

Description of flood risk management objectives

Integrated Report for Tisza River Basin

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Abbreviations

APSR	Areas with Potentially Significant Flood Risk
CORINE	Coordination of information on the environment
DFL (MÁSZ)	Design Flood Level
DTP	Danube Transnational Programme
E-PRTR	European - Pollutant Release and Transfer Register
EU	European Union
FD	Floods Directive
FHRM	Flood Hazard Maps and Risk Maps
FRM	Flood Risk Management
FRMP	Flood Risk Management Plan
GES/GEF	Good ecological status/good ecological potential
GIS	Geographic Information System
ICPDR	International Commission for the Protection of the Danube River
ICPR	International Commission for the Protection of the Rhine
IED	Industrial Emissions Directive
NVP	New Vásárhelyi Plan
PFRA	Preliminary Flood Risk Assessment
UK	United Kingdom
WB	Water Bodies
WFD	Water Framework Directive

Chapter 1 Introduction

Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks states that member states shall establish objectives for the management of flood risk, for the areas, for which they conclude that potential significant flood risk exist or might be considered likely to occur.

There are many differences in the way Member States set targets. One of the models is that the setting of objectives should first be made at national level and then detailed at the basin level / APSFR.

In general, two types of objectives can be identified: strategic and operational. The first objective relates to guiding principles, such as the principle of subsidiarity, the principle of solidarity, achieving synergy between the Water Framework Directive and the Floods Directive etc. The second objective refers, among others, to reduce new or existing risks and to minimize negative consequences.

Some countries identify operational objectives at a very high level, for example "reducing risks related to all areas of the flood risk management cycle" (Austria). In Ireland, the main purpose is to reduce the risk; but a number of sub-objectives (economic, social, environmental and cultural) have also been defined. These objectives are potential benefits and do not focus on avoiding damage. The objectives are used to select the measures and also to prioritize them. Because objectives are not all of equal importance, Ireland assigns them different weights. These weights reflect the importance of the target for society and are validated / corrected through public consultation at national level. The Netherlands focuses mainly on infrastructure safety standards. Croatia main objective is to reduce risks. Germany is focusing to prevent new risks (construction in risk areas is forbidden). In the UK, the objectives are set to i) avoid risks; ii) protection and iii) training. At ICPR, three levels of objectives are distinguished: 1) strategic objectives, namely achieving an acceptable level of security, exchange of responsibility, the principle of subsidiarity; 2) operational objectives, namely reducing new risks, reducing existing risks to an acceptable level; 3) sub-objectives related to measures (e.g. the establishment of a flood risk map, etc.). ICPDR agreed on the following objectives for the Danube River Flood Risk Management Plan: avoiding new risks, reducing existing hazards, increasing resilience, public awareness (operational objectives), the principle of solidarity (strategic objective).

It is noticed that the distinction between objectives and measures can not often be done directly. As a conclusion, almost all countries define flood risk management objectives in terms of risk reduction (risk reduction for the population). Another relatively frequently used term is the achievement of a target level of protection (e.g. community protection at the flood with a 100-year return period).

The general recommendation is that the national / strategic objectives should be detailed in specific /operational flood risk management objectives, mainly to reduce the risk for APSFR areas, with "localized" measures at the level of APSFR as well as at the basin / hydrographic sub-basin level.

Chapter 2 Flood risk management objectives at Tisza River Basin component countries

Reducing the consequences of floods is the result of extensive combinations between measures and actions preceding the occurrence of the phenomenon (prevention, protection and training activities), management during the floods and those undertaken after floods (reconstruction and lessons learned as a result of the phenomenon).

In line with European legislation and international literature, flood risk management means applying procedures and practices having as objectives identification of risks, their analysis and evaluation, discussing, monitoring and reassessing risks for their reduction, so that human communities, all citizens, can live, work and meet their needs and aspirations in a sustainable physical and social environment.

Thus, Member States establish flood risk management objectives, focusing on reducing the potential negative impacts of floods on human health, economic activity, the environment and cultural heritage.

2.1. Flood risk management objectives for Tisza River Basin in Ukraine

In 2014, **Ukraine** and EU signed Association Agreement. It came in force in part of environment from 1st November 2014. This Agreement includes Annex XXX with the list of EU environmental legislation, to which Ukraine should approximate. It also included EU Water Framework Directive and EU Flood Directive. According to the schedule provided, Flood Risk Management Plans should be prepared by 2022.

Ukraine already made significant steps towards the implementation of the EU water Directives. In autumn 2016, Ukrainian Parliament has adopted the amendments to the Water Code, which came in force since February 2017. The core of the amendments is inclusion of the provisions of EU Water Framework Directive and EU Flood Directive such as need of development of River Basin and Flood Risk Management Plans.

Further to the amendments to the Water Code implementing the requirements of the Water Framework Directive, Flood Directive and Drinking Water Directive the number of the secondary acts are developed (see Table II.1.).

Table II.1. Ukraine progress towards implementation of the EU Flood Risk Directive

Action (as stated in the EU-Ukraine Association Agreement)	Set deadline	Progress
Adoption of national legislation and designation of competent authority/ies	Nov 2016	DONE with adoption of amendments to the Water Code (2016)
Undertaking preliminary flood risk assessment (art. 4 and 5)	Nov 2018	At present Ministry of Interior Affairs Order "On Approving the Methodology of the Preliminary Flood Risk Assessment" is developed and passing Interministerial consent procedure.
Preparation of flood hazard maps and flood risk maps	Nov 2020	At present the Ministry of Interior Affairs Order "On Approving the Methodology of the Flood Risk and Flood Hazard Maps Development" is developed and submitted for the interministerial

Action (as stated in the EU-Ukraine Association Agreement)	Set deadline	Progress
		consent procedure.
Establishment of flood risk management plans	Nov 2022	At present the Cabinet of Ministers of Ukraine Resolution “ <i>On Approving the Procedure for the Development of Flood Risk Management Plans</i> ” is being developed.

This means that on the contrary to the Tisza countries, who are EU members, who have developed their national Flood Risk Management Plans earlier, according to EU FD implementation schedule, Ukraine is still in the process of their development, including setting flood risk management objectives.

The National Targeted Program for Water Management Development and the Environmental Rehabilitation of the Dnipro River Basin for the period till 2021 (№ 4836-VI)¹ has been developed and approved in 2012 prior the signing of EU-Ukraine Association Agreement.

The major objectives of the Program include the establishment of favourable conditions for the effective water management; implementation of the governmental policy in the field of water resources management, use and restoration of water resources based on the river basin principle; ensuring development of land reclamation and operation of the state multi-purpose water facilities; improvement of the organizational structure of the integrated water resources management.

In the area of protection of rural settlements and farming lands from the hazardous impacts of water and the comprehensive flood control in the Dniester, Prut and Siret river basins and Tisza river basin in Zakarpatska oblast (point 3) the tasks include:

- construction, reconstruction and major repairs of hydro technical facilities; protective flood control dams, bank protection structures; riverbed clean up and regulation;
- construction of storage flood control reservoirs in mountain and valley stretches of the rivers, polders and flood control storages;
- implementation of the contemporary methods for floods monitoring and forecasting, timely, accurate and reliable information and warning of the population and industries of the hazards of flood emergencies and potential aftermath;
- construction and renovation of landslide and mudslide protection structures;
- implementation of local programs of restoration of small rivers and water reservoirs;
- decrease of the intensity of surface water flow;
- improvements in the organizational structure of water utilization scheme aimed at ensuring protection of territories against the negative impact of water.

2.2. Flood risk management objectives for Tisza River Basin in Romania

Following the analysis of the requirements of Directive 2007/60/EC, of the guidelines developed to support the implementation of this Directive as well as the European context, in **Romania**, two

¹ <http://zakon3.rada.gov.ua/laws/show/4836-17/page>

types of objectives have been identified: **national flood risk management objectives (strategic objectives) and specific flood risk management objectives (operational objectives).**

In defining the *strategic flood risk management objectives* it was taken into account the agreed approach at the ICPDR level as follows: *avoiding/preventing new risks, reducing existing risks, increasing resilience and public awareness.*

The strategic objectives defined at national level were detailed into specific objectives. These objectives focus on the reduction of potential adverse consequences of flooding for human health (social), the environment, cultural heritage and economic activity and address all aspects of flood risk management, as follows:

- **Economic** which implies *minimise the flood risk to transport infrastructure*: the length and importance of transport infrastructure (road, railway, railway stations, shipping, airports, etc.) at flood risk, *minimise the flood risk to economic activities* (the number economic objectives at flood risk), and *flood risk management over agricultural land* (the surface of agricultural land exposed to flood risk);
- **Social** which assume *minimise the flood risk to life* (the number of inhabitants exposed to flood risk) and *minimise the flood risk to community*: the number of social infrastructures (hospitals, schools, libraries, town halls, police units) exposed to flood risk;
- **Environment** which implies *support the achievement and conservation of GES/GEP in accordance with WFD requirements* (number of WBs at risk of failing to GES/GEP as an effect of the hydro morphological pressures - linked to the FRM measures), *minimise the flood risk to protected areas for abstraction of drinking water*: (number of protected areas for abstraction of drinking water exposed to flood risk) and *minimise the flood risk to objectives with potential pollution* (number of areas under IED-IPPC Directive (96/61/EC), Urban Wastewater Directive (92/271/EEC) and the SEVESO III (2012/18/EC) exposed to flood risk);
- **Cultural heritage** which translates into *minimise flood risk to cultural heritage objectives* (number of museums, churches and monuments exposed to flood risk).

2.3. Flood risk management objectives for Tisza River Basin in Slovak Republic

In **Slovakia**, the objectives are defined by the Act. no. 7/2010 Coll. on flood protection, into which the Directive on the assessment and management of flood risks is transposed. The objectives are aimed at reducing the probability of floods on the area of flood risk and at the mitigation of adverse consequences of floods for human health, environment, cultural heritage and economic activity.

Achievement of the above objectives precedes the preliminary flood risk assessment, which identifies areas with a potentially significant flood risk or in which might be considered likely to occur. This was followed by the development of flood hazard maps, which show the extent of the floods of territory and flood risk maps, which contain data on the potential adverse consequences of floods caused by flood risk. Based on the above evaluations, floods risk management plans were developed for the river sub-basins of the Slovak Republic, which are determined the objectives and measures to reduce the adverse consequences of floods.

The floods in many cases directly endanger lives and health of people. For this reason, one of the primary objectives of flood risk management is the protection of human health. Except the direct endanger of human lives, the floods affect on human health with their direct and indirect health

risks. With human health is directly related another objective - the environment. To ensure the protection of waters and their sustainable use are determined environmental objectives accordance with Directive 2000/60/EC, for surface water bodies, groundwater bodies and protected areas dependent on water. Flood risk management plans are also aimed at the protection of cultural heritage, especially cultural monuments and monuments areas and archaeological sites and economic activities on potentially endangered areas by floods of the relevant sub-basins.

Data on estimated number of potentially affected inhabitants by flood, data on environmental objectives for bodies of surface water and protected areas, data on the protection of cultural heritage, especially cultural monuments and monuments areas and data on economic activities in the Tisza river basin (Slaná, Bodva, Hornád and Bodrog sub-basin) are listed in the flood risk management plans of the relevant sub – basin and they are shown on the flood risk maps.

2.4. Flood risk management objectives for Tisza River Basin in Hungary

In **Hungary**, the flood protection has remarkable history and the defence system is highly developed. Events like the Tisza floods and the Danube floods between 2000- 2013 called attention to the limited capacity of the reservoirs and narrow development possibilities of the structures. The event highlighted the necessity of a revision of the 100 years flood levels, so called DFL ('MÁSZ'), which is the threshold limit of the state responsibility of general protection and the main parameter of the embankment design.

In the *Flood Risk Management Plan*, on the basis of highly scientific method the values had been recalculated for all the approximately 2800 km main river sections in 2013-2014 and the new longitudinal profiles were legally adopted on 1st of January 2015. The new DFL ('MÁSZ') is based on statistically determined discharge value and represents the actual conditions of the riverbed with numerical modelling. The update is obligatory in every 6 years or after a remarkable event.

Parallel, the continuous field observations enhanced measuring techniques and numerical investigations prove the unfavourable processes in the floodplains, which obstruct the flood conveyance, such as intensive expansion of vegetation in the flow routes because of depression of the low water regime, silting-up of the embanked floodplains due to sedimentation, morphologic changes in the rivers and the consequences of budget-limited maintenance.

The evolution of the flood management leads towards the sustainable floodplain management. The aim is to keep the characteristic peak levels on the design/ flood level (DFL - Q1% flood level) or lower them with comprehensive tools. The Hungarian Government made a decision at the end of 2013 to elaborate flood management plans for all rivers or river stretches that possess with DFL. The legal force was adopted in June, 2014. The documentations were carried until the end of the same year. The first step was to define conveyance zones: primary, secondary, transition, still (legislative changes and official land use limitations). For that 2 dimensional numerical modelling had been carried out on detailed complex terrain raster. The division between the categories generally based on unit discharge. The banks of the rivers have also been redrawn and with the zonal distribution they will legally affect the users in the floodplain. During the process the morphological history was investigated, but the documentation considers the existing land use, the regional and national development strategies, forestry, housing nearby the river, WFD and FD aspects, nature protected sites, national border region specialties, navigation and the geometric parameters of the floodplain. The development chapters contain the measures to be taken to enhance the flood transport. The public consultation of the plans began in the middle of 2015 and after the harmonization they will be finalized.

The other measures to establish or enhance preparedness for flood events to reduce adverse consequences include e.g., insurance, financial precautions, new regulation of the financial circumstances, communication of flood risk, permanent monitoring, inspection and maintenance of erosion control and flood protection structures.

The preventive measures focus on avoiding the location of new or additional receptors in flood prone areas. They are essential for the land use planning policies or regulation. The key measures adopted in countries include preparation and update of hazard zone plans and their incorporation into regional land use planning, legal restrictions for construction activities on flood risk areas and prevention of any increase of the damage potential in flood hazard areas via properly designed spatial plans and/or legislation. General preparedness is being enhanced through measures that establish or enhance flood event institutional emergency response planning. These include flood-related inspection on rivers, water reservoirs and water structures, updates of the flood protection plans and the hydrological characteristics such as design flood levels, discharge return periods reflecting also the climate change projections. These activities lead to updates of operation plans of flood protection systems and of operative flood defence plans and their harmonization with other stakeholders such as civil protection.

The EU Flood Directive was implemented into the national legislation in 2010 by the 178/2010 (V.13.) governmental act. for the fulfilment of the requirements a national project started with a name "Flood risk mapping and development of strategic risk management plan (KEOP-2.5.0.B)", also called as 'ÁKK'. The flood inundation analyses are based on a GIS platform-based fully integrated water management tool, where the digital terrain model has a 10x10 m resolution as a raster, but the specific objects (e.g. rivers, dikes, localization roads etc.) are presented as vectors. The probable failure points of the dikes were investigated and the specific flood curves were calculated from the available 80-120 years long data sets to the certain sections of the water outtake. Climate change effects were interpreted in the low probability events. The transport on the field was calculated with 2D numerical models for each floodplain. The hazard maps were exported to 50x50 meter raster layers for visualization, the boundaries were transformed to shape files. The mapping results were constructed in an aggregated form for the (national) Danube, Tisza, Balaton and Dráva sub-basins in line with the river basin management plans. The reporting format is a 1:2.000.000 scale map, but the appropriate view is 1:100.000. The scenarios for fluvial flooding were likely 30/100/1000 year return probability. The inundation contours represent the three events' maximum extents, the water depth categories are 0-0.5 m, 0.5-1 m, 1-2 m, 2-3 m, 3-5 m, >5 m. The velocities were quite low and considered not important in regard with the inundation hazard, so they were not indicated. The risk analysis is based on the water depth.

The effects of the groundwater floods (inland excess water) are represented by the low probability events that have been extracted from the real observed inundations in the last decades. The recent flood events and especially the Danube flood in June 2013 pointed out the necessity of a new statistical calculation of the design flood events. Furthermore new terrain data is being incorporated into the existing surface models. The hazard and risk maps will be fine-tuned based on the new data sets during the flood risk management planning in 2014-2015. Based on the different scenarios' extents the necessary risk evaluation was carried out in separate maps for proper visualization.

- *Population affected*: estimated number of inhabitants who live in settlements that are spatially overlapping with the inundation (2001 data). The indication of the value is the size of the dot mark.

- *Economic activity*: the classification is based on the CORINE land cover data set. The important roads and railways, SEVESO objects, power plants, sewage treatment plants, harbours, airports and other industrial facilities were added from the river basin management plans.
- *IED installations*: the E-PRTR facilities were taken in account on the maps with harmonized classification.
- *WFD protected areas*: updated data from the river basin management plans were used, such as freshwater sources, recreational areas and protected landscapes. The surface water affected groundwater is also presented.

On the Tisza River, in Hungary, two problems are in focus: increasing the conveying capacity of the flood bed and the use of emergency reservoirs. The studies focusing on increasing the capacity of the flood bed have succeeded in identifying the potential and necessary measures needed to decrease the flood peaks to the necessary level. In the program of implementation the following key measures have been envisaged: removing the obstacles from, and keeping clear of, the flood conveying channel, proposal on retaining, relocation or complete demolition of summer dykes, solving the problems associated with parallel bars, river training works, realignment of the main defences (where unavoidable).

Improvement of the conveying capacity of the flood bed has been envisaged in combination with the environmental revitalisation thereof. The study on the emergency storage scheme in the Tisza Valley (flood plain revitalisation by means of controlled diversion) has revealed no obstacle to establishing the reservoirs at the proposed sites. Eleven potential reservoirs studied were found viable – with some restrictions – in the (NVP). The sites were ranked by sections.

In Hungary, the water storage capacity is limited by the low-land formations and 1-2 cm inclination in wide regions. Along the Danube River neither the subsoil conditions nor the lack of space makes the retention possibilities favourable. Beside the geographical problems the volume of the necessary storage is that high which is nearly impossible to handle with field retention. In case of Tisza River the ongoing NVP has the water retention in the outmost focus aiming to establish numerous reservoirs and create sufficient storage capacity. The completed reservoirs in operation are the following: Cigánd, Hanyi-Tizsasüly, Tiszaroff, Nagykunság and Szamos-Kraszna. The planned reservoirs are: Bereg, Tisza-Túr and Hanyi-Jászság. In 2014–2020 financing period the Hungarian Government decided to allocate almost 19 million EUR cohesion funds to support domestic projects focussing on developing the conditions of water management in hilly areas and establishment of reservoirs to control pluvial floods. This initiative gives a background to create additional natural retention areas and use them against flash floods in the coming years.

Development of concepts, plans, projects, strategies on catchment scale to improve the water and sediment balance is an important tool to implement sediment management measures to maintain river conveying capacity.

Surface water management covers measures involving physical interventions to reduce surface water flooding especially in an urban environment. To achieve this, the infiltration structures to catch the rainfall water (e.g. drainage channels in settlements) have to be constructed, properly maintained (kept clear) and, if necessary, repaired. Improving the capacity of urban drainage systems is planned. Use of green roofs and rain gardens contributes positively to increasing the

water retention in urban areas. To avoid pollution problems the flood protection measures on sewerage systems will be taken including construction of retention storages on sewerage system.

After the 2013 highest flood water level ever recorded in the Danube, it became evident that most of the settlements along directly at the Danube banks are subject of the flood hazard maps. These populated places were known formerly as the housing and industry placed on high-grounds which settles above the design flood levels and possibly not be inundated. Full reconsideration was needed due to the new calculations that had been carried out accompanying the measured discharge and water levels in June, 2013. At the end of 2013 the Hungarian Government decided to assign the task of creating municipality defence plans for water-related damages, to the regionally responsible Water Directorate for those settlements that are located on open floodplains. This duty was covered and financed by the local municipality before the decision but the quality and content was very diverse. In 2014 from state budget approx. 160 plans were carried out coherently based on the manual defined by the Hungarian Engineering Chamber. The documentation deals with the hydrological circumstances of the settlements, main characteristics of the rivers and creeks or ground water table around them. It defines the operative tasks in case of different levels of alert for the municipality organisations and the most important legislative information is given to the mayors. Furthermore with annexes the official documentation guidelines and preparatory activities, development possibilities are reflected as well. The full plan contains textual and map information.

In Hungary the basic planning units of the flood risk management plans are the embanked floodplains. These areas have the threat to be inundated by fluvial floods or by groundwater floods (inland excess water). The numbers of the designated areas are 151 and 90 respectively and they are stated in the legislation. These coverages overlap with municipality and county borders, institutional operational borders, furthermore in some cases the national border, but each of them is handled by only one Water Directorate. The Water Directorates are responsible for constructing the plans, coordinate the local and regional discussions with contributing parties and the wider audience.

The EU Flood Directive in Article 10 declares that 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. In Hungary the links are the following:

PFRA: <http://www.vizugy.hu/index.php?module=content&programelemid=1&id=826>

FHRM: <http://www.vizugy.hu/index.php?module=content&programelemid=62>

FRMP: <http://www.vizugy.hu/index.php?module=vizstrat&programelemid=145>

The Directive also says that Member States shall encourage active involvement of interested parties in the production, review and updating of the flood risk management plans. The Directive has been implemented to the national law in the 178/2010 (V.13.) governmental decree. In the 10§ (2) section the legislation obligate the involvement of the Regional and National Water Management Committees for the development process. The 13. § (2) section instructs the designer to organize information exchange platforms and discussion forums for the affected population. It also emphasizes the need for the strong connection to the institutes that are dealing with the accomplishment of the Water Framework Directive. From the beginning of 2014 these task are also the responsibility of the Water Directorates, so the cooperation is fundamental. The national flood risk management plan has to be approved by the Government.

The negative process taking place in riverbed caused higher flood levels and decreased our flood protection facilities. This fact and high cost of flood protection developments needed to

improvement of the conveyance capacity of the flood bed. Making of the *Flood riverbed management plans* specify Act LVII of 1995 on water management and the preparation of the planning ordered by the 83/2014. (III.24.) government regulation.

The aims of the flood riverbed management plans are reducing flood levels, keeping or repairing capacity of riverbed and ensure the flood protection safety.

The flood riverbed management plans are made for 67 river section. In the plans determined in flood perspective primary, secondary, temporary, and dead zones in the flow.

The technical content of the flood riverbed management plan documentation has been completed. The registration of the flow zones into the parcel numbers is in progress. The action plans in the riverbed management plans are implemented after the law enforcement, which action is not depends on the water sector.

2.5. Flood risk management objectives for Tisza River Basin in Serbia

The strategic objective of protection from adverse effects of water, in **Serbia**, is to provide protection from fluvial floods and excess inland waters and protection against erosion and torrents, in order to reduce the harmful effects on human health, the environment, cultural heritage and economic activities.

The specific objectives, as defined in a draft *Flood Risk Management Plan for the Territory of the Republic of Serbia*, are:

- Development of the fluvial floods protection system;
- Efficient and coordinated operational defence against fluvial floods;
- Efficient and coordinated defence against ice and icy floods;
- Regular maintenance and control of hydraulic structures for fluvial floods protection;
- Efficient and continuous monitoring and forecasting of hydro meteorological phenomena;
- Adequate utilization of water land and potentially flooded areas;
- Improvement of water retention in the basin;
- Creation of a legal framework for the improvement of protection against erosion and torrents;
- Improvement of conditions for the protection against erosion and torrents;
- Monitoring of the status and maintenance of structures and works for the protection against erosion and torrents;
- Improvement of excess inland waters protection system;
- Efficient and coordinated operational defence against excess inland waters;
- Regular maintenance and control of hydraulic structures for protection against excess inland waters;
- Flood Recovery.

Chapter 3 Flood risk management objectives at Tisza River Basin level

Tisza River Basin has an important impact in the Danube River Basin on all socio, cultural, environmental and economical aspects, taking into account that is the largest sub-basin in the Danube River Basin and the longest tributary of the Danube (966 km). Being aware of this importance and assuming the coordination role among the Danube countries including EU Member States, accession countries and other Danube riparian states, in the process of WFD and FD implementation, ICPDR has been very actively involved in sub basin planning activities.

Considering the contribution of Tisza river basin at the general perspective of Danube River Basin and the need to have an integrated and correlated strategy among the Danube countries, it has been agreed that Flood risk management objectives set out for the Tisza River Basin will have to follow the same objectives set out at level of Danube River basin, respectively:

- Avoidance of new risks;
- Reduction of existing risks;
- Strengthening resilience;
- Raising awareness;
- Solidarity principle.

Setting the same objectives for both international river basins can ensure the framework for a joint working effort of all riparian countries in achieving the same goals, who will eventually lead to reduction of the risk of adverse consequences for human health and life, environment, cultural heritage, economic activity and infrastructure associated with floods.

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The countries of the Tisza river basin, follows the same principle in terms of flood risk management objectives. These objectives are focused on reducing potential negative effects of floods on human health, the environment, cultural heritage and human activity for areas identified as having a significant potential flood risk.

In order to achieve the specific objectives of the Tisza Flood Risk Management Plan, within the deliverable 5.2.2 *“Summary of the flood risk management proposed measures - Integrated Report for Tisza River Basin”*, will be proposed flood risk management measures to cover the five areas of action which are in close connection with the flood risk management cycle: prevention, protection, training and public awareness.

With regard to the prioritization of the measures to be proposed in the next step of the Activity 5.2 is necessary that at the level of the Tisza river basin to develop a methodology for prioritizing flood risk management measures common of the 5 countries tributary to the Tisza River.

References

■ Ukraine

Про затвердження Загальнодержавної цільової програми розвитку водного господарства та екологічного оздоровлення басейну річки Дніпро на період до 2021 року (2013) <http://zakon3.rada.gov.ua/laws/show/4836-17> (On approval of the National Targeted Program for Water Management Development and the Environmental Rehabilitation of the Dnipro River Basin for the period till 2021)

Розпорядження Кабінету Міністрів України від 25 лютого 2015 р. № 132 «Про схвалення розроблених Державною службою з надзвичайних ситуацій планів імплементації деяких актів законодавства ЄС» (Resolution of the Cabinet of Ministers of Ukraine of 25 February 2015 №132 "On approval of developed by the State Emergency Service of Ukraine plans to implement some legislative acts of the EU") http://www.kmu.gov.ua/document/247983992/Dir_2007_60.pdf

Reports of the EU project "Support to Ukraine in approximation of the EU environmental acquis" <http://env-approx.org/index.php/en/reports.html>

■ Romania

Flood Risk Management Plan for the Danube River Basin District, Version 2, International Commission for the Protection of the Danube River (ICPDR), 2014

NIHWM Studies – Studies for the implementation of Directive 2007/60/EC regarding the "Assessment and Flood Risk Management", 2013, 2014

Plan de gestion des risques d'inondation dans le District Hydrographique International Rhin, Commission Internationale pour la Protection du Rhin, Décembre 2014

Report of the WGF and STAR-FLOOD Workshop on Objectives, Measures and Prioritisation Workshop, D. Hegger (STAR-FLOOD), M. van Herten, T. Raadgever (STAR-FLOOD), M. Adamson (OPW, IE), B. Näslund-Landenmark (MSB, SE), C. Neuhold (BMLFUW, Austria), April 2014.

Guideline for objectives of Flood Risk Management and financially balanced programme of measures, The European Union Twinning Project for Turkey "Capacity building to implement the Flood Directive" TR 10 IB EN 01.

■ Slovak Republic

Ministry of Environment of the Slovak Republic. 2015. Flood risk management plan in Slaná river sub-basin. 314 p.

Ministry of Environment of the Slovak Republic. 2015. Flood risk management plan in Bodva river sub-basin. 191 p.

Ministry of Environment of the Slovak Republic. 2015. Flood risk management plan in Hornád river sub-basin. 611 p.

Ministry of Environment of the Slovak Republic. 2015. Flood risk management plan in Bodrog river sub-basin. 826 p.

Ministry of Environment of the Slovak Republic. Flood maps. [cit. 2017-04-06]. Bratislava, 2017. URL: <http://www.minzp.sk/sekcie/temy-oblasti/voda/ochrana-pred-povodnami/manazment-povodnovych-rizik/povodnove-mapy.html>.

■ Hungary

ICPDR – Flood Risk Management Plan for the Danube River Basin District

ICPDR – ICPDR Flood risk Management Plan: ANNEX 2 Overview of measures

ÁKK - <http://www.vizugy.hu/index.php?module=vizstrat&programelemid=145>

Károly Gombás – Implementation of the Flood Directive in Hungary 13th of October in 2015, 28th FP-EG meeting, Budapest

Károly Gombás - Implementation of the Flood Directive in Hungary Flood risk management plan 10th of May in 2016, 29th FP-EG meeting, Belgrade

ICPDR – Integrated Tisza River Basin Management Plan

■ Serbia

Draft Flood Risk Management Plan for the Territory of the Republic of Serbia (Republic of Serbia Ministry for agriculture, forestry and water management – Water Directorate, 2017)

ICPDR – Integrated Tisza River Basin Management Plan

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Partners: General Directorate of Water Management, Hungary | Global Water Partnership Central and Eastern Europe, Slovakia | International Commission for the Protection of the Danube River | Ministry of Water and Forests, Romania | Ministry of Foreign Affairs and Trade, Hungary | National Administration "Romanian Waters", Romania | National Institute of Hydrology and Water Management, Romania | Public Water Management Company "Vode Vojvodine", Serbia | Regional Environmental Center for Central and Eastern Europe, Hungary | The Jaroslav Černi Institute for the Development of Water Resources, Serbia | Water Research Institute, Slovakia | World Wide Fund for Nature Hungary

Associated Partners: Interior Ministry, Hungary | Republic of Serbia Ministry of Agriculture and Environmental Protection - Water Directorate | Secretariat of the Carpathian Convention (SCC), Austria | State Agency of Water Resources of Ukraine | Tisza River Basin Water Resources Directorate, Ukraine