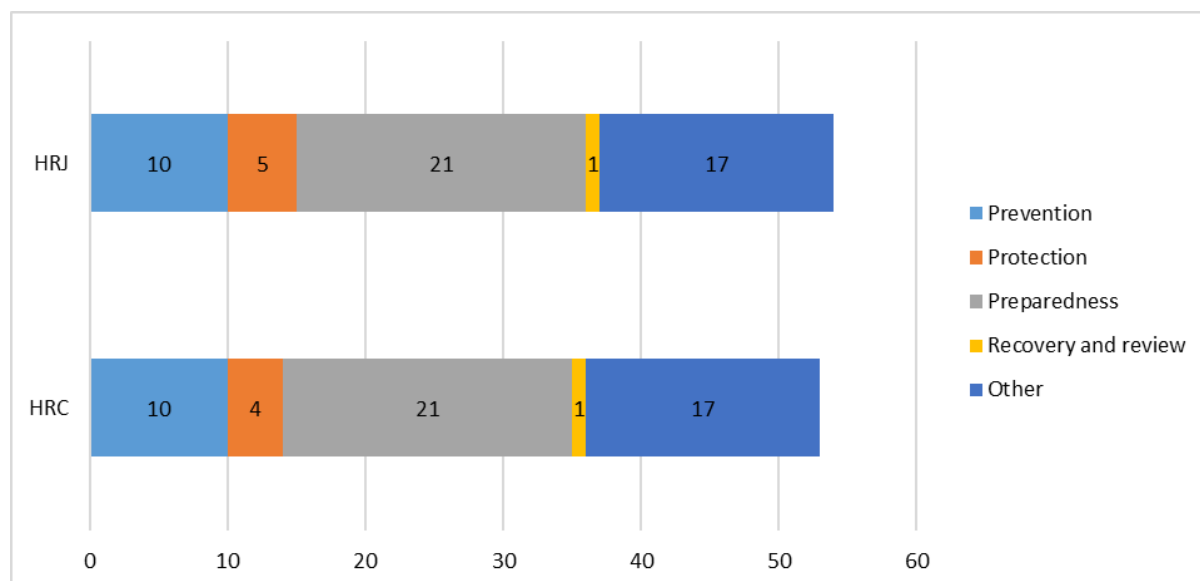
Table A2 – Total number of measures per measure type and UoM

	Prevention		Total	Protection			Total	Preparedness				Total	Recovery & review	Total	Other	Total	Grand Total
	M21	M24		M31	M32	M35		M41	M42	M43	M44		M53		M61		
HRC	3	7	10	1	1	2	4	5	2	7	7	21	1	1	17	17	53
HRJ	3	7	10	1	1	3	5	5	2	7	7	21	1	1	17	17	54
Grand Total	6	14	20	2	2	5	9	10	4	14	14	42	2	2	34	34	107
Average per UoM	3	7	10	1	1	2.5	4.5	5	2	7	7	21	1	1	17	17	54

Note: Croatia did not report individual measures, so only aggregated measures are represented in the table.

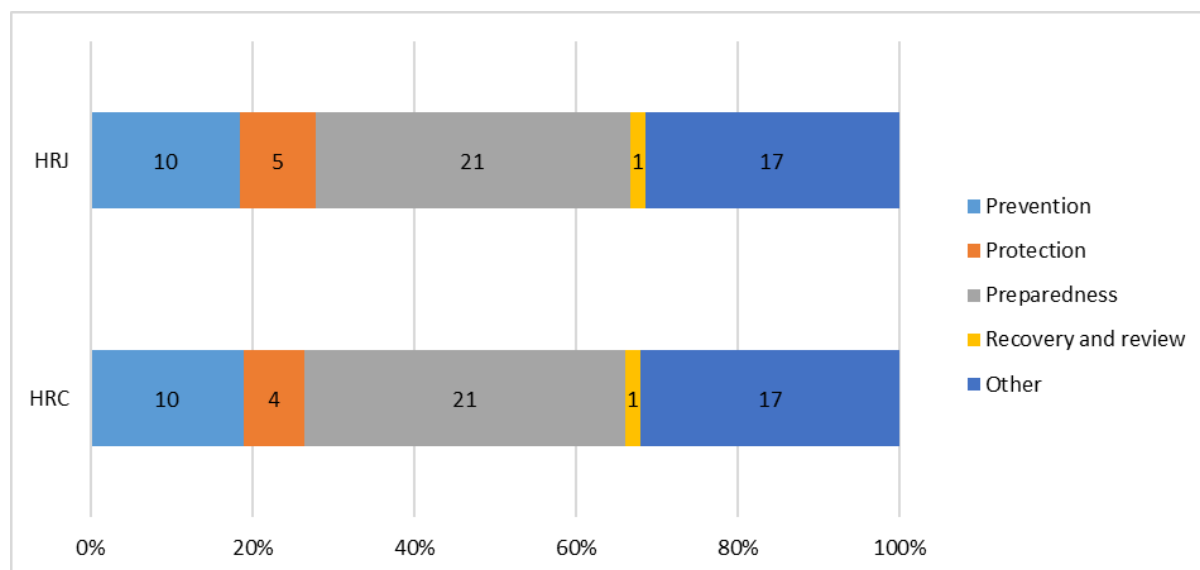
The information in Table A2 is visualised in Figures A1 and A2 below:

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



Note: All measures are aggregated as Croatia did not report any individual measures.

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



Note: All measures are aggregated as Croatia did not report any individual measures.

Measure details: cost

Member States were requested to report information on:

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

Croatia did not provide any information about the costs of 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

Croatia provided information about the location of all measures, the location is indicated as the respective UoM of each measure.

Geographic coverage

Croatia did not provide information about the geographic coverage of the effects of any 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

Croatia did not provide information about the objectives of the measures in the reporting sheets.

Category of priority

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

- Critical;
- Very high;

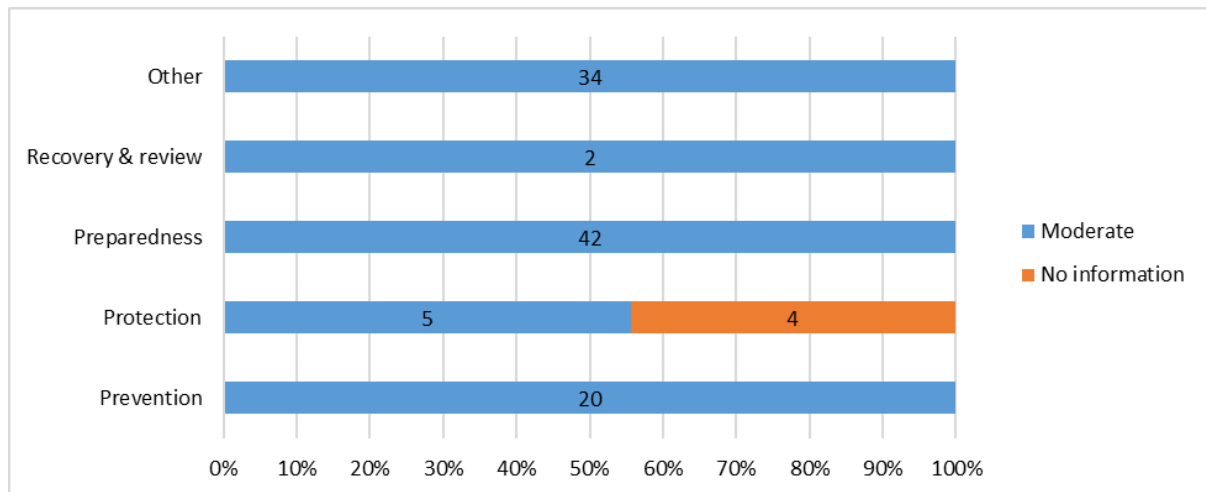
- High;
- Moderate;
- Low.

Table A3 - Category of priority by measure aspect

	Moderate	No information	Grand Total
Prevention	20		20
Protection	5	4	9
Preparedness	42		42
Recovery & review	2		2
Other	34		34
Grand Total	103	4	107

Note: Croatia did not classify any of the measures as critical, very high, high or low priority.

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



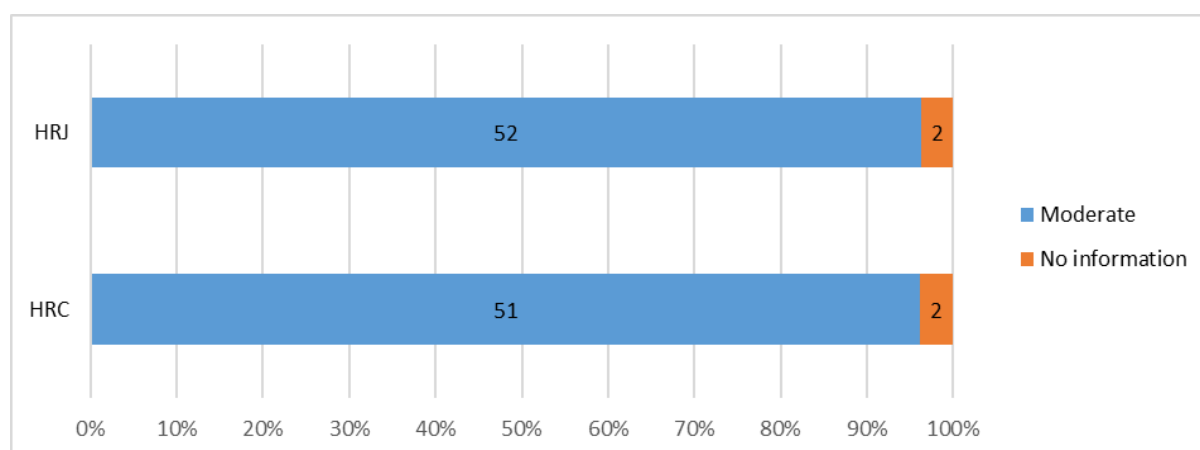
Note: Croatia did not classify any of the measures as critical, very high, high or low priority.

Table A4 - Category of priority by UoM

	Moderate	No information	Grand Total
HRC	51	2	53
HRJ	52	2	54
Grand Total	103	4	107
Average per UoM	51.5	2	53.5

Note: Croatia did not classify any of the measures as critical, very high, high or low priority.

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



Timetable

Croatia did not provide any information about the timetable of the measures in the reporting sheets.

Measure details: authorities

Member States were requested to report information on:

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

Croatia provided the names of responsible authorities for all measures. The majority of the measures fall in the responsibility of multiple authorities, often the Water Management Authority (WMA) in combination with other actors. Overall, the responsible authorities can be grouped in the following authorities:

- WMA: Water Management Authority in Croatia (Hrvatske vode);
- WMA & local authorities: WMA and the local authority units (‘JLS’);
- WMA & national agencies: WMA and various state-level agencies or institutions such as State Administration for Protection and Rescue, State Hydrometeorological Institute, Croatian Electricity Company and the Croatian Environmental and Nature Agencies (‘HOAP’);
- WMA & national ministries: WMA and various national ministries such as those responsible for water, nature, environment, spatial planning and culture;
- WMA & users;
- National ministries: for example, the ministries responsible for water and energy;
- Multiple: different combinations of the authorities listed above.

Croatia did not report the level of responsibility of the authorities responsible for the measures, but it provided their names for all the measures.

Table A5 - Level of responsibility by measure aspect

	WMA	WMA & local authorities	WMA & national agencies	WMA & national ministries	WMA & users	National ministries	Multiple	Grand Total
Prevention	20							20
Protection	7			2				9
Preparedness	14	4	12	2			10	42
Recovery & review	2							2
Other	4		2	14	2	4	8	34
Grand Total	47	4	14	18	2	4	18	107

Note: WMA refers to Hrvatske vode, the national water management authority. “Multiple authorities” are believed to refer to more than two authorities.

Figure A5 - Visualisation of Table A5: Level of responsibility by measure aspect

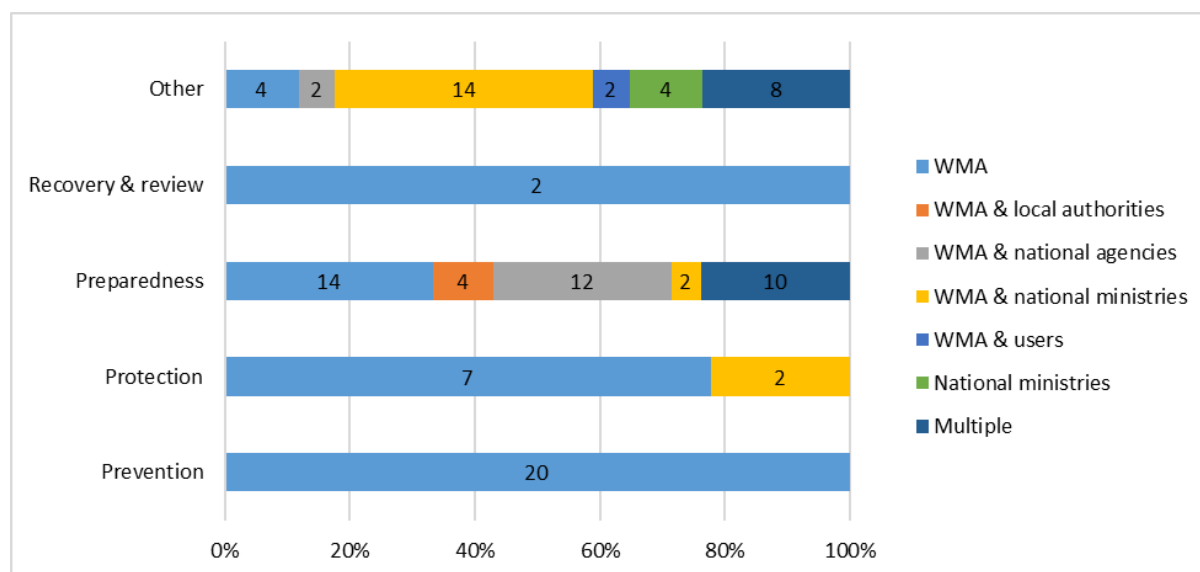
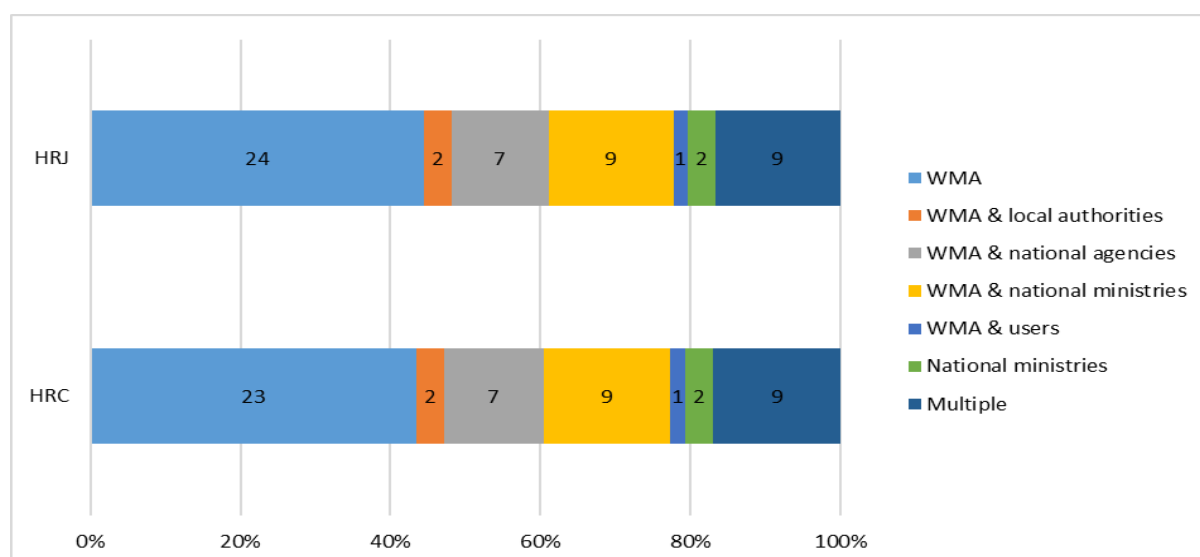


Table A6 - Level of responsibility by UoM

	WMA	WMA & local authorities	WMA & national agencies	WMA & national ministries	WMA & users	National ministries	Multiple	Grand Total
HRC	23	2	7	9	1	2	9	53
HRJ	24	2	7	9	1	2	9	54
Grand Total	47	4	14	18	2	4	18	107
Average per UoM	23.5	2	7	9	1	2	9	53.5

Figure A6 - Visualisation of Table A6: Level of responsibility by UoM



Measure details: progress

Member States were requested to report information on:

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

Croatia reported information about the progress of implementation of the measures. The Progress of implementation was reported as¹¹²:

- 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.

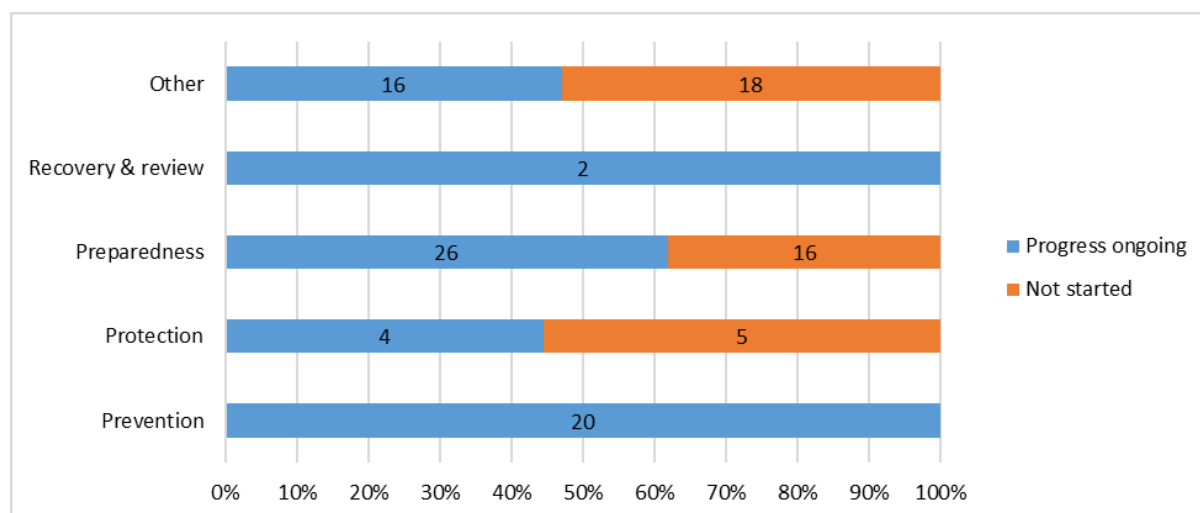
¹¹² Guidance for Reporting under the Floods Directive (2007/60/EC): <https://circabc.europa.eu/w/browse/a3c92123-1013-47ff-b832-16e1caaaf9a>

Table A7 – Progress of implementation by measure aspect

	Progress ongoing	Not started	Grand Total
Prevention	20		20
Protection	4	5	9
Preparedness	26	16	42
Recovery & review	2		2
Other	16	18	34
Grand Total	68	39	107

Note: Croatia did not report any measures as ‘completed’ or ‘ongoing construction’.

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



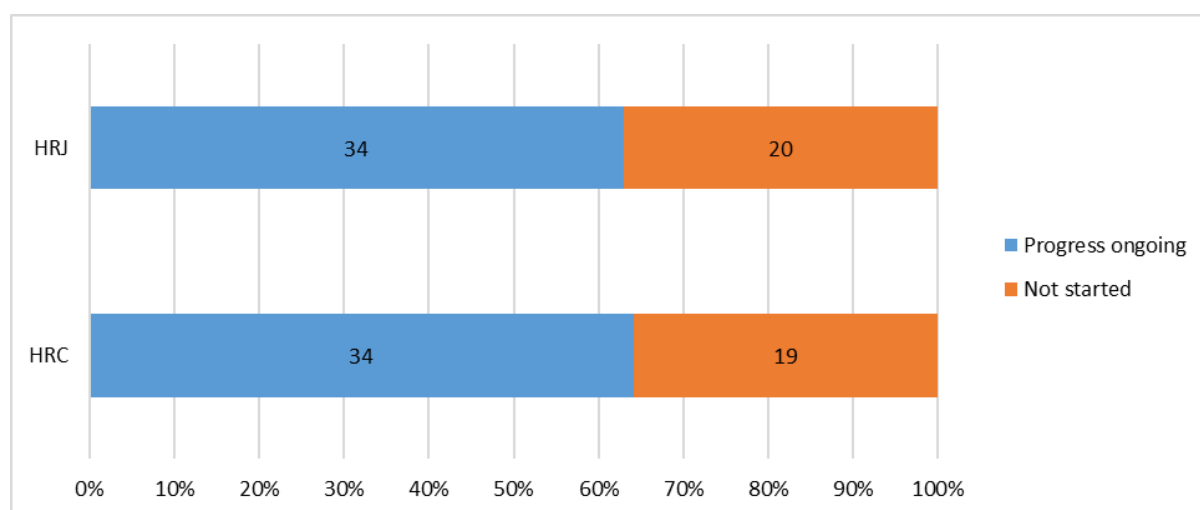
Note: Croatia did not report any measures as ‘completed’ or ‘ongoing construction’.

Table A8– Progress of implementation by UoM

	Progress ongoing	Not started	Grand Total
HRC	34	19	53
HRJ	34	20	54
Grand Total	68	39	107
Average per UoM	34	19.5	53.5

Note: Croatia did not report any measures as ‘completed’ or ‘ongoing construction’.

Figure A8 - Visualisation of Table 8: 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).

Croatia did not provide any information about other Community Acts associated with the measures in the reporting sheets.

Croatia did provide ‘other information’ for all of the measures. However, this was an open question and a large number of different answers were provided, making the aggregation of the information impractical.

Annex B: Definitions of measure types

Table B1 *Types of flood risk management measures*¹¹³

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

¹¹³ Guidance for Reporting under the Floods Directive (2007/60/EC):
<https://circabc.europa.eu/w/browse/a3c92123-1013-47ff-b832-16e1caaaf9a>

M44	Preparedness, Other preparedness, Other measure to establish or enhance preparedness for flood events to reduce adverse consequences
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	N06 Restoration and	U06 Filter Strips

Agriculture	Forest	Hydro Morphology	Urban
	forestry	reconnection of seasonal streams	
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