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# Findings and Recommendations

## CROATIA

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## Glossary

EUFD	European Union Floods Directive[Directive 2007/60/EC of the European Parliament and of the Council on the assessment and management of flood risks]
EUWFD	European Union Water Framework Directive[Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy]
PFRA	Preliminary Flood Risk Assessment
APSFR	Areas with Potential Significant Flood Risk



FH&FRM	Flood Hazard and Flood Risk Maps
FRMP	FloodRisk Management Plans
ISRBC	International Sava River Basin Commission
CW	Croatian Water - Hrvatske Vode
DHMZ	National Meteorological and Hydrological Service
NPRD	National Protection and Rescue Directorate
RBD	River Basin Districts
DEWETRA	IT platform aimed at the prediction, prevention and monitoring of hydro-meteorological and risk of forest fires
FloodCAT	IT platform aimed to run as catalogue on floods

## 1. Legal and Institutional Framework for Flood Risk Management

Water management in the Republic of Croatia is regulated by the Water Act (Official Gazette – OG 153/09, 63/11, 130/11, 56/13 and 14/14), the Act on Water Management Financing (OG 153/09, 90/11, 56/13 and 154/14) and EU water related Acquis. National legislation of Croatia is harmonized with regulations of EU water-related directives including the Water Framework Directive (EUWFD 2000/60/EC) and Floods Directive (EUFD 2007/60/EC on the assessment and management of flood risks).

Croatia is in line with the deadlines for EUFD.

The Water Act establishes the complete water management framework in Croatia and establishes Croatian Water - Hrvatske Vode (CW) as a legal entity for water management. CW is a legal entity under the Ministry of Agriculture that acts as political body by elaborating acts and legislation to be submitted to the Government.

Besides Croatian Water, the other institutions that are responsible for flood management in Croatia are described in the National Flood Risk Management Plan; they are:

- Ministry of Agriculture
- National Meteorological and Hydrological Service (DHMZ)
- National Protection and Rescue Directorate (NPRD)
- Units of local and regional self-government

- Other competent state administration bodies
- Companies certified by CW for works in implementation of preventive, regular and emergency flood defense measures

*No specific recommendations are envisaged for the legal and institutional framework of Croatia which is in line with the provisions of EU Floods Directive.*

## 2. Units of Management

In line with the WFD, Croatia has identified two River Basin Districts (RBD): Danube and Adriatic. Both districts are part of an international RBD. Croatian Water is the competent authorities for the implementation of EU Floods Directive.

*No specific recommendations are envisaged.*

## 3. International River Basin Authorities

Croatia is member of the International Sava River Basin Commission (ISRBC). ISRBC is a common platform for all Sava countries (Parties: Bosnia and Herzegovina, Croatia, Serbia, Slovenia and Montenegro as Associated Party) and provides high quality assistance for international cooperation in the field of navigation, water and flood management. The Flood Experts Group of ISRBC has prepared a Protocol on Flood Protection that supplements the **Framework Agreement on the Sava River Basin**. The Protocol has been ratified by all Parties and explicitly refers to the approximation to the EUFD setting 6 areas of activities:

- a. Preparation of the Flood Risk Management Plan of Sava River
- b. Undertake Preliminary Risk Assessment
- c. Preparation of Flood Maps
- d. Development of Flood Risk Management Plan in the Sava River Basin
- e. Establishment of the Flood Forecasting, Warning and Alert system in the Sava river Basin
- f. Exchange of information significant for sustainable flood protection

- g. Implementation of all measures and activities originating from planning documents

The Protocol refers to the EUFD for PFRA, FRMP and Flood Maps and it specifies that the Sava Commission will coordinate the development of a joint methodology for flood mapping to be applied in the entire river basin.

*It is recommended to promote the full implementation of the Protocol on flood protection of ISRBC.*

#### 4. Preliminary Flood Risk Assessment

Preliminary Flood Risk assessment has been completed by Croatian Water in 2013 and it was reported to the EC in 2014. PFRA data and maps are reported on the EU geoportal (Eionet - European Environment Information and Observation Network) and on the CW official website <http://korp.voda.hr/>. The Policy of Croatian Water is to guarantee the access to data to public.

CW built a database of historical floods; the database is on ARCGIS software. CW collects data on losses for CW infrastructures (construction of regulation and flood protection structures) and a few data for damage to population and houses are available. National Protection and Rescue Directorate registers damage on different sectors related to floods and Ministry of Finance collects data on economic losses from local administrations.

For the purposes of the description of floods in PFRA, CW has carried an extensive analysis of existing information and recorded over 260 flood events; a list of recorded historical flood is reported in the PFRA report. Basic forms for collecting information on flood events are regulated by the Main operational plan of flood control of Croatian Water.

The PFRA of Croatia and the methodology adopted is reported in the report „Prethodna procjena rizika od poplava”<sup>1</sup> prepared by Croatian Water in 2013. The methodology for PFRA is roughly the following: identification of historically flooded area and potentially floodable area; collection of data on exposed element such as population, environment, economical activities and cultural heritage for each administrative areas of settlements (6759 settlements), assessment of the risk sensitivity and identification of APSFR.

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<http://korp.voda.hr/pdf/Prethodna%20procjena%20rizika%20od%20poplava/PRETHODNA%20PROCJENA%20RIZIKA%20OD%20POPLAVA%20-%20TEKST.pdf>

According to the methodology described, Croatian Water has estimated areas with different level of risk: very high, high, medium, low and very low. Note that the assessment has been verified by experts of Croatian Waters. A total of 2976 APSFR has been identified.

*For the second cycle of PFRA (December 2018) it is recommended to improve and refine the approach used for the definition of APSFR by considering a methodology based on weighting different category of exposed element such as health, environment, economic activities and cultural heritage. The methodology should also consider a clear identification of the source of flooding as prescribed by the EUFD (fluvial, pluvial, groundwater, Sea Water, Artificial Water Bearing Infrastructure) and address the effect of Climate Change. The “Guidelines for the implementation of EU Floods Directive and MSs Good practices” developed by IPA Floods Programme could be used as reference for the methodology.*

*It is further recommended to establish a unique national database of floods based on the existing catalogue of CW and data collected by other relevant authorities (i.e. NPRD, Ministry of Finance, etc.); the database should be compliant with the reporting schema of EUFD and should contain data on damage and losses in line with the requirements of the Guidance for recording and sharing disaster damage and loss data (JRC, 2015)<sup>2</sup>. The Flood Risk Information System developed in IPA FLOODS and containing the FloodCat platform, could be used to address this recommendation.*

## 5. Flood Hazard and Flood Risk Mapping

CW has been beneficiary of the EU IPA 2010 TWINNING PROJECT: “Development of Flood Hazard Maps and Flood Risk Maps”<sup>3</sup>. The project was implemented during 15 months, in the period between January 2013 and April 2014. This Twinning project helped in the preparation of Flood Hazard Maps and Flood Risk Maps for the two selected pilot areas (city of Karlovac and lower Neretva) as well as in the preparation of six guidance documents on flood related topics and in capacity building of relevant institutions.

<sup>2</sup> Guidance for recording and sharing disaster damage and loss data – Towards the development of operational indicators to translate the Sendai Framework into action: EU expert working group on disaster damage and loss data; European Commission, Joint Research Centre, Institute for the Protection and the Security of the Citizen, 2015, ISBN 978-92-79-47452-1, ISSN 1831-9424

<sup>3</sup> <http://twinning.voda.hr/>

Croatian Water developed Flood Hazard Maps for the entire country for each APSFR. Four maps are made: one is displaying information on three probability scenarios presented as extents, while other three maps display information for each individual probability scenario with flood depths.

Croatian Water has also developed Flood Risk Maps on the base of Flood Hazard Maps. The maps are available at CW website and produced for low, medium and high probability of flooding. The hazard maps are overlapped with CORINE Land Cover and exposure over a larger area.

FHM and FRM have been elaborated according to the methodology developed under the Twinning project (the methodology is extensively described in the guidelines<sup>4</sup>). The FHM and FRM have been completed and published in December 2014 and reported to the EU Commission in January 2015. They are published at CW website<sup>5</sup>.

*Flood Hazard and Flood Risk Mapping in Croatia are at advanced stage, however for the second cycle of reporting under the EUFD it is recommended to:*

- *clearly differentiate FHM and FRM for the different source of flooding (fluvial, pluvial, groundwater, Sea Water, Artificial Water Bearing Infrastructure) for reporting to EU Commission;*
- *elaborate dedicated FHM and FRM for communication to general public; the maps need to be easily understandable also by non-technical stakeholders;*
- *address Climate Change effects of Flood Hazard Mapping;*
- *develop and adopt a quantitative method based on hydrological and hydraulic modelling for FHM from torrential floods;*
- *improve the methodology for assessing floods hazard from Sea Water under a changing climate;*
- *complement the FRM with an estimation of the economic damages for each hazard scenarios and potential impacts on critical infrastructures.*

## 6. Flood Risk Management Plans

<sup>4</sup> [http://twinning.voda.hr/project\\_content\\_doc.html](http://twinning.voda.hr/project_content_doc.html)

<sup>5</sup> <http://korp.voda.hr/>

In compliance with EUFD, CW has developed a National Flood Risk Management Plan that is expected to be approved by December 2015. The draft version of FRMP can be downloaded from Croatian Water website and it is fully integrated into River Basin Management Plan, ensuring harmonization of the requirements of EUWFD and EUFD.

It must be underlined that RBMP is part of the Long-term Water Management Planning documents of CW, namely: Water Management Strategy, River Basin Management Plan, Long-term program for construction of water utility facilities, Long-term program for construction of regulation and flood protection water facilities and amelioration facilities and Long-term Monitoring program. The Flood Risk Management Plan and Long-Term Programme for Construction of Water Regulation and Protection Structures and Amelioration Structures are planning documents for flood protection foreseen by the Water Act.

The FRMP developed by CW is a planning document that lists the measures that could be adopted in order to reduce flood risk in Croatia; furthermore, each measure is linked with the competent institution responsible for its implementation. The measures are described in general term and are not linked to a specific location. The FRMP contains: the Conclusions of the Preliminary Flood Risk Assessment with corresponding maps; Flood Hazard Maps and Flood Risk Maps with interpretation and conclusions; Flood risk management objectives which are particularly related to the reduction of potential adverse effects of floods on human health, the environment, cultural heritage and economic activity; Summary of measures sorted by priority order which are to be implemented in order to inter alia meet the objectives of the flood risk management. FRMP also contains the description of the Croatian Flood Risk Management system during flood-related emergencies.

*FRMP is currently under approval, thus no specific recommendations are envisaged at this stage.*

## 7. Data Sharing and Data Information Systems

The policy of CW on data and information sharing is such that it promotes the exchange of information with institutions and general stakeholders. Flood risk data and information are published and shared by CW website and dedicated portal<sup>6</sup>. The portal contains data on PFRA, FHM and FRM on GIS format

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<sup>6</sup> <http://korp.voda.hr/>

and interactive maps. Though the system allows the visualization of data and maps, the accessibility is still limited (no web-services).

*It is recommended to further develop the systems currently in use (<http://korp.voda.hr/>) in order to improve the accessibility to data and maps by different national and international institutions and general stakeholders. The platform should be adapted to the requirements of the INSPIRE directive on geospatial data. It is recommended to connect the existing system with the Flood Risk Information System, developed under IPA FLOODS, with the aim of improving the exchange of information at Regional and European level.*

*It is further recommended to adopt a data information system for collecting, recording and sharing data on historical floods and related damage and losses as outlined in the session dedicated to PFRA. The Flood Risk Information System, developed under IPA FLOODS, could be used as asset for addressing this recommendation.*