Guidance document on

the preparation of the Flood Risk Management Plans

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Introduction

Water management in the Republic of Croatia is regulated by the Water Act (Official Gazette - OG153/09 and the Act on Water Management Financing (OG 153/09). Both acts are harmonised with EU water related acquis and were adopted in 2009. According to the Water Act, Croatian Waters is obliged to undertake preliminary flood risk assessment, develop flood hazard maps and flood risk maps and to prepare flood risk management plans. The European Commission and Croatia initiated a Twinning project. A consortium of the Netherlands, Austria and France were selected by the European Commission and Croatia. Aim of this Twinning project is to contribute to the implementation of the Water Act through the preparation of flood hazard maps and flood risk maps. One of the results of the project is a series of documents related to the implementation of the Floods Directive by Croatia:

1. A guidance document on the technical aspects of the preparation of flood hazard maps and flood risk maps.
3. A guidance document on the integrated assessment of existing and planned civil engineering measures for flood protection.
5. A guidance document on the participation of the public and stakeholders in flood risk management.

The guidance documents are addressing the issues concerning the various steps and requirements for the implementation of the Floods Directive. These steps are illustrated by the following figure 1.

Figure 1. The steps under the Floods Directive

The steps are the Preliminary Flood Risk Assessment, the identification of the Area with Potential Significant Flood Risk (APSFR), the elaboration of the flood hazard maps and flood risk maps, and finally the preparation of the Flood Risk Management plan. As the flooding phenomena is strongly linked to the water quality aspects (chemical, biological) in a river basin, the link with the water framework directive (WFD) has to be established, which is also a requirement of the EU Floods Directive. The steps must also lead to reporting to the European Commission.
Process of reporting

The Floods Directive requires reporting on results after certain steps. Reporting is required once the Preliminary Flood Risk Assessment (PFRA)\(^1\) is ready, once the Flood Hazard Maps (FHM) and the Flood Risk Maps (FRM) are ready and after the preparation of the Flood Risk Management Plan is ready (FRMP). The various steps and reporting obligations are shown in the following flow diagram:

\[\text{Figure 1. Flow diagram of the various steps and reporting requirements under the Floods Directive}\]

In figure 1 the various steps and reporting requirements are visualised. The blocks in the left part of the figure give the data that are necessary and indicate where they might be available in Croatia. In the middle part of the figure, the steps to come from a Preliminary Flood Risk Assessment to a Flood

\[^1\] For a list of abbreviations, see Annex 1
Risk Management Plan are given with the relevant articles of the Floods Directive. In the right part of the figure are the various obligations regarding to Reporting to the European Commission are mentioned.

Based on readily available information or derivable information such as records and studies, a preliminary flood risk assessment (PFRA) shall be undertaken to provide an assessment of potential risks. In the legislative text of the Floods Directive the assessment shall include besides maps of the river basins, a description of floods which have occurred in the past and which had significant negative impacts on human health, the environment, cultural heritage and economic activities. It has to be likely that similar floods might occur in the future. An assessment of the potential adverse consequences of future floods for human health, the environment, cultural heritage and economic activity may be included in the PFRA depending on specific needs of Member States. Member States shall complete the preliminary flood risk assessment by 22 December 2011.

Based on this preliminary flood risk assessment, Member States shall for each river basin indicate those areas for which they conclude that potential significant flood risks exist or might be considered likely to occur. There is no reporting obligation.

For those areas where potential significant flood risk exist or is considered likely to occur, flood hazard maps and flood risk maps has to be produced. The flood hazard maps show the flood extent, the water depth and where relevant the flow velocities of events with a low, medium and high return period. The Floods Directive does not specify the return periods for each of the 3 events. Only for the medium probability a likely return period of ≥ 100 years is indicated. The risk maps are a quantification of the consequences of the floods used for the risk maps.

According to the requirements of the Floods Directive, the flood risk maps have to indicate the number of people potentially affected, kind of economic activity potentially affected by the installations referred to in the EU directive on integrated pollution protection and control which might cause accidental pollution while flooded and as potentially protected areas as mentioned in the Water Framework Directive. Flood hazard and flood risk maps have to be completed by 22 December 2013.

For the areas mentioned above, the Member States shall establish flood risk management plans. In this plans appropriate objectives for the reduction of flood risk are worked out. These objectives can focus on the reduction of the adverse consequences of flooding and/or reduce the likelihood of flooding. Non-structural measures can be considered if appropriate. Flood risk management plans shall address all aspects of flood risk management focusing on prevention, protection, preparedness, including flood forecasts and early warning systems.

Flood Risk Management Plans have to describe how the FRMP will be implemented

1. A description of the prioritisation and the way in which progress in implementing the plan will be monitored;
2. A summary of the public information and consultation measures/actions taken;
3. A list of competent authorities and, as appropriate, a description of the coordination process within any international river basin district and of the coordination process with Directive 2000/60/EC.
The Flood risks management plans have to be ready by 22 December 2015. For rivers that are shared with other countries, Member States shall ensure that exchange of information and international coordination between competent authorities take place.

The Member States are free to include other subjects. Annex 2 and Annex 3 contain respectively the table of content for the draft Flood Risk Management Plan of the river Dodder in Ireland and for the draft Flood Risk Management Plan of the Dutch part of the river Rhine.

How to proceed
Croatia is now an EU Member State. In the discussions with the European Union on the conditions, various exemptions were made, however not on the Floods Directive. This means that the draft Flood Risk Management Plans have to be ready at the latest on the 22nd December 2014, one year before the final Flood Risk Management Plans have to be ready. The reason is that the Water Framework Directive to which the Floods Directive is related prescribes a consultation period of 6 months. This means that the available time is limited. The project RTA made a proposal and a timetable for the steps to take (see Annex 4):

- The general management of Croatian Waters has to define the main task and set the desired deadline.
- The drafting of the Flood Risk Management Plan has to be structured as a project with a defined project leader, project plan, project members, time schedule etc.
- A Steering Committee has to be established with members from Croatian Waters and other competent authorities as well as other relevant stakeholders. Objective of the Steering Committee is to supervise the quality of the outputs, the time schedule, to take decisions on relevant issues, to guarantee the involvement of interested parties other than Croatian Waters.
- One of the outputs of component 4.6 is that Croatian Waters accepted the proposal to construct a prototype of the Flood Risk Management Plan for the Neretva delta. It is recommended to connect to and use this prototype for the production of the FRMP by CW.
- Croatia already made a Preliminary Flood Risk Assessment. Build on this product, using the steps, questions, examples and recommendations given in this guidance document.
- This guidance should be used for the first cycle of Flood Risk Management Plans only.
1. List of Competent Authorities

The Floods Directive asks its Member States to nominate competent authorities for the implementation of the Directive. For the purposes of this Directive Member States shall make use of the arrangements made under Article 3(1), (2), (3), (5) and (6) of Directive 2000/60/EC. Under the WFD the competent authorities for the different river basin districts should have been identified already.

Steps to be taken

Step 1  For the Directive 2000/60/EC the competent authorities should have been identified. Check whether this has been done in Croatia.

Step 2  The Floods Directive gives the Member States the opportunity to nominate different competent authorities than under the Directive 2000/60/EC. Croatia should see whether all the aspects: objective setting, measures related to protection, measures related to prevention, measures related to preparedness and crisis management can be done by the same competent authority as identified under the Directive 2000/60/EC or whether different competent authorities have to be identified.

Step 3  In case additional competent authorities are nominated, this must be reported to the European Commission within 3 months these changes come into effect.

Step 4  Make a list of the competent authorities and include it in the Flood Risk Management Plan.

Examples

For the implementation of the Floods Directive, a competent authority is an organisation, responsible for the whole process or responsible for one designated task. In Austria as well in France and the Netherlands a number of institutions at various levels are nominated as competent authorities for the implementation and execution of the Floods Directive.

Competent authorities in Austria:

Federal Ministry of Agriculture, Forestry, Environment and Water Management
The Ministry is the supreme water and forest legislation authority. It defines the framework for flood protection and related funding mechanisms. The torrents and upper catchments are managed by the Forest Engineering Service for Torrent and Avalanche Control in the ministry; all other catchments (apart from waterways) are managed by the Federal Water Engineering Administration.
Management covers Maintenance and Flood Protection.

The governors of the 9 provinces
The governors of the provinces are the representatives of the secondary national administration for water and forest legislation. They are the competent authorities for provincial legislation. At the same time, the provinces are part of the Federal Water Engineering Administration and conduct maintenance and flood protection on the provincial levels.
Federal Ministry of Transport, Innovation and Technology
The Ministry is the supreme waterways authority. Therefore it is responsible for the rivers Danube, March and Thaya. It manages maintenance and Flood Protection along these waterways.

Competent authorities in France:
Figure 2 gives an overview of the competent authorities in France.

![Figure 2 Overview of the competent authorities in France](image)

Figure 2 Overview of the competent authorities in France (see annex 5 for more details).

Competent authorities in the Netherlands:
Ministry of Infrastructure and Environment
The Ministry has responsibilities on various levels. The Ministry is responsible for the policy against flooding and defines the framework within which the other governmental organisations can execute their work against flooding.

The Ministry arranges for the drawing up and availability of technical guidelines for the design, management and maintenance of primary flood defence structures. These guidelines serve as recommendation for the water authorities. For the primary dikes, the protection levels are set in the Water Law.

An executive body of the Ministry (“Rijkswaterstaat”) is responsible for the inspection of the main primary dikes.

Ministry of Safety and Justice
The Ministry of Safety and Justice is responsible for the organisation of the crisis management.

Provinces
The provinces are responsible for the protection levels of the regional dikes with a secondary protection function.
Water boards

The water boards are responsible for the daily maintenance of most of the primary dikes and for all of the secondary dikes. The water boards have to check whether dikes meet the protection levels they are established for, either by the Ministry or by the provinces. In cases when dikes do not meet the required protection levels, the water boards are responsible for making of project plans for the improvement of the dikes and for the execution of these plans.

Municipalities

The municipalities are responsible for spatial plans. While adopting these plans they have to take into account various aspects of these plans on water bodies (quantity, quality, flooding) and vice versa.

The municipalities are responsible for crisis management at municipal level in case of an accident. In case the accident goes beyond the boundaries of the municipality, scaling up will take place. The Netherlands has been divided into 25 safety regions. In each region organisations and services related to disaster prevention, crisis management, fire brigades, health institutes and institutions related to public safety work together. In case of a disaster with more than local effects occur, the safety regions are responsible for the control of that disaster. The board of each safety region consist of the mayors of the cities within the safety regions. The mayor of the biggest city will be the chair.

As it can be seen from the examples of Austria, France and the Netherlands there are different competent authorities at different governmental levels. They are responsible for different parts of the water management. In Ireland, there is only one competent authority, the Office of Public Works.

Recommendations

The decision on who will be the competent authorities should be taken as soon as possible. As mentioned before, there is a strong relation with the Directive 2000/60/EC. River Basin Management Plans under the Directive 2000/60/EC and Flood Risk Management Plans under this Directive are subject of the integrated river basin management. Member States shall ensure that Flood Risk Management Plans are completed and published by 22 December 2015. For the Floods Directive, draft copies of the Flood Risk Management Plan(s) have to be finalised at least one year before the beginning of the period to which the plan(s) refer. This means that by 22 December 2014 the draft Flood Risk Management Plans for Croatia should be ready.
2. Coordination between Flood risk management plans and River basin management plans

According to the Floods Directive, development of river basin management plans under Directive 2000/60/EC and of flood risk management plans under this Directive are elements of integrated river basin management. The objectives for the two directives should be in line.

Steps to be taken

Step 1 In the River Basin Management Plan there is a catalogue of measures. Quantify the consequences that these measures will have on floods.

Step 2 In case there are measures that will have an negative effect on floods, reconsider them. Study the measures in an integrated way to see whether this problem can be solved (see as well Step 3).

Common themes for the FRMP and the RBMP are amongst others:

- Maintenance of natural dynamic water courses (protection/restoration of floodplain areas, restoration of meander of rivers, solid transportation, etc.) and the wetlands, including improvement of knowledge.
- River maintenance, avoiding the possible contradictions between the objective to reach good ecological status of surface water bodies and measures to reduce flood risks, for instance ecological restoration, vegetation maintenance or logs suppression to make the flow easier.
- Runoff and erosion control.

Specific themes for the FRMP, amongst others:

- Land management in order to reduce vulnerability of goods.
- Structural measures like dams or dikes.
- Public awareness, public information, consciousness of the flood risk.
- Preparedness and crisis management.
- Flood forecast, early warning.
- Diagnosis and knowledge of stakes and vulnerabilities.
- Hazard knowledge.

Step 3 See how synergy can be created between measures proposed by the two Directives.

In the Netherlands for projects of a certain extent, initiators are obliged to perform an Environmental Impact Assessment. This is the case for almost all measures proposed under the two Directives. An EIA obliges the initiators to take into consideration an integrated realisation of the measures.
**Step 4**  See whether and how the (public) consultation process should be made.

For the implementation of the WFD, intensive consultation rounds were held in the Netherlands. For the actualisation of the River Basin Management Plans in the upcoming years this will also be the case. For the Floods Directive, the Netherlands in principle propose only measures that have already been identified in existing laws, regulations, policy plans and management plans. For the realisation of these plans all the necessary procedures for public consultation, participation and consultation already were passed. No separate procedures for public consultation and participation were necessary.

In Austria, stakeholder consultations may be done during the drafting of the plan (until 09/2014) when the plan is at the federal states level. After 12/2014 a public consultation is done by the Ministry.

**Step 5.**  Organize the process of finalising the RBMPs and the FRMPs in such a way that public participation, official approval and reporting towards the EU runs parallel as much as possible.

### Example of the Netherlands, road towards official approval of the RBMPs and the FRMPs

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2011</strong></td>
<td></td>
</tr>
<tr>
<td>Thematic gatherings nationwide</td>
<td>Regional gatherings on the topic of flood maps (per province)</td>
</tr>
<tr>
<td>Large gatherings on sub-basin level</td>
<td>Individual contacts with water boards in order to collect data for flood maps</td>
</tr>
<tr>
<td></td>
<td>FRMP analysis on national basis; define gaps and weaknesses (on regional level)</td>
</tr>
<tr>
<td><strong>1&lt;sup&gt;st&lt;/sup&gt; half of 2012</strong></td>
<td>Prepare technical infrastructure for the development of flood maps</td>
</tr>
<tr>
<td><strong>2&lt;sup&gt;nd&lt;/sup&gt; half of 2012</strong></td>
<td>Develop the scope of applicability for the maps of relevant waters</td>
</tr>
<tr>
<td>Date</td>
<td>Activity</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>22 Dec 2012</td>
<td>Intensify talks on cross-border management issues</td>
</tr>
<tr>
<td></td>
<td>Prepare flood scenarios for waters in the applicable area</td>
</tr>
<tr>
<td></td>
<td>Write 1st draft of FRMPs (part B) on sub-basin level</td>
</tr>
<tr>
<td></td>
<td>Consultation of the Union of Water Boards and the Association of Provincial Authorities on 1st draft of FRMPs (part B)</td>
</tr>
<tr>
<td>1st half of 2013</td>
<td>Inform the EC on progress of measures</td>
</tr>
<tr>
<td></td>
<td>On national level: hold thematic gatherings and organise participation on remaining management issues</td>
</tr>
<tr>
<td></td>
<td>Regional processes – actualisation of the river basin analysis</td>
</tr>
<tr>
<td></td>
<td>Administrative official consultation on 1st draft of FRMPs (part B) in meetings of representatives of regional governments</td>
</tr>
<tr>
<td></td>
<td>Involve safety regions in setup of FRMPs</td>
</tr>
<tr>
<td></td>
<td>Consultation of Rijkswaterstaat services on 2nd draft of FRMPs (part B)</td>
</tr>
<tr>
<td></td>
<td>Make regional analyses based on FHMs and FRMs (with relevant authorities)</td>
</tr>
<tr>
<td></td>
<td>Fill in missing texts in draft FRMPs (part B)</td>
</tr>
<tr>
<td></td>
<td>Start of consultations on FHMs and FRMs (with relevant authorities)</td>
</tr>
</tbody>
</table>
### Open questions

- How can the relation between the WFD and the FD be organised at district and branch level (VGOs and VGIs).
- According to the Croatian Water Act, the FRMP will be included in RBMP; will the measures be merged or kept separated?
3. Conclusion of the Preliminary Flood Risk Assessment

During the preliminary flood risk assessment, for each river district or part of a river district an assessment was made of the potential risks. For this assessment use can be made of existing data and studies. The adverse consequences of these floods on human health, the environment, economic activities and cultural heritage have to be assessed. In case member states consider it relevant, the adverse consequences of future floods can be assessed as well. This preliminary flood risk assessment will identify those areas were potential significant flood risk exist or might be considered likely to occur.

**Steps to be taken**

**Step 1** In case this has not been done yet, produce the maps for those areas for which Croatia conclude that potential significant flood risks exist or might be considered likely to occur.

Austria did not produce maps with areas, but indicated the river stretches with a potential significant risk of flooding.

Figure 1 Areas with a potential significant flood risk (the red lines indicate the potential significant flood risk).
At the level of the sub basins maps with potential flood risk were produced. The map below shows the potential flood risk areas in the French part of the river Rhone, with indicated both inundations from the rivers and from the sea.

The Netherlands didn’t make new flood hazard maps and flood risk maps. From the existing information it was already clear for which areas potential flood risk existed or might be likely to occur.

**Recommendations**

The Floods Directive requires from the Member States to insert only the conclusions of the Preliminary Flood Risk Assessment into the Flood Risk Management Plan. Reporting is not necessary. In order not to lose information, it is also recommended to describe the steps made to produce the Preliminary Flood Risk Assessment, which are the considerations that underlie the assessment etc.
In Croatia, the preliminary flood risk assessment was done in a bottom-up approach. Each of the branch offices produced the maps, needed for the PFRA and these have been combined at the central level. The bottom-up approach has been very useful. However, the result is that the identified areas may differ considerably either because different criteria were used or because the areas differ considerably in nature. An area with the highest priority in area 1 may have a much lower priority when it is compared to the highest priority in another region. This means that the process to indicate the areas with potential flood risk has not been transparent and consistent:

- For the first Flood Risk Management Plan Croatia can use the PFRA maps that have been produced. For the second generation flood risk management plans, a transparent procedure to define the APSFRs can be developed and applied.

- Make a distinction in APSFRs relevant for the first cycle and APSFRs to be addressed in the medium and longer term. For those APSFRs were flood risk management plans are made in the first cycle, select only those measures that yield benefit under different scenarios (so called no-regret measures).
4. Conclusions of Flood Hazard Maps and Flood Risk Maps

Steps to be taken

Step 1  Make Flood Hazard Maps according to the following specifications.

Flood Hazard Maps shall cover the geographical areas which could be flooded according to the following scenarios:
(a) Floods with a low probability, or extreme event scenarios;
(b) Floods with a medium probability (likely return period ≥ 100 years);
(c) Floods with a high probability, where appropriate.
The following elements shall be shown:
(d) The flood extent;
(e) Water depths or water level, as appropriate;
(f) Where appropriate, the flow velocity or the relevant water flow.

The following figure illustrates an example of a Flood Hazard Map from Austria. (return periods in dark blue 30 years, in medium blue 100 years, in light blue 300 years)

2 In the Twinning project water depth and flow velocity were selected to be shown on the maps.
Step 2 Make Flood Risk Maps according to the following specifications.

Flood Risk Maps will be developed on the basis of the FHM for the same scenarios. These maps will show the potential adverse consequences associated with flood scenarios and will be expressed in the following terms:

(a) Indicative number of inhabitants potentially affected;
(b) Type of economic activity in the potentially affected area;
(c) Installations as referred to in Annex I to the Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control (1) which might cause accidental pollution in case of flooding and potentially affected protected areas identified in Annex IV(1)(i), (iii) and (v) to Directive 2000/60/EC.

The following figure illustrates an example of a Flood Risk Map of the same area as the Flood Hazard Map in the picture above.

Legend: pink (settlement), violet (industrial), orange (infrastructure), green (agricultural and forestry), light blue (water bodies), hatched area (natura2000 area), light blue hatched area (water protection area), vertical hatched (UNESCO), blue squares (infrastructures)
The following picture illustrates an example of a first draft Flood Risk Map from Croatia.

Pink (settlement), hatched (planned constructions), violet (economic use), orange (agriculture), green (forests and other green areas), blue (water areas), blue squares (infrastructures), green hatches (protected habitats or species), dark brown hatches (national parks), light brown hatches (water protected areas), red square (sewage water treatment), red circle (garbage waste location), square blue (bathing places), pink hatched square (UNESCO area), monument sign (important culture monument)

additional data: red square: ASFR, blue line: watercourses, grey square: topographic map

**Step 3** Concretise the risk receptors. The following risk receptors have been identified for the first cycle in Croatia. For the detailed content of the FRM it is necessary to detail these risk receptors:

<table>
<thead>
<tr>
<th>Risk element</th>
<th>Content and use</th>
<th>Possible data sources</th>
<th>Type of display on FRM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buildings</td>
<td>Cadastre data with building locations, heights, use</td>
<td>Geoportal</td>
<td>Population disaggregation needs, no direct display</td>
</tr>
<tr>
<td>Tourists</td>
<td>Number of tourists or number of max tourists per night per</td>
<td>Statistical offices</td>
<td>Number per administrative unit</td>
</tr>
<tr>
<td>Administrative Unit</td>
<td>(Point Information)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Airports</strong></td>
<td>International airports only</td>
<td>Geoportal and/or Ministry of Transport</td>
<td>Point information</td>
</tr>
<tr>
<td><strong>Harbours</strong></td>
<td>Find threshold (International harbours? Economic harbours? Size criterion (number of ships, size of ships?)</td>
<td>Geoportal and/or Ministry of Transport and/or Agency for Waterways</td>
<td>Point information</td>
</tr>
<tr>
<td><strong>Major railroad stations</strong></td>
<td>Find threshold! (same as in Geoportal?)</td>
<td>Geoportal and/or Ministry of Transport</td>
<td>Point information</td>
</tr>
<tr>
<td><strong>Major bus stations</strong></td>
<td>International and “overland” bus stations</td>
<td>Geoportal and/or Ministry of Transport</td>
<td>Point information</td>
</tr>
<tr>
<td><strong>Hospitals</strong></td>
<td>Only hospitals, no ambulances</td>
<td>Ministry of Health</td>
<td>Point information</td>
</tr>
<tr>
<td><strong>Schools</strong></td>
<td>All schools</td>
<td>Ministry of Education</td>
<td>Point information</td>
</tr>
<tr>
<td><strong>Kindergartens and homes for elderly people</strong></td>
<td>To be added by VGOs? Collect for GIS, no display on map for readability?!</td>
<td>Alma</td>
<td>Point information</td>
</tr>
<tr>
<td><strong>Prisons</strong></td>
<td>Police stations are excluded</td>
<td>Ministry of Internal Affairs</td>
<td>Point information</td>
</tr>
<tr>
<td><strong>Big animal farms and zoo</strong></td>
<td>Find threshold value! Cattle equivalent?!</td>
<td>Ministry of Agriculture</td>
<td>Point information</td>
</tr>
<tr>
<td><strong>Electrical substations</strong></td>
<td>Find threshold value! 35KW?</td>
<td>Croatia electricity company and spatial plans</td>
<td>Point information</td>
</tr>
<tr>
<td><strong>Police and fire brigade stations</strong></td>
<td>Professional fire brigades only, all police stations</td>
<td>Ministry of Interior and of Internal Affairs</td>
<td>Point information</td>
</tr>
<tr>
<td><strong>Industrial sites, waste and wastewater management facilities</strong></td>
<td>IPPC sites, E-PRTR sites, Seveso II sites, waste disposal sites, wastewater treatment plants</td>
<td>??</td>
<td>Point information</td>
</tr>
<tr>
<td><strong>Bathing waters</strong></td>
<td>Find threshold values!</td>
<td>??</td>
<td>Point information</td>
</tr>
<tr>
<td><strong>Water protection areas</strong></td>
<td>For human consumption, areas reported under the WFD</td>
<td>Available in CW?</td>
<td>Area information</td>
</tr>
<tr>
<td><strong>UNESCO cultural heritage</strong></td>
<td></td>
<td>Ministry of Cultural Affairs</td>
<td>Area information</td>
</tr>
</tbody>
</table>
Step 4  Draw conclusions of the Flood Hazard Maps and the Flood Risk Maps. It is Croatian Waters that will draw the conclusions. CW elaborates the FHM and FRM. CW also reports the conclusions that can be divided from those maps.

The conclusions and the decisions about the measures in the FRMP, which have to be defined to reduce the existing risks, should be a result of a joint expertise of all sectors which are concerned with floods and involved in the development of the FRMP.

From the FHM it is possible to get information about the extent of the flood, the water depth in the flood prone areas and the flow velocity. This data allows further assessment of the damage potential.

The FRMs show the land use in the areas which are prone to flooding. It is possible to get information about affected people as well. People affected are put into classes. In this Twinning project, only three classes of population affected are considered. Furthermore, the FRMs show the economic activity, the land use, cultural heritage and negative impacts of flooding on the environment, e.g. factories which might cause accidental pollution in case of flooding (IPPC sites) and potentially affected protected areas (e.g. Natura 2000). Similar to that, sensitive point information as hospitals, schools, kindergartens and houses for elderly, important infrastructure elements are also mapped. Information from the FRMs gives very useful input for FRMP, especially for choosing the measures to reduce the risks. Furthermore, in case of flooding, FHM and FRM are useful instruments for different sectors and they are the base for the Programme of Measures within the FRMP.

Many sectors can draw conclusions from the information gathered in the FHM and FRM.

Flood Hazard Maps and Flood Risk Maps can be used for other purposes, amongst others:

- basis for flood protection concepts
- prioritisation of flood protection measures
- planning criteria for activation of retention areas
- basis for legal proceedings
- regulations on handling of water pollution materials
- basis for responses to inquiries from citizens
- basis for defining areas for protection measures (e.g. retention basins)
- basis for land use planning and spatial planning
- basis for the assessment and the preparation of land for building
- basis for the management of building zones (e.g. living areas, industrial zones)
- basis for citizens to take self-protection measures
- basis for evacuation planning, contingency plans and emergency plans
- preparation for disaster management and flood defence
- basis for disaster control exercises
- information about risks and as input for raising awareness on flooding amongst the population
In the next example it is shown how information from the Flood risk maps can be used for spatial planning.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>D&lt;0.5m</th>
<th>0.5&lt;D&lt;1m</th>
<th>1&lt;D&lt;2m</th>
<th>2m&lt;D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low probability</td>
<td>L</td>
<td>M</td>
<td>M+</td>
<td>S</td>
</tr>
<tr>
<td>Medium probability</td>
<td>M</td>
<td>M+</td>
<td>S</td>
<td>S+</td>
</tr>
<tr>
<td>High probability</td>
<td>M+</td>
<td>S</td>
<td>S+</td>
<td>VS</td>
</tr>
</tbody>
</table>

FHM could help to prioritize areas from a low (L) to a very strong (VS) level. There are also medium (M) and strong (S) levels.

According to the level, it is possible to list possible measures e.g.:

- VS: expropriations
- S+: relocations
- S: measures concerning the existing building like identifying safe areas
- M-M+: reduction of vulnerabilities for goods
- L: recommendations

Areas concerned by medium probability: land-use control

**Step 5:** Define which kinds of floods are considered and which additional data is needed. The flood hazard maps at the moment consider only flooding from rivers. The origin of floods can be very different, e.g. flooding from the sea, flash floods, ground water flooding. Consider whether flooding from the sea might create serious risks and if so, check whether collected data are sufficient. The same holds for areas where flash floods or floods from ground water occur in a more than accidental way.

**Open questions**

- According to Article 10 of the FD and in accordance with applicable community legislation, Member States shall make available to the public the Preliminary Flood Risk Assessment, the Flood Hazard Maps, the Flood Risk Maps and the Flood Risk Management Plans. Croatia has to decide in which form the information for the public will be done.
- Croatia has to decide which other maps have to be drawn from Flood Hazard Maps and Flood Risk Maps. These can be maps that are not meant for the public, but for specific user groups.
like rescue services.

**Recommendations**

- The Floods Directive requires from the Member States to insert the conclusions of the Flood Hazard Maps and Flood Risk Maps into the Flood Risk Management Plan. In order not to lose information, it is recommended to make a description of the steps that were made to produce Flood Hazard Maps and Flood Risk Maps, the considerations that underlie the assessment etc. This information will be only of use by Croatian waters and doesn't have to be reported to Brussels.

- For the first cycle of Flood Risk Management Plans Croatia only considered floods from rivers. There are also other sources of flooding: sea, ground water, flash floods. In the second and third Flood Risk Management Plans these sources have to be considered as well. A decision on which sources for flooding are relevant, taken into account hazard and risk has to be taken as soon as possible. Once a decision has been taken, Croatian Waters together with relevant stakeholders have to control/ascertain whether the existing data are sufficient to draw conclusions or not. During the first period/cycle, the collection of relevant data should start.
5. Other useful information sources for Flood Risk Management Plans

The FHMs and FRMs give important information for the selection of measurements.

**Step 1** Check whether there is information available in other sectors that deal with floods, e.g.:
- civil protection
- spatial planning
- hydrological services
- communities
- other governmental organisations.

**Step 2** If it was not done already during the preparation of the Preliminary Flood Risk Assessments, it is also useful to consider historical information sources such as old maps or documentations about historical floods.

**Step 3** For a better prioritisation of the measures, an economical cost – benefit analysis can be executed.

**Step 4** Concerning Article 10 of the FD, the Member States shall encourage active involvement of interested parties in the production, reviewing and updating of the Flood Risk Management Plans. The knowledge of the local situation and experiences of the people in situ is often very helpful for the selection of measures. For more information see Chapter 8 as well.

**Step 5** Especially when international river basins are concerned, information from institutions and governmental organisations from neighbouring countries should be used. For more information see Chapter 9 as well.

**Recommendations**

The involvement of the personnel from the regional offices (VGOs) and from the regional branches (VGIs) during the preparation of various Flood Risk Management Plans can ensure that the implementation of the Flood Risk Management Plan will be done not only at central level, but at the lower levels as well.
6. Description of the appropriate objectives

Steps to be taken

**Step 1:** Validation of key objectives (the “National Croatian strategy”)

“According to Article 7(2) of the Directive 2007/60/EC, Member States shall establish appropriate objectives for the management of flood risks for the areas with potential significant flood risk as identified under Article 5(1) and the areas covered by Article 13(1)(b)”.

<table>
<thead>
<tr>
<th>Appropriate objectives identified in Austria:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Avoidance of new risks before a flood event</td>
</tr>
<tr>
<td>2. Reduction of existing risks before a flood event</td>
</tr>
<tr>
<td>3. Raising awareness for risks and hazards</td>
</tr>
<tr>
<td>4. Reduction of existing risks during/after a flood event (resilience strengthening)</td>
</tr>
</tbody>
</table>

**The French National Strategy for Flood Risk Management:**

3 Main objectives based on the appropriation of flood risk by all the actors:

- Increase the security of exposed population
- Stabilise in the short term and decrease on the long term the cost of damage linked to floods
- Decrease sharply the delay to get back to normal state in territories affected by a flood event

4 Challenges:

- Develop the Governance and the sustainable project ownership (contracting authority) in order to implement all axes of the flood risk management
- Better knowledge for better action
- Manage the territories sustainably and in long term
- Learn to live with the risk

5 Implementation principles:

- Efficient and assumed sharing of responsibilities, based on subsidiarity
- Maintaining of the nation-wide solidarity in regard to the flood risks
- Synergy with the other policies
- Proportionality: prioritised programming based on the analysis of socio-economic and environmental benefits
- Evaluation and continuous improvement of the national and territorial policy for flood risk management
The Dutch Water Law defines the objective(s) of flood risk management as follows: ‘...prevention and where necessary a reduction of floods, ... in combination with protection and improvement of the chemical and ecological quality of water systems and the realization of the social functions of these water systems...’.

The following appropriate objectives for the management of flood risks were elaborated in the group work during the Twinning Project:

- Level of acceptability of flood risk (population, economy, industry, stakeholders, agriculture, environmental aspects, etc.)
- Harmonisation between different sectors and institutes (e.g. spatial planning and FRM)
- Harmonisation between RBMP and FRMP
- Minimising the risk in sustainable way
- Raising public awareness
- Completion of flood defence systems
- Reduction of existing flood risks
- Improvement of flood defence management

The appropriate objectives for the management of flood risks should cover – in a generally accepted and correct form – all measures of the FRMP. Nevertheless, it is recommended to underline and concentrate the effort of the plan on only few appropriate key objectives that will constitute the top priority for the planning cycle period. To build a consensus on the priorities which have been pre-identified by the workshop participants, there is still a need for an intensive consultation for acceptance of these national key objectives for the FRMP.

The following possible key objectives for Croatia have been identified as working group results:

- Optimising the risk reduction (according to the sector, local situation, geographical situation)
- Coordinated involvement and cooperation between different sectors and institutions dealing with FRM - directly and indirectly (e.g. Civil protection, Forestry, Land use planning, RBMP)
- Minimising the risk in a sustainable way
- Raising public awareness for FRM
- Optimising crisis management during floods

These key objectives can be regarded as the possible national Croatian strategy (objectives), and have to be validated.

**Step 2:** Decide what will be the appropriate level of the objectives.

Several scenarios are possible:
- Objectives only at the national level, like in Austria
- A National Croatian strategy, and appropriate objectives for the river basin districts
- A National Croatian strategy, objectives for the district and objectives for the APSFR, like in France

**Step 3** Depending of the decision taken under **Step 2**, define objectives for the two river basin districts, the Adriatic Sea and the Danube.

Defining of objectives for the two river basin districts, the Adriatic Sea and the Danube, needs to be taken into account:

- conclusions of the PFRA,
- local diagnosis and characteristics (what kind of floods, what kind of stakes e.g.?) in the different APSFR.

**Step 4** Depending of the decision taken under **Step 2**, define objectives for the APSFR. Some objectives can be the same for all APSFR like objectives concerning public awareness, but other objectives are specific for some APSFR: for example, objectives concerning crisis management (counties have their own policies). Prioritising a list of measures can be useful to define appropriate objectives for the APSFR. These objectives take into account stakeholders’ expectations.

**Step 5** Depending of the decision taken under Step 2, define objectives for the districts. If some objectives have been specified at the APSFR level, they can be applied at the district level.

Examples of objectives for an APSFR:

O1: limiting the exposure increase in flood areas
O2: reducing economic vulnerability
O3: improving population security
O4: assessing and managing dangerous industrial establishments
O5: taking into account flood risks in all public policies
O6: developing governance for different scales

...  
O: preparing a major disaster
O: improving risk management for mountain torrents
O: reducing vulnerability of farming activities

**Open questions:**

- Who has to define river basin district objectives?
- Who has to define APSFR objectives?
- (Leader and stakeholders for each level?)
**Recommendations**

The best should be to translate the national objectives into the river basin district objectives, and then into the APSFR objectives including the local specificities, particularly those brought by the local stakeholders; then it is possible to adapt district objectives according to the local proposals.
7. Summary of measures and their prioritisation

Steps needed to obtain a summary of measures and their prioritisation

Until today, measures and prioritisation are not defined in Croatia. In order to reach this result, the following steps are seen as essential:

**Step 1** Decide whether a fixed list of measures or a free summary of measures (without format) shall be applied in Croatia:
   a) In case of a fixed list of measures: decide upon the list and upon other necessary information for proper description
   b) In case of a free summary of measures: decide upon criteria for the summary (if needed)

**Step 2** Decide upon the process for choosing the measures:
   a) Which stakeholders (other administration) to involve
   b) Which levels (national, regional, municipality)
   c) Which way: combined top-down and bottom-up or only top-down or only bottom up?

**Step 3** Decide upon a prioritisation method for Croatia.

**Step 4** Decide upon the process for prioritising the measures if there is no automatised fixed/defined method for prioritisation:
   a) Which stakeholders (other administration) to involve
   b) Which way: top-down, bottom-up, only top, only bottom, other?
   c) Who overrules whom in case of disputes?

Even though there is a separate guideline on Measures, some ideas and examples shall also be given here, as first food for thought, hoping that this will help to frame the Croatian expectations and wishes until the relevant mission on the guideline on measures.

**Examples**

In the following examples, different parts of the steps will be worked out. For each example it will be indicated for which step it can be used.

**Example for a possible list of measures (Step 1a)**

In Mission 8, the following list of main pillars of measures together with the institutional involvement was proposed.

<table>
<thead>
<tr>
<th>Pillar</th>
<th>Sub pillar</th>
<th>Institutional involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
An example list for possible measures (based on the Austrian catalogue), and a first proposal for a possible allocation to the main pillars listed below. Annex 6 gives a summary of the proposed measures for flood protection in the Netherlands, based on the principles of protection, prevention, preparedness (and recovery). Annex 7 gives an example of measures to limit the consequences of floods in France and the way France will report to the European Commission):

<table>
<thead>
<tr>
<th>Pillar</th>
<th>Sub pillar</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.2</td>
<td>Elaborate and update hazard zone plans</td>
</tr>
<tr>
<td>2</td>
<td>2.1</td>
<td>Re-establish, maintain and expand floodplains and retention areas</td>
</tr>
<tr>
<td>2</td>
<td>2.2</td>
<td>Plan and build protection and water regulation facilities</td>
</tr>
<tr>
<td>2</td>
<td>2.3</td>
<td>Effectively manage retention areas in the catchment basin</td>
</tr>
<tr>
<td>2</td>
<td>2.4</td>
<td>Implement and adapt protection measures for individual objects</td>
</tr>
<tr>
<td>2</td>
<td>2.4</td>
<td>Check and apply re-settlements and re-classification of areas</td>
</tr>
<tr>
<td>2</td>
<td>2.4</td>
<td>Perform and improve water monitoring</td>
</tr>
</tbody>
</table>
### 2.4 Carry out emergency measures and repair of waters and flood protection facilities immediately after the flood event

### 2.4 Assess and eliminate flood damage to buildings and infrastructure

### 2.4 Carry out a documentation of the flood event and its damage as well as analyse the flood event

### 3.1 Prepare information on flood hazards and flood risks and suitably provide it to the public

### 3.1 Promote public participation activities regarding flood hazards and flood risks

### 3.1 Establish educational activities regarding flood hazards and flood risks

### 3.2 Take into account hazard zone plans

### 3.3 Create catchment-wide concepts and plans to improve the water cycle

### 3.3 Elaborate and take into account local and supra-local plans for land use/spatial planning

### 3.3 Create a framework for the implementation and maintenance of protective measures

### 3.3 Maintain, operate and improve flood protection facilities and perform water management and monitoring activities

### 3.3 Elaborate operating rules for facilities in flood risk or flood affected areas

### 3.4 Establish and operate monitoring systems, warning systems and early forecasting systems/models

### 3.5 Elaborate flood emergency plans

### 3.5 Set up requirements for the application/implementation of flood emergency plans

The list above shows that some pillars might be underrepresented and others might be overrepresented in order to fit the Croatian needs. The workshop held during the Twinning project resulted in the following list of non-structural measures which could be attributed as examples to the list above, or might be considered to be added (or already contained) in the list above.

<table>
<thead>
<tr>
<th>PUBLIC AWARENESS</th>
<th>PREVENTION THROUGH LAND USE MANAGEMENT</th>
<th>FLOOD FORECASTING</th>
<th>CRISIS MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW web</td>
<td>Retention areas</td>
<td>Hydrological data</td>
<td>Civil protection services</td>
</tr>
<tr>
<td>Website (for information purposes)</td>
<td>Hazard zoning</td>
<td>Historical data</td>
<td>Develop procedures between governmental organisation at national level and between neighbouring countries at international level and → who does what, who is responsible</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>--------------</td>
<td>----------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Developing the website (thematic on flood risk)</td>
<td>Data exchange with spatial planning</td>
<td>Data &amp; predictions from meteorological services</td>
<td>National plan for flood defence/crisis management in place &amp; need to be improved (involvement of military &amp; other actors)</td>
</tr>
<tr>
<td>General rules for public “what to do in the case of floods”</td>
<td>Informing population when buying a house in flood risk areas</td>
<td>News services</td>
<td>Improving and developing coordination between bodies working on crisis management</td>
</tr>
<tr>
<td>Information to the public via press releases &amp; TV spots by National Protection and Rescue Directorate</td>
<td>Preferring agricultural industry in flood risk zones</td>
<td>Alarm systems</td>
<td>Alarm plans</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Intervention plans</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Rescue plans</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Evacuation plans</td>
</tr>
<tr>
<td>Leaflet for school children / about flood Camping / tourists</td>
<td>Construction permits issued only in “not-red” zones (spatial planning/land use planning)</td>
<td>Data collection on flood vulnerability → to make better flood risk maps</td>
<td>(Different) evacuation plans</td>
</tr>
<tr>
<td>Folder to inform the sector(s): Farmers Recreation (tourists) Citizens Industry</td>
<td>Protection of natural wetlands</td>
<td>Forecast models + early warning</td>
<td>Military support</td>
</tr>
<tr>
<td>Campaign on public awareness – public information before flood (“what can To plan + to preserve → retention areas</td>
<td>Develop models for flood forecasting / public friendly (not technical)</td>
<td>Emergency (crisis) funding</td>
<td></td>
</tr>
<tr>
<td>Guidance Document on the Preparation of the Flood Risk Management Plans</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area</th>
<th>Task Description</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forecasting and information to citizens via CW website</td>
<td>Common language for LP and WM</td>
<td>Information on time</td>
</tr>
<tr>
<td>Developing sensitive TV movies about floods</td>
<td>Focus on advantages with land use planning</td>
<td>Forecasting and warning system to be improved and further developed</td>
</tr>
<tr>
<td>Newspaper / regular base</td>
<td>Review of land use plans → more information for land use planning about hazard + risk maps</td>
<td>Improved cooperation with upstream countries in terms of forecasting</td>
</tr>
<tr>
<td>Building standards for flood prone areas</td>
<td>Transboundary alert communication system (upstream countries)</td>
<td></td>
</tr>
<tr>
<td>Building permit delivering / improving the process of issuing of building permits concerning the information on floods</td>
<td>Work together → international exchange of meteorological data</td>
<td></td>
</tr>
<tr>
<td>Condition for construction / improvement and knowledge / exchange between land planning and WM</td>
<td>Forecasting needs to be improved on all levels (Meteorological and Hydrological Service &amp; National Protection and Rescue Directorate)</td>
<td></td>
</tr>
<tr>
<td>Governance regulations / rules Harmonisation of plans / discussion RMBP/FRMP ↔ land planning</td>
<td>Improvement of data exchange between institutions</td>
<td></td>
</tr>
<tr>
<td>Land use planning / prepare: General description (ref. Ordinance on measures for</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

March 2014
Proposal for the process how to define the Croatian list of measures (step 1a)

A further elaboration, e.g. in the form of a workshop with Croatian Waters and other stakeholders, might be helpful in order to give a better picture of a comprehensive list of measures needed in Croatia. Finding measures fitting each pillar/sub pillar might be a good starting point for the additional measures required. Possible stakeholders to be invited for finding a full catalogue of measures could be:

- Legal department, responsible for the Water Act policies from the Ministry of Agriculture
- Other legal departments, responsible for crisis management, spatial planning from other Ministries (if improvement of legal Acts shall be discussed)
- Surface water management institutions on national level (inland waters, sea waters, Flood Management, maintenance, ...)
- Crisis management institutions on national level
- Hydrology management institutions on national level
- Selected representatives from county levels regarding water management and planning, crisis management, spatial planning (depending on the competences of the county level)
- Selected representatives from one or two VGOs and VGIs

The final list of measures should fit the following aspects of flood risk management, as communicated for the reporting of the FRMP to the EC:

<table>
<thead>
<tr>
<th>Aspects of flood risk management</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Action</td>
<td>No measure is proposed to reduce the flood risk in the APSFR.</td>
</tr>
<tr>
<td>Prevention</td>
<td>Preventing damage caused by floods by avoiding construction of houses and industries in present and future flood-prone areas; by adapting existing receptors and future developments to the risk of flooding; and by promoting appropriate land-use.</td>
</tr>
<tr>
<td>Protection</td>
<td>Taking measures, both structural and non-structural, to reduce the likelihood of floods in a specific location.</td>
</tr>
<tr>
<td>Preparedness</td>
<td>Informing the population about flood risks and what to do in the event of a</td>
</tr>
</tbody>
</table>
In a more elaborated manner, the measures to be reported to the EC look as given below:

<table>
<thead>
<tr>
<th>Aspects of flood risk management</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Action</td>
<td>No Action</td>
<td>No measure is proposed to reduce the flood risk in the APSFR or other defined areas</td>
</tr>
<tr>
<td>Prevention</td>
<td>Avoidance</td>
<td>Measure(s) to prevent the location of new or additional receptors in flood prone areas, such as land use planning policies or regulations</td>
</tr>
<tr>
<td></td>
<td>Removal or relocation</td>
<td>Measure(s) to remove receptors from flood prone areas, or to relocate receptors to areas of lower probability of flooding and/or of lower hazard</td>
</tr>
<tr>
<td></td>
<td>Reduction</td>
<td>Measure(s) to adapt receptors to reduce the adverse consequences in the event of a flood, actions to be taken on buildings, public networks, etc...</td>
</tr>
<tr>
<td></td>
<td>Other prevention</td>
<td>Other measure(s) to enhance flood risk prevention (may include flood risk modelling and assessment, etc...)</td>
</tr>
</tbody>
</table>

**Protection**

<table>
<thead>
<tr>
<th>Natural flood management/runoff and catchment management</th>
<th>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 reforestation of banks that restore natural systems to help slow down the flow and store water.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water flow regulation</td>
<td>Measures involving physical interventions to regulate flows, such as construction, modification or removal of water retaining structures (e.g. dams or other on-line storage areas or development of existing flow regulation rules) which have a significant impact on the</td>
</tr>
<tr>
<td>Category</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Channel, Coastal and Floodplain Works</td>
<td>Measures involving physical interventions in freshwater channels, estuaries, coastal waters and flood-prone areas of land, such as the construction, modification or removal of structures or the alteration of channels.</td>
</tr>
<tr>
<td>Surface Water Management</td>
<td>Measures involving physical interventions to reduce surface water flooding, typically in an urban environment, such as enhancing artificial drainage capacities or though sustainable urban drainage systems (SUDS).</td>
</tr>
<tr>
<td>Other Protection</td>
<td>Other measure(s) to enhance protection against flooding, which may include flood defence asset maintenance programmes or policies</td>
</tr>
<tr>
<td>Preparedness</td>
<td></td>
</tr>
<tr>
<td>Flood Forecasting and Warning</td>
<td>Measure(s) to establish or enhance flood forecasting or warning systems</td>
</tr>
<tr>
<td>Emergency Event Response Planning</td>
<td>Measure(s) to establish or enhance flood event institutional emergency response planning</td>
</tr>
<tr>
<td>Public Awareness and Preparedness</td>
<td>Measure(s) to establish or enhance public awareness or preparedness for flood events</td>
</tr>
<tr>
<td>Other preparedness</td>
<td>Other measures to establish or enhance preparedness for flood events to reduce adverse consequences</td>
</tr>
<tr>
<td>Recovery and Review</td>
<td></td>
</tr>
<tr>
<td>Individual and societal recovery</td>
<td>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</td>
</tr>
<tr>
<td>Environmental recovery</td>
<td>Clean-up and restoration activities (with several sub-topics as mould protection, well-water safety and securing hazardous materials containers) Other</td>
</tr>
<tr>
<td>Other recovery and review</td>
<td>Lessons learnt from flood events Insurance policies</td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>
Examples of further (helpful) attributes to add to the list of measures (step 1a)

If the catalogue of measures will be applied by different persons, maybe from different fields of expertise, a better description of each measure might be helpful in order to achieve a common understanding of each measure. Therefore, the following characteristics might be elaborated for each measure:

- a general description of the measure
- a list of practical examples
- related legislation
- specialist fields involved
- process for implementation of the measure

It might be helpful if each measure refers to only one specialist field involved. For a better picture, one measure shall be elaborated here:

Measure: Create flood hazard plans

Description: Areas potentially endangered by flooding are investigated regarding flood risk. Hazard scenarios are chosen and hydrologic/hydraulic simulations are performed. Areas endangered by flood risk, areas suitable for retention, areas affected by residual risk and areas for future protection measures are illustrated.

Examples: Hydraulic simulations, incl. solid matter transport, Simulations of residual risk and/or extended risk scenarios

Related legislation: Water Act

Specialist fields involved: Croatian Waters

Process for implementation: (not known for Croatia)

Proposal for a process on how to fill in other useful attributes to the list of measures (step 1a)

Regarding the process of filling-in the attributes of the measure, the following proposal shall be given for improving the quality and the filling-in criteria for the attributes:

- a first draft of all characteristics shall be done in the workshop proposed above
- provide the list of measures to the national legislative authority/ies in order to:
  - fill in the references to the related legislations and check if there is more than one legislation involved
  - fill in the process of implementation of the measure(s), if the national law is concerned; and provide a general overview for those measures where other than national law is concerned
- provide the measures related to a certain field of expertise (with the input from above) to the national bodies responsible for the implementation of these measures in order to provide:
  - a general description,
guidance document on the preparation of the flood risk management plans

- a list of practical examples,
- special fields involved,
- process of implementation.

- provide the list of measures (with the input from above) to a limited number of active institutions on lower level(s) (for water measures e.g. to VGOs and possibly VGIs), where lower level measures are concerned in order to add/comment the existing list
- when there is no lower level institution responsible (e.g. awareness raising measures), find an engaged stakeholder for getting feedback
- finalise the list of measures with the characteristics

This process might take some months, therefore, early start is recommended.

Possibilities for prioritisation methods according to the objectives (step 2)
The Floods Directive allows for three prioritisation methods for the FRMP reporting, and that is by providing either:

1. a timetable for the implementation (Annex Part A.II.1 and A.I.4 ), or,
2. a summary text, or,
3. a category of priority such as for instance critical, high, very high, moderate etc. (enumeration list to be developed)

Croatia has not yet reached the decision which method will be used. For this reason, the possible methods shall shortly be discussed and one method shall be elaborated more in depth. The first option regarding the timetable prioritisation sounds comparatively easy and straightforward. However, it has to be taken into account that uncertainties like availability of financial funds or accessibility of land might make a solid schedule difficult.

The second option of verbal description allows for expert judgement. Expert judgement is expected to provide a good result regarding the priorities within one APSFR, provided that all related specialist fields have been involved in a proper way in the prioritisation process. However, a comparison between APSFRs might be more difficult, as different people might have done the prioritisation in different APSFRs and might have had different criteria for prioritisation. Additionally, especially when there is a high number of APSFRs, comparison will be even more difficult.

The third option might also provide for expert judgement, but a classification of measures requires criteria. This might be a difficult task.

Examples for a prioritisation method (Step 2)
Examples from Austria illustrate possible criteria for classification of prioritisation. In general, Austria has selected 2 categories with 2 subcategories each for finding the priority of a measure:

- risk reduction
  - reduction of the flood hazard (high, medium, low, no reduction)
  - reduction of the damage potential (high, medium, low, no reduction)
- feasibility
  - institutional feasibility (very high, high, medium, low effort)
  - financial feasibility (very high, high, medium, low effort)
• other information, no classification:
  - non-structural measure
  - in line with WFD objectives
  - short-term implementation possible

Possible definitions for risk reduction classes and for feasibility classes are given below. However, the challenge is to find definitions which apply to all kinds of measures and which rank in a balanced way the different kinds of measures. This is considered a task requiring high effort and much time, therefore the work on this in Croatia should start soon.

### RISK REDUCTION

**Reduction of flood hazard**
Measure effects hydrology and hydraulics (flood extent, water depth, velocity) in the area of the four risk receptors (human health, economy, environment, culture)

<table>
<thead>
<tr>
<th>high</th>
<th>If the flood hazard is reduced for larger areas or for a major part of the affected objects</th>
</tr>
</thead>
<tbody>
<tr>
<td>medium</td>
<td>If the flood hazard is reduced for a number of affected objects or for small areas</td>
</tr>
<tr>
<td>low</td>
<td>If the flood hazard is reduced for affected objects</td>
</tr>
<tr>
<td>no</td>
<td>If the flood hazard is reduced for none of the four risk receptors</td>
</tr>
</tbody>
</table>

**Reduction of flood damage**
Measure has an effect upon the potentially adverse consequences for the four risk receptors: human health, economy, environment, culture

<table>
<thead>
<tr>
<th>high</th>
<th>If the expected damage is reduced for larger areas or for a major part of the affected objects</th>
</tr>
</thead>
<tbody>
<tr>
<td>medium</td>
<td>If the expected damage is reduced for a major part of the affected objects or for small areas</td>
</tr>
<tr>
<td>low</td>
<td>If the expected damage is reduced for affected objects</td>
</tr>
<tr>
<td>no</td>
<td>If the expected damage is reduced for none of the four risk receptors</td>
</tr>
</tbody>
</table>

### FEASIBILITY

**Institutional effort**
The used criteria are: the expected willingness to cooperate, the administrative units (disciplines) involved, the distribution of competencies (mandates) and the institutional effort for land acquisition

<table>
<thead>
<tr>
<th>very high</th>
<th>If at least three statements apply</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- the expected willingness to cooperate is low</td>
</tr>
</tbody>
</table>

March 2014
- different administrative units (fields of expertise) are involved
- mandates are not clearly defined
- institutional effort for land acquisition is very high

**high** If at least one statement applies
- the expected willingness to cooperate is low
- different administrative units (fields of expertise) are involved
- mandates are not clearly defined
- institutional effort for land acquisition is high

**medium** If at least one statement applies
- the expected willingness to cooperate is moderate
- there are uncertainties in definition of mandates
- institutional effort for land acquisition exists

**low** If at least two statements apply
- the expected willingness to cooperate is high
- definition of mandates is clear
- institutional effort for land acquisition is low

### Financial effort

Expected costs for institutional, administrative, planning and construction activities for implementation of the measure

| **very high** | If the expected costs for measure exceed 3,5 mil. EUR |
| **medium**   | If the expected costs for measure are between 100.000 EUR and 1,0 mil. EUR |
| **low**      | If the expected costs for measure are below 100.000 EUR |

When a rating of measures according to the selected criteria has been performed, an overall prioritisation is needed for the reporting to the EC. A possible way of prioritisation in matrix form is given below:
In addition to the use of the example above, it would also be needed to take a decision as to whether additional information regarding WFD objectives, non-structural measures or other information should also be part of the ranking or not.

If Croatian colleagues do not prefer a set of criteria that covers all kinds of measures, another option could be to have criteria per expertise field, and to compare the resulting rankings to find an overall ranking.

Possible process for the choice of measures when making the FRMP (step 3)

Generally, a harmonised or well-coordinated approach is seen as favourable in order to come up with a reasonably comparable plan across Croatia. Therefore, the following text addresses possible criteria for making the choice of measures, elaborates some advantages and disadvantages, and provides a possible process for making the choice of measures.

In principle, there are different options on how the choice of measures for an APSFR can be done:

a. picking those measures which you already have in an implementation plan for the following years

b. picking those measures which are possible in the APSFR (with regard to the geographical characteristics of the area)

c. picking those measures which are possible in the APSFR and feasible to implement (with regards to financial means, stakeholder support et al.)

The first option is seen as a pragmatic way forward, easily and quickly done. A disadvantage might be that in this way other measures, which have not yet been thought of, but which might be very adequate for the area in question, will not be considered and therefore will not enter in the FRMP.
Another point to consider here is that future FRMPs might contain new measures and justifications for adding these new measures will be needed.

The second option delivers the broadest possible catalogue of measures for an APSFR, being aware that some of these measures might not be implemented for a long time. Setting up this list will be time-consuming and should define the frame not only for the next cycle, but for a long-term perspective, with the view that the full implementation of all the measures will give the best achievable solution for the APSFR.

The third option is seen as the compromise between the pragmatic and the consequent choice of measures. However, a change of the situation in an APSFR to the better (a strong resistant stakeholder has disappeared, or financial means become available against expectations), but also to the worse (a new stakeholder with high resistance, cancellation of funds) will influence the set of measures for the next cycle.

With regards to the decision process, a similar process shall be/is recommended as before:

a. a first draft might be given by Croatian Waters as the responsible body for the FRMP implementation;

b. in order to give a better balanced picture of measures, a workshop with stakeholders from the national level from other related fields of expertise might be helpful. Where there are no national bodies for the expertise needed, other stakeholders should be found and invited. In this workshop, the relevant measures from the other fields of expertise should be selected;

c. for further improvement of the plan it could be delivered to the next lower levels of administration (county level, VGOs) of the related fields, in order to add to the measures and get a feedback;

d. it can be thought of delivering the plan to the local level of administration, maybe some improvement could also be obtained from there.

It has to be noted that each step of improvement means additional effort for making the plan. However, if fields of expertise other than water are concerned and if those fields of expertise cannot be officially obliged to implement the selected measures, then their voluntary commitment to the FRMP is all the more of paramount importance.

**Recommendations how to come to a prioritisation by category of priority (steps 2 and 4)**

As the prioritisation might most probably affect all fields of expertise relevant in an APSFR or other unit of management for which the FRMP is done, a coordinated and balanced prioritisation would be recommended. It has to be taken into account that the prioritisation shall be in line with and shall support the objectives for the FRMP. A recommendation for the steps is as follows:

- a proposal should be drafted, maybe best by someone or a group acquainted with the tools for prioritising and/or decision-making
- this proposed method should be tested (incl. sensitivity analysis) with all measures to see whether the method delivers the expected ranking of measures, at least on a qualitative basis
• when a first draft for prioritisation has been done, a workshop with administration from other expert fields should be organised to find out if there is common agreement on the general ranking of measures

• if agreement or acceptance is achieved, the method is finalised

• then it has to be decided whether the general method for prioritisation might be adapted to the local level FRMPs or not, and if yes, how and by whom.
8. Summary of public information and consultation measures/actions taken

Article 9.3 of the Floods Directive states that active involvement of all interested parties under Article 10 of this Directive shall be coordinated, as appropriate, with the active involvement of interested parties under Article 14 of the Water Framework Directive (Directive 2000/60/EC). Article 10.2 also states that Member States shall encourage active involvement of interested parties in the production, reviewing and updating of the FRMP.

Due to the available time frame of the first cycle, a pragmatic approach is considered as the best solution for Croatia. Even though the CW recognizes that public participation from the very beginning of the planning process gives a lot of advantages, it will be implemented thoroughly only from the second cycle.

In the guidance document on “Participation of the public and stakeholders in flood risk management”, more aspects will be highlighted, also in the perspective of the second and third cycle of the FD.

Steps to be taken

**Step 1** Decide who will be in charge in CW for public participation and how it will be organised.

- Who, what levels within CW are needed, being aware that the FRMP will affect/have influence from the central to the local level?
- What other organisations, levels, key persons does CW need to participate in the writing process or would like to consult in an early stage?

**Step 2** Decide what CW wants to achieve with public consultations during the first cycle.

- Does CW want to inform a broad public about the work in progress (what is being done at this moment in the FRMP)?
- Does CW want to consult certain groups during the process, e.g. institutions which have data relevant for Flood Hazard Maps and/or Flood Risk Maps?
- Does CW want to involve certain groups in the process of decision making, e.g. institutions that have to work with the results of the Flood Hazard and Flood Risk Maps?
- What will be done with the results of the public participation and what will be the degree of influence on the final content of the FRMP? Does the public have co-decision rights or will the comments just be taken into consideration by CW? Does CW give the participants feedback on what CW did with their input or do they have to find it out by themselves in the final results?

**Step 3** Make a list of stakeholders.

Who are the interested stakeholders? Decide what CW considers to be interested stakeholders. Is it the public, or representatives of interested groups?

- What are the relevant stakeholders on national, regional and local level?
Recommendation

- Make it as specific as possible.

Insert not only the title of the institution, for example: the Ministry of Infrastructure and Environment, but add more details: the Ministry of Infrastructure and Environment, Agency Rijkswaterstaat, key person Mr Hrvoje, director Floods, Association of Farmers in the Rhine delta, department Biesbosch, Mrs Jansen, chairman...

Step 4 Make a stakeholder analysis.

There are several ways and methods to group/analyse the relevant stakeholders. On what base does CW want to rank the stakeholders?

- Ranking based on the influence they have on the process and results of the FRMP;
- Ranking based on their importance towards the implementation of the FRMP.

Recommendation

The ranking of the stakeholders must have a relation with the answer in step 2. Tools for stakeholder analyses are to be found in guidance document public and stakeholder participation.

Step 5 Based on the ranking method of step 4, decide who are the most important stakeholders. For those stakeholders answer the following questions:

- Are they “allies” or “opponents”?
- Can CW influence them easily or not?

Point it out in the ranking. Examples for contest a conflict analyses are included in guidance document public and stakeholder participation.

Step 6 Make a plan to arrange the communication and consultation with the most important stakeholders. For every (group of) stakeholder(s):

- What does CW want to achieve?
- What actions does CW need?
- What means does CW need and whom does CW need?
- When will the actions take place?
- How can a stakeholder support this activity?

Recommendation

- Answer the questions based on the outputs from steps 2 to 5.

Step 7 Make an action plan to implement the results of step 6:

- Who is overall responsible, who is coordinating the implementation?
- Will CW execute it all by itself or are there parts that CW wants to outsource?
- Whom does CW want to involve with the actions?
- Who is doing what and when?
- What will it cost?
- How does CW take care that the output from the actions will find its way to the FRMP (process)?
9. International coordination

The FD contains some obligations to internationally coordinated aspects of flood risk management. Concerning the Preliminary Flood Risk Assessment, Article 4(3) states that in the case of international river basin districts, or units of management referred to in Article 3(2)(b) which are shared with other Member States, Member States shall ensure that exchange of relevant information takes place between the competent authorities concerned.

Concerning the FRMP, Article 7(4) points out that in the interests of solidarity, Flood Risk Management Plans established in one Member State shall not include measures which, by their extent and impact, significantly increase flood risks upstream or downstream of other countries in the same river basin or sub-basin, unless these measures have been coordinated and an agreed solution has been found among the Member States concerned in the framework of Article 8.

Article 8 (2) and (3) regulate the coordination of FRMP in international river basin districts. Member States shall ensure coordination with the aim of producing one single international Flood Risk Management Plan, or a set of Flood Risk Management Plans coordinated at the level of the international river basin district.

Steps to be taken

Step 1  Make an overview of all Croatian transboundary rivers and of the territories of Croatia belonging to international river basin districts.

Step 2  Croatia is member of the International Commission for the Protection of the Danube River (ICPDR), the Danube Commission and of the International Sava River Basin Commission, the latter being a sub basin of the Danube. See whether the international coordination for the FRMP of Croatia can/should take place in these International Commissions and see whether all territories of Croatia belonging to international river basin districts are covered. If this is not the case, it is recommended to investigate whether there are other international commissions in which Croatia can internationally coordinate its FRMP.

Step 3  Make a list of delegation members of both international commissions for the Danube and for the Sava and include these contacts in the Flood Risk Management Plan.

Croatia is a member of the International Commission for the Protection of the Danube river. The head of the delegation is Mr Dražen Kurečić from the Ministry of Agriculture.

Croatia is a member of the Sava Commission as well. The delegated persons for Croatia are Mr Igor Butorac and Mr Dražen Kurečić.

Step 4  Include the results of the work already done in the international commissions into the appropriate Flood Risk Management Plans.

Especially in international river basins a close cooperation and coordination between Member States is necessary. In Austria the international calibration is done in the existing bilateral river commissions e.g. for the rivers Rhine, Danube, Drava and Mur. Bilateral commissions exist between Germany, Czech Republic, Slovakia, Hungary and Slovenia. For the international river basins as Danube and
Rhine the appropriate commissions are coordinating the FRMP for the Catchment in accordance with all Member States.

**Step 5** Decide how to deal with the smaller transboundary rivers, e.g. the Neretva river.

*Recommendations*
In case there are no international commissions already existing for transboundary rivers, they should be created together with neighbouring countries.
### Annex 1 - List of abbreviations on Twinning project “Floods”

<table>
<thead>
<tr>
<th>ENGLISH</th>
<th>CROATIAN</th>
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<tbody>
<tr>
<td>Act.</td>
<td>aktivnost</td>
</tr>
<tr>
<td>AHN Actueel Hoogtebestand Nederland (The Up-to-date Height Model of The Netherlands)</td>
<td>Digitalni model reljefa Nizozemske</td>
</tr>
<tr>
<td>APSFR Areas with Potential Significant Flood Risk</td>
<td>Područja s potencijalno značajnim rizikom od poplava</td>
</tr>
<tr>
<td>ASCII American Standard Code for Information Interchange</td>
<td>ASCII Američki standardni znakovnik za razmjenu informacija</td>
</tr>
<tr>
<td>AT Austria</td>
<td>AT Austrija</td>
</tr>
<tr>
<td>BC Beneficiary Country</td>
<td>Zemlja korisnica</td>
</tr>
<tr>
<td>CEA Croatian Environment Agency</td>
<td>AZO Agencija za zaštitu okoliša</td>
</tr>
<tr>
<td>Bosnia &amp; Herzegovina</td>
<td>BIH Bosna i Hercegovina</td>
</tr>
<tr>
<td>CETE Le Centre d’Études Techniques de l’Équipement (The Technical Study and Engineering Centre)</td>
<td>Centar za tehničke studije i inženjering (Francuska)</td>
</tr>
<tr>
<td>CL Component Leader</td>
<td>Voditelj projektne komponente</td>
</tr>
<tr>
<td>CLC Corine Land Cover</td>
<td>Corine baza podataka</td>
</tr>
<tr>
<td>CRO Croatia</td>
<td>HR Hrvatska</td>
</tr>
<tr>
<td>CW Croatian Waters</td>
<td>HV Hrvatske vode</td>
</tr>
<tr>
<td>dbf DataBase File</td>
<td>dbf DataBase File</td>
</tr>
<tr>
<td>DEM Digital Elevation Model</td>
<td>DMR Digitalni model reljefa</td>
</tr>
<tr>
<td>DGPS Differential Global Positioning System</td>
<td>DGPS Diferencijalni globalni pozicijski sustav</td>
</tr>
<tr>
<td>DLG Dienst Landelijk Gebied (Dutch Government Service for Land and Water Management)</td>
<td>Državna služba za upravljanje zemljištem i vodama (Nizozemska)</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
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</tr>
<tr>
<td>DSM</td>
<td>Digital Surface Model</td>
</tr>
<tr>
<td>DTAP</td>
<td>Development, Testing, Acceptance and Production</td>
</tr>
<tr>
<td>DTM</td>
<td>Digital Terrain Model</td>
</tr>
<tr>
<td>DWG</td>
<td>DraWinG (a file format)</td>
</tr>
<tr>
<td>EC</td>
<td>European Commission</td>
</tr>
<tr>
<td>ETRS</td>
<td>European Terrestrial Reference System</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>EUD</td>
<td>European Union Delegation</td>
</tr>
<tr>
<td>FD</td>
<td>Floods Directive</td>
</tr>
<tr>
<td>FR</td>
<td>France</td>
</tr>
<tr>
<td>FRM</td>
<td>Flood Risk Management</td>
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<tr>
<td>FRMP</td>
<td>Flood Risk Management Plan</td>
</tr>
<tr>
<td>FTP</td>
<td>File Transfer Protocol</td>
</tr>
<tr>
<td>GDB</td>
<td>Geodatabase</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>HEC</td>
<td>Hydrologic Engineering Centre</td>
</tr>
<tr>
<td>HEC-RAS</td>
<td>Hydrologic Engineering Centre River Analysis System</td>
</tr>
<tr>
<td>HEP</td>
<td>HEP (Group), Croatian national electricity company</td>
</tr>
<tr>
<td>HIC</td>
<td>Hydrographic Institute of the Republic of Croatia</td>
</tr>
<tr>
<td></td>
<td>Croatian Terrestrial Reference System</td>
</tr>
<tr>
<td>HQ</td>
<td>headquarters</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
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<td>-------------</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communications Technology</td>
</tr>
<tr>
<td>IIS</td>
<td>Internet Information Services</td>
</tr>
<tr>
<td>IPA</td>
<td>Instrument for Pre-Accession Assistance</td>
</tr>
<tr>
<td>IPPC</td>
<td>Integrated pollution prevention and control</td>
</tr>
<tr>
<td>JPL</td>
<td>Junior Project Leader</td>
</tr>
<tr>
<td>MHSC</td>
<td>Meteorological and Hydrological Service of Croatia</td>
</tr>
<tr>
<td>MoA</td>
<td>Ministry of Agriculture</td>
</tr>
<tr>
<td>MoSCoW</td>
<td>Must/Should/Could/Would</td>
</tr>
<tr>
<td>MS</td>
<td>Member State</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-governmental organisation</td>
</tr>
<tr>
<td>NL</td>
<td>The Netherlands</td>
</tr>
<tr>
<td>NPRD</td>
<td>National Protection and Rescue Directorate</td>
</tr>
<tr>
<td>PA</td>
<td>Pilot area</td>
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<tr>
<td>PFRA</td>
<td>Preliminary Flood Risk Assessment</td>
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<tr>
<td>PIP</td>
<td>Project Implementation Plan</td>
</tr>
<tr>
<td>PL</td>
<td>Project Leader</td>
</tr>
<tr>
<td>PPT</td>
<td>PowerPoint</td>
</tr>
<tr>
<td>RBD</td>
<td>River Basin District</td>
</tr>
<tr>
<td>RBMP</td>
<td>River Basin Management Plan</td>
</tr>
<tr>
<td>QA</td>
<td>Quality Assurance</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>QR</td>
<td>Quarterly Report</td>
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<tr>
<td>QS</td>
<td>Quality Standards</td>
</tr>
<tr>
<td>RTA</td>
<td>Resident Twinning Advisor</td>
</tr>
<tr>
<td>RTAA</td>
<td>Resident Twinning Advisor Assistant</td>
</tr>
<tr>
<td>RTAI/T</td>
<td>Resident Twinning Advisor Interpreter/Translator</td>
</tr>
<tr>
<td>SGA</td>
<td>State Geodetic Administration</td>
</tr>
<tr>
<td>SQL</td>
<td>Structured Query Language</td>
</tr>
<tr>
<td>STE</td>
<td>Short Term Expert</td>
</tr>
<tr>
<td>TIN</td>
<td>Triangulated Irregular Network</td>
</tr>
<tr>
<td>TNA</td>
<td>Training Needs Analysis</td>
</tr>
<tr>
<td>ToR</td>
<td>Terms of Reference</td>
</tr>
<tr>
<td>Polytechnic of Zagreb</td>
<td></td>
</tr>
<tr>
<td>TP</td>
<td>Testing, Production</td>
</tr>
<tr>
<td>TW</td>
<td>Twinning</td>
</tr>
<tr>
<td>WFD</td>
<td>Water Framework Directive</td>
</tr>
<tr>
<td>WISE</td>
<td>Water Information System for Europe</td>
</tr>
<tr>
<td>WMD</td>
<td>Water Management Department</td>
</tr>
<tr>
<td>WMI</td>
<td>Water Management Institute</td>
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</tbody>
</table>
Annex 2 - Table of contents for the FRM of the river Dodder (Ireland)

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1.3.3 Flood risk and the Water Framework Directive

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2.2 Provision of information

2.3 Stakeholder consultation

2.4 Public consultation

2.5 Final consultation stage

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3.2.1 Topography

3.2.2 Geology, soils and groundwater

3.3 Land use and land management

3.4 Hydrology and tidal conditions

3.4.1 Rainfall and hydrometric data

3.4.2 Tides and surge

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5.1.2 Risk to infrastructure
5.2 Social flood risk
5.3 Environmental and heritage flood risk
5.4 Existing flood risk management

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6.3 Option assessment process
6.3.1 Screening of measures
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6.3.3 Detailed option evaluation
6.4 Production of cohesive options
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7 Environmental considerations
7.1 Introduction
7.2 Environmental constraints and opportunities in the Dodder catchment
7.3 Strategic environmental assessment
7.4 Habitats directive assessment
7.5 Strategic environmental assessment
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8.1  Introduction to the strategy

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8.3  Non-structural measures

8.3.1  Flood forecasting

8.3.2  Other non-structural/minor & localised modifications

8.4  Structural measures

8.4.1  Preferred option details

8.4.2  Existing defences

8.5  Individual risk receptors

8.6  Assessment of the environmental effects of the plan components

8.6.1  Overview

8.6.2  Key recommendations of the strategic environmental assessment and the appropriate assessment

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8.8  Prioritisation and implementation of the FRMP

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8.8.2  Proposed implementation

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1.2 Objective of the report
1.3 Production of the report and its status
1.4 How to read the report
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2.1 Background and objective
2.2 Obligatory products
2.3 Principles of the flood management in the Netherlands
2.4 Dutch objectives
3 Organisation of flood management in the Netherlands
4 Description of the catchment
4.1 Boundaries of the catchment
4.2 Water, soil and altitude
4.3 Protection against floods
4.4 Land use
4.5 Developments in the future
5 Area of application and risk analysis
5.1 Principles
5.2 Boundaries of the area of limitation
5.3 Flood hazards and risks in the area of application
6 Objectives of flood risk management
6.1 Principles of flood risk management
6.2 Structure and priorities
6.3 Objectives for protection

6.4 Objectives for prevention

6.5 Objectives for crisis management

7 Measures: protection

7.1 Considerations on the choice of measures

7.2 Objective 1: The Netherlands goes through a continuous cycle of normalisation, checking the dikes for these standards and if necessary taking measures to ensure the dikes fulfil the standard as required by law

7.3 Objective 2: Where necessary, the Netherlands takes measures to protect areas not protected by dikes

7.4 Objective 3: The Netherlands has a notion of future flood risks and suitable measures for protection

8 Measures: prevention

8.1 Considerations on the choice of measures

8.2 Objective 4: Limiting the consequences of flooding through choices in spatial planning

8.3 Objective 5: Notion of future developments

9 Measures: Crisis management

9.1 Objective 6: Considerations on the choice of measures

9.2 Dutch crisis management ensure an alert and efficient performance before, during and after a (possible) flood

9.3 Objective 7: Notion of future possibilities for crisis management

10 Monitoring

11 Public participation

12 International coordination

13 Coordination with Water Framework Directive and other policies

13.1 Coordination with the Water Framework Directive

13.2 Coordination with other policies

Annex 1 List of competent authorities

Annex 2 Flood hazard maps and flood risk maps
Annex 3 Measures to reduce the flood risk, period 2015 - 2021
Annex 4 - Steps and time schedule to produce FRMP for Croatia

### ACTIVITIES FOR THE GENERAL MANAGEMENT

<table>
<thead>
<tr>
<th>Activity</th>
<th>Proposed date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Define the main task and set the desired deadline</td>
<td>October 2013</td>
</tr>
<tr>
<td>Nominate a project leader (PL)</td>
<td>October 2013</td>
</tr>
<tr>
<td>Give the PL the task to write a project plan (PP)</td>
<td>October 2013</td>
</tr>
<tr>
<td>Give the PL the mandate to establish a core group (CG), mention candidates</td>
<td>October 2013</td>
</tr>
<tr>
<td>Nominate a project assistant (PA) and/or ask the PL to propose candidate(s)</td>
<td>November 2013</td>
</tr>
<tr>
<td>Install a project steering committee (PSC) and give PSC mandate to adopt the PP</td>
<td>November 2013</td>
</tr>
<tr>
<td>Give the PL the means to make the result according to the PP</td>
<td>November 2013</td>
</tr>
<tr>
<td>Adopt the final result and give further tasks</td>
<td>December 2014</td>
</tr>
</tbody>
</table>

### ACTIVITIES FOR THE PROJECT STEERING COMMITTEE

<table>
<thead>
<tr>
<th>Activity</th>
<th>Proposed date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominate the secretary (probably the PL and/or the PA)</td>
<td>November 2013</td>
</tr>
<tr>
<td>Nominate a communication officer and describe his/her tasks</td>
<td>November 2013</td>
</tr>
<tr>
<td>Adopt the PP in the PSC</td>
<td>December 2013</td>
</tr>
<tr>
<td>Discuss the intermediate results of the project in the PSC</td>
<td>each quarter of 2014</td>
</tr>
<tr>
<td>Discuss and finalize the result in the PSC</td>
<td>November 2014</td>
</tr>
<tr>
<td>Define further tasks</td>
<td>November 2014</td>
</tr>
</tbody>
</table>

### ACTIVITIES FOR THE PROJECT LEADER<sup>3</sup>

<table>
<thead>
<tr>
<th>Activity</th>
<th>Proposed date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draft a project plan (PP)</td>
<td>October 2013</td>
</tr>
<tr>
<td>Formulate the final result</td>
<td>October 2013</td>
</tr>
<tr>
<td>Estimate when you want to have the final result</td>
<td>October 2013</td>
</tr>
<tr>
<td>Split the final result into pieces</td>
<td>October 2013</td>
</tr>
<tr>
<td>Make a time schedule, calculating “backwards”</td>
<td>October 2013</td>
</tr>
</tbody>
</table>

<sup>3</sup> Make also use of Twinning experience (contract/activities/missions/people/working methods etc.).
<table>
<thead>
<tr>
<th>Task</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Find candidates for a core group (CG)</td>
<td>October 2013</td>
</tr>
<tr>
<td>Settle a date and a draft agenda for the 1&lt;sup&gt;st&lt;/sup&gt; CG meeting</td>
<td>October 2013</td>
</tr>
<tr>
<td>Propose a working structure to make the pieces</td>
<td>November 2013</td>
</tr>
<tr>
<td>Propose candidates to produce the pieces</td>
<td>November 2013</td>
</tr>
<tr>
<td>Think how you link to other activities outside the project</td>
<td>November 2013</td>
</tr>
<tr>
<td>Connect to and use the prototype</td>
<td>November 2013</td>
</tr>
<tr>
<td>Propose who to involve from outside CW, when and how</td>
<td>November 2013</td>
</tr>
<tr>
<td>Settle a date and a draft agenda for the 2&lt;sup&gt;nd&lt;/sup&gt; CG meeting</td>
<td>November 2013</td>
</tr>
<tr>
<td>Discuss and adopt the draft PP in the 2&lt;sup&gt;nd&lt;/sup&gt; CG meeting</td>
<td>November 2013</td>
</tr>
<tr>
<td>Settle a date and a draft agenda for the 1&lt;sup&gt;st&lt;/sup&gt; PSC</td>
<td>November 2013</td>
</tr>
<tr>
<td>Send the draft PP to the PSC and ask to discuss, amend and adopt your PP</td>
<td>December 2013</td>
</tr>
<tr>
<td>Implement the PP</td>
<td>2014</td>
</tr>
<tr>
<td>Report to the PSC</td>
<td>each quarter of 2014</td>
</tr>
</tbody>
</table>
Annex 5 - Authorities for the implementation of the FD in France

General Directorate of Risk Prevention (Ministry of Ecology and Sustainable Development)

It carries the inter-ministerial policy coordination to prevent major risks (industrial risks, technological risks, and natural hazards – floods...). It develops and implements policies for water management. It has achieved the National Preliminary Flood Risk Assessment (PFRA) and has defined criteria for selecting Areas of Potential Significant Flood Risk (APSFR).

The Regional Directorate of the Environment (DREAL) at the basin level, under the authority of the coordinator governor of the basin, contributes to the elaboration, implementation and monitoring of water management master plan, the programme of measures, programmes monitoring water status and water information system; it coordinates necessary actions for the management of water resources and prevention of flood risks; it prepares the programming and distribution of decentralised credits of the Ministry of Ecology for interregional programs in the basin.

It has achieved PFRA for the river basin district, and has selected APSFR.

Under the authority of the governor of the region, DREAL of the region is responsible for developing and implementing the state policy in the field of environment, housing, sustainable development. It assists the administrative authorities in their role as environmental authority on plans, programmes and projects. It contributes to raising awareness regarding the risks.

In some regions, DREAL are in charge of hazard and risk mapping.
Department level

The department governor is responsible for crisis management, especially when municipalities are overwhelmed. He achieves, with his Directorates, natural risks prevention plans.

Under the authority of the department governor, Departmental Directorate of Territories assures support to sustainable development with municipalities particularly to contribute to the sustainable development of territories in the land-use planning processes. It is in charge of housing and habitat policy, urban renovation, implementation of the common agricultural policy, control in the areas of water, hunting and fishing, protection of natural areas.

Basin structures

Composed of several municipalities, they implement programmes of (structural or non-structural) measures for water or flood risk management.

Public establishments for cooperation between local authorities

Some of them are in charge of carrying out territorial consistency plan (for land-use planning), at the multi-municipalities scale.

Municipalities

The municipalities achieve new structural measures, such as dikes. The municipalities are also responsible for the land-use planning. While establishing urban plans they have to take into account environment and especially water: quantity, quality, flooding. Besides this, the municipalities are responsible for public awareness and crisis management in case of floods.
Annex 6 - Summary of Dutch measures for flood protection

The measures are categorised according to four aspects of flood risk management: protection, prevention, preparedness and recovery. In the list the measures that might be of importance for Croatia are mentioned.

Protection

- Maintenance of dikes
- Assign and normalise dikes
- Checking protection levels of dikes
- Maintenance of the coast line
- Room for the river projects along the Rhine and Maas
- Nomination of retention areas
- Storage of water in the upstream parts
- Delta programme

Prevention

- Make spatial plans water proof
- Zoning and conditions in spatial planning

Preparedness

- Accelerate water during peak flows
- Closing of storm surge barriers
- Formulation of a national plan for calamities
- Communication on calamities
- Pilot on the stimulation of people’s own interest
- International coordination

Recovery

- Care after floods
- Evaluation of calamities
- Compensation of damage through floods
Annex 7 - Example of measures in France

Objective: Limiting the stakes increase in flood areas

Improving the knowledge of exposed areas

M1: Mapping flood areas for 3 kinds of events: high, medium and low probability, for the areas of ...

M2: Reinforcing the knowledge on coastal areas which could be flooded by the sea, including the consequences of climate change

M3: Reinforcing the knowledge of rising groundwater: updating the sensitivity map for the whole basin

Planning the land use taking into account flood risk

M4: Principles for development of flood risk areas, from the national strategy for flood risk management, should be implemented:

- Strictly preserving floodplains, wetlands, dune systems on the coastal areas;
- Forbidding building in zones subject to strong hazards, except downtown,
- Limiting sensitive equipment in flood areas in order not to complicate crisis management;
- Adapting new buildings to the risk;
- Where areas are protected from flooding by dikes, it is forbidden to build between the river (or sea) and the dike (except for strategic projects).

M5: The areas subject to strong hazard for the medium scenario, where people’s security cannot be ensured in case of flooding, especially regarding land development, warning systems, evacuation, will not settle in new buildings, new equipment or technical plants,

M6: Prevention risk plans should take into account the following rules:

Reporting the measures

<table>
<thead>
<tr>
<th>Elements for reporting</th>
<th>Type</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For each measure or group of measures merged</td>
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</tr>
<tr>
<td>1 - Code</td>
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<td></td>
</tr>
<tr>
<td>If the measure has been reported for the WFD, use the same code.</td>
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</tr>
<tr>
<td>2 - Name of the measure</td>
<td>&lt; 100 characters</td>
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</tr>
<tr>
<td>3 - Description of the measure including:</td>
<td>Location &lt; 250 characters</td>
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</tr>
<tr>
<td>- category: individual/collective;</td>
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<td></td>
</tr>
<tr>
<td>- type: prevention, protection, awareness, structural, non-structural ...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Section</td>
<td>Description</td>
<td></td>
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<tr>
<td>---------</td>
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</tr>
<tr>
<td>-</td>
<td>- location: district code/APSFR code/place name/basin, sub-basin, coastal area code/body of water/other, - spatial extent for the expected effects of the measure, if different from the location of the measure</td>
<td></td>
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<td>4</td>
<td>Responsibility: level (national/district/regional/communal/other) or name of the competent authority</td>
<td></td>
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<tr>
<td>5</td>
<td>Explanation of how the measure contributes to objectives</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Prioritisation: by providing either a timetable for implementation, or, by providing a summary text, or, by providing a category of priority such as for instance critical, high, very high, moderate etc.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>State of progress: not started/being defined/being achieved/finished Comments on progress</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Costs and benefits of the measure, Euros/national currency or in qualitative/quantitative terms Explanation of the method for calculating costs and benefits of the measure</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Other EU acts (e.g. Directives) concerned by the implementation of the measure (if appropriate)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Other description of the measure or other information useful for understanding</td>
<td></td>
</tr>
<tr>
<td>Other information</td>
<td>11 - Link to more detailed information</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12 - Description of the link above, for instance link to the full FRMP, guidance documents, external source of information</td>
<td></td>
</tr>
</tbody>
</table>