



*Water Contingency Management in the Sava River Basin*

**Strategy for implementation of  
protocols to the FASRB - response of  
civil protection authorities and water  
management administration**

**Output Number T1.1.**

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## 1 List of abbreviations

AEWS	Accident Emergency Warning System
APSFR	Areas of Potential significant Flood Risk
ARSO	Slovenian Environment Agency
BiH	Bosnia and Herzegovina
DC	Danube Commission
DRAS	Disaster Risk Analysis System
DRSV	Slovenian Water Agency
EC	European Commission
EU	European Union
EU WFD	European Water Framework Directive
FASRB	Framework Agreement on the Sava River Basin
FEWS	Flood Early Warning System
FFWS	Flood Forecasting and Warning System
FRMP	Flood Risk Management Plan
GIS	Geographic Information System
HIS	Hydrological Information System
IAP	Incident Action Plan
ICS	Incident Command System
ICT	Information and Communication Technology
ICPDR	International Commission for Protection of Danube River
IED	Industrial Emissions Directive
ISRBC	International Sava River Basin Commission
NICS	Next generation incident system
NWP	Numerical Weather Prediction
PEG	Permanent expert group

PEG APC	Permanent expert group for accident prevention and control
PEG FP	Permanent expert group for flood prevention
PEG NAV	Permanent expert group for navigation
PEG RMB	Permanent expert group for river basin management
PIAC	Principal International Alert Center
POM	Programme of Measures
RBMP	River Basin Management Plan
SCADA	Supervisory Control and Data Acquisition
UN	United Nations
UNECE	United Nations Economic Commission for Europe
UZRS	Civil Protection and Disaster Relief
VIS	Water information system (abbreviation in original language for: Vodni informacioni sustav)
WACOM	Water Contingency Management in the Sava River Basin

## 2 Introduction

To facilitate effective implementation of protocols to the *Framework Agreement on the Sava River Basin* (FASRB), it is necessary to develop strategy, which will ensure understanding of relevant stakeholder's responsibilities and roles in the implementation process. This strategy refers to expected activities of civil protection authorities and water management administrations in the Sava River Basin, which in the case of incidents and accidents (referring to the entire disaster management cycle, thus including the segment of preventive activities) should have clear procedural framework for the efficient and effective response.

Taking into account existing invested efforts and realized achievements that are made so far (and which are gathered through WACOM project in format of *National Response Practices Analysis*), the aim of this strategy is to provide an overview, which could additionally steer the states and processes, motivate transfer of best practices and in that way achieve more complete implementation of FASRB protocols. The strategy encompasses the existing practices and procedures (also taking into account EU and regional mechanisms), on one hand, but on the other hand furthermore elaborating the role of national institutions in the event of transboundary accidental pollution and floods.

The structure of the *Strategy for implementation of protocols to the FASRB – response of civil protection authorities and water management administration*, consists of four segments:

- 1) Framework of legal background that encompasses the transboundary cooperation and establishes the basics of legal and institutional framework for the cooperation;
- 2) Listed strategic objectives of FASRB and measures according to the priority areas;
- 3) Implementation potential of FASRB protocols – through state of implementation with ISRBC coordination and stakeholder's involvement – which actors are involved in the implementation of the protocols, their operational procedures and;
- 4) Suggestions of further improvement under mutual and multinational cooperation framework.

## 3 Legal background

### 3.1 International cooperation

As the first development-oriented multilateral agreement of the region, *Framework Agreement on the Sava River Basin*, was signed by the Parties on the 3 December 2002 in Kranjska Gora, Slovenia and ratified in 2004 – representing a foundation for a cross-border cooperation of governments, institutions and individuals towards sustainable development of the Sava River Basin (Sava Commission, 2021).

Therefore, in respect to the stipulates of the FASRB, the transboundary cooperation is of vital importance and its Parties (Slovenia, Croatia, Bosnia and Herzegovina, and Serbia) should undertake measures to prevent or limit hazards and reduce and eliminate adverse consequences of floods and incidents involving substances to water. Those countries are also obliged to establish a coordinated or joint system of measures, activities, warnings, and alarms in Sava River Basin for extraordinary impacts on the water regime, such as sudden and accidental pollution, discharge of artificial accumulations and retentions caused by collapsing or inappropriate handling, flood, ice, drought, water shortage, and obstruction of navigation.

Determined by the FASRB, The International Sava River Basin Commission (ISRBC) which is the international partner of the WACOM project, is a responsible body for the implementation of the FASRB. It coordinates the activities of the Parties in establishment of an international regime of navigation, establishment of sustainable water management and undertaking of measures to prevent and limit hazards.

In those activities, for reduction of environmental risks related to accidental pollution and floods (especially with transboundary impacts) two protocols should be implemented, which are developed under FASRB umbrella – the *Protocol on Flood Protection* and *Protocol on Emergency Situations*. The *Protocol on Flood Protection*, which was signed in Gradiska (BA) on June 1, 2010 and entered into force on November 27, 2015. Regarding the *Protocol on Emergency Situation*, the draft text has been adopted by the ISRBC and distributed to the Parties for final review. Final harmonization of the Protocol is expected in near future.

#### 3.1.1 Protocol on Flood Protection to the FASRB

The *Protocol on Flood Protection* formalizes a firm commitment of the Parties to the FASRB to further cooperate in implementing joint activities aimed at improvement of flood protection in Sava River Basin, via their joint platform – Sava Commission and to undertake all necessary actions related to the preparation of joint flood risk management plan, establishment of flood forecasting and warning system, exchange of information relevant for sustainable flood protection, as well as undertaking any other agreed activities that can contribute improvement of flood protection in the basin. The Protocol regulates issues of sustainable flood protection with aim to prevent or limit flood hazard, to reduce flood risk and to reduce or mitigate detrimental consequences of floods.

According to the Protocol, the countries shall cooperate on development of *Flood Risk Management Plan in the Sava River Basin*, establishment of the *Flood Forecasting, Warning and Alarm System* (both elaborated in following sub-section 2.1.1.1 and 2.1.1.2 of this Strategy) and exchange of information significant for sustainable flood protection among others on the basis of *Directive 2007/60/EC – Flood Directive*. The Parties should also undertake appropriate measures for establishment and maintenance of preparedness, as well as measures related to flood defense emergency situations. These measures also include the measures for mitigation of transboundary impacts. In case of flood emergency, the affected Party(ies) may request assistance from other Parties. The implementation of the Protocol is coordinated by the ISRBC as defined by the FASRB.

### 3.1.1.1 Sava Flood Risk Management Plan (Sava FRMP)

At the 8<sup>th</sup> Meeting of the Parties to the FASRB, held in Sarajevo on October 24, 2019 the 1<sup>st</sup> Sava Flood Risk Management Plan (Sava FRMP) was approved. It represents a milestone in the cooperation of the Parties leading towards fulfilment of one of the main objectives of the *Framework Agreement on the Sava River Basin* – to prevent or limit hazards and reduce and eliminate adverse consequences, including those from floods. In the Sava FRMP structural and non-structural measures are defined as to contribute to meeting the commonly agreed objectives – avoidance of new flood risks, reduction of existing flood risks during and after floods, strengthening resilience, raising awareness about flood risks and implementing solidarity principle. Coordination mechanisms at the Sava River Basin level and cooperation in case of extraordinary flood defense are also analyzed, with recommendations for improvements.

### 3.1.1.2 Flood Forecasting and Warning System for the Sava River Basin (Sava FFWS)

Sava FFWS is a common flood forecasting platform as added value to existing national systems based on the Delft-FEWS platform and is implemented as an open shell for managing the data handling and forecasting process, allowing a wide range of external data and models to be integrated. This concept is particularly important for five cooperating Sava countries, where different models are in use. Sava FFWS integrates various numerical weather prediction models, available weather radar and satellite imagery, outputs of the existing national forecasting systems, different meteorological, hydrological, and hydraulic models which are easily ‘plugged’ into a common Sava FFWS platform.

Sava FFWS integrates *Sava Hydrological Information System (SavaHIS)*, as a data hub for collection of real-time observed hydrological and meteorological data. Within Sava FFWS, 8 *Numerical Weather Prediction (NWP)* models are used as meteorological inputs and contain different hydrological models already in use in the Sava River Basin.

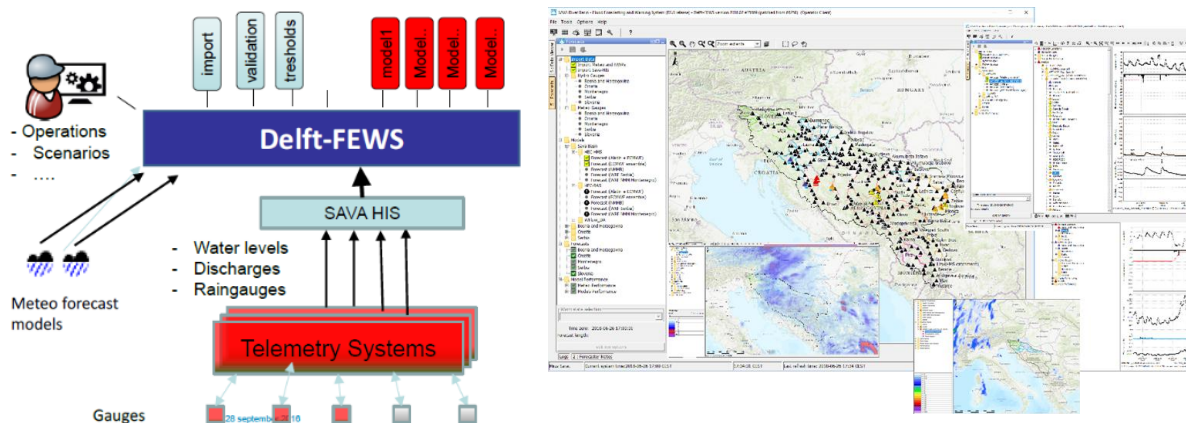


Figure 1: The scheme of FFWS functioning in case of floods

### 3.1.2 The Draft of Protocol on Emergency Situation to the FASRB

The *Draft of Protocol on Emergency Situations to FASRB* comprises several goals aimed at the identification of hazardous activities, their character and possible consequences, prevention, emergency planning and preparedness, adequate alarm and warning system compatible with already existing systems on the wider basin level, assessment of extraordinary impacts,



emergency response and mutual assistance of the Parties. As previously mentioned, it still needs to be finally harmonized, yet the preconditions and requirements for the implementation are set. As well as the *Protocol on Flood Protection to the FASRB*, it prescribes which tools are used in implementation of the protocols (described below).

### **3.1.2.1 Accident Emergency Warning System (AEWS)**

The AEWS is an internet-based information system which operates in the whole Danube River Basin including the Sava River Basin and has been developed and is maintained by the International Commission for Protection of Danube River (ICPDR).

The general objective of the AEWS is to increase public safety and protect the environment in the event of an accidental pollution by providing early information for potentially affected riparian countries.

The specific objectives of the Danube AEWS are:

- Prompt receiving, processing and transmission of information of pollution caused by dangerous substances which entered surface waters accidentally and which may cause significant adverse transboundary impact;
- Prompt dealing with and communication of information on emergencies that may take place in the rivers of the Danube River Basin.

The system has the capability to warn national services in charge of handling emergencies promptly so that they can take action to contain danger, ascertain the cause, find those responsible for the accident, rectify the damage and avoid other consequences.

The AEWS is activated whenever there is a risk of transboundary water pollution, or threshold danger levels of hazardous substances are exceeded. The AEWS sends out international warning messages to countries downstream. This helps the authorities to put environmental protection and public safety measures into action.

All countries having the status of an ICPDR Contracting Party cooperate within the AEWS structure. Principal International Alert Centers (PIACs) in these countries are the central points of the basin-wide cooperation with three main tasks:

- Communication about reported accident pollution of the Danube River Basin waters;
- Expert involvement to assess the effects or impact of the reported accidental pollution;
- Decision making on actions to be taken.

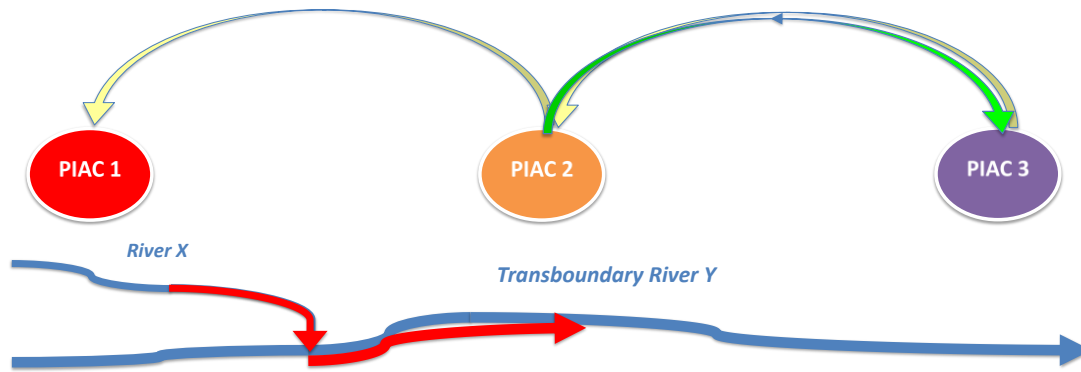


Figure 2: The scheme of AEWS functioning in case of transboundary pollution

According to the *Draft of Protocol on Emergency situations*, Article 7, in the event of an emergency situation, or imminent threat thereof, the Party of origin shall ensure that affected Parties and the Sava Commission are, without delay, notified at appropriate levels through the alarm and warning systems. Such notification shall include the elements which are required by *Alarm Emergency Warning System* (ISRBC, 2021: 30).

The *Draft of Protocol on Flood Protection* and *Protocol on Emergency situations* are the basis of the establishment of cooperation mechanisms in the event of emergencies, from flood to water pollution. Considering the crisis management cycle, focus is on prevention and preparedness in accordance with which both objectives and measures of FASRB are implemented (as described in Section 3).

### 3.2 Compliance with EU strategic documents and legislative frameworks in the region

The *Protocol on Flood Protection to the FASRB*, itself, emphasize the importance of compliance with international strategic documents. It is stipulated in Article 3, stating that “the Parties shall, in planning and implementation of measures, works and activities on sustainable flood protection in the Sava River Basin, cooperate on the basis of the *Directive 2007/60/EC*, taking into account the *Action Program for Sustainable Flood Protection in the Danube River Basin* and taking into account the good practices in cooperation in the field of flood protection in the Sava River Basin” (Sava Commission, 2014:3). Considering that flood defense practices across Europe vary, the *Directive 2007/60/EC* therefore ensures availability of information on practice regarding the participation of all stakeholders in the flood defense system, as well as details and accuracy of flood risk information.

Another important consideration, previously mentioned, is the interconnection of the experience across multiple basins in addressing flood challenges. Flood risk, having in mind that river basins extend through territory of several countries, requires close and effective cooperation between countries. It would be beneficial to create mechanisms, which could be commonly applied; to develop an integrated approach to build operational capacity; and to conduct a joint evaluation of measures to achieve the objectives of flood risk management. For that process, support can be found also in the *Framework Agreement on the Sava River Basin* (FASRB) where in the Article 5, under the realization of the Agreement is mentioned the cooperation with:

- a. The International Commission for Protection of Danube River (ICPDR)

- b. The Danube Commission; (DC)
- c. The United Nations Economic Commission for Europe, (UNECE) and
- d. Institutions of the European Union. (Framework Agreement on the Sava River Basin, 2002:5).

Regarding the last one, institutions of the European Union, it is important to emphasize that not all International Sava River Basin Commission parties are members of EU, and those who are not, they are all in EU integration process. Even before that status, all parties agreed to commit to the *EU Flood Directive* and *EU Water Framework Directive*.

Additionally, in the draft of *Protocol on Emergency Situations to the Framework Agreement on the Sava River Basin*, several relevant EU strategic and normative documents are mentioned:

- *Convention on the Transboundary Effects of Industrial Accidents*;
- *Convention on the Protection and Use of Transboundary Watercourses and International Lakes*;
- *UN's Code of Conduct on Accidental Pollution of Transboundary Inland Waters*;
- *Directive of the European Parliament and of the Council 2000/60/EC* establishing a framework for community action in the field of water policy;
- *Directive 2012/18/EU* of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC (ISRBC, 2021:1).

These documents are used as a reference in the development of the content of the protocol, which demonstrates good practice of taking existing documents into consideration when drafting new ones.

Observing the regional level, based on the analysis which the WACOM project conducted in Bosnia and Herzegovina, Croatia, Slovenia and Serbia, on normative documents in relation with civil protection/flood protection and water management, each country has developed strategies, laws and bylaws. All four countries have various strategies for those areas:

- national security strategies,
- strategies for protection and rescue in emergency situations,
- water management strategies,
- national flood defense plans,
- national plans of measures in the events of accidental and sudden water pollution,
- disaster risk assessments, and climate change adaptation strategies.

Some of laws (acts) and bylaws that are common for four countries are: *Civil Protection System Law*, *Water Law* and *Environmental Protection Law*. All countries has also developed comprehensive local and national protection and rescue plans and water management plans, which are important for mitigating flood risk.

Also countries have, alongside previously mentioned and common to all ISRBC countries international agreements, developed inter-agency (bilateral) protocols and international agreements addressing flood protection and accidental pollution. Some of the examples are: *Standard Operating Procedure for activities of Flood Protection and Rescue Operational forces* (Croatian inter-agency protocol); *Water Agency and Slovenian Environment Agency interagency protocol* (Republic of Slovenia) and *Agreement between the Government of the Republic of Croatia and the Government of Bosnia and Herzegovina on the regulation of water management relations*; *Disaster Preparedness and Prevention Initiative for Southeast Europe*; *Bilateral Agreement Between the Government of the Republic of Slovenia and Government of Republic of Croatia in the field of water management*; *Republic of Serbia Agreement on Cooperation in the Field of Emergency Situations with Bosnia and Herzegovina*, etc.

## 4 General strategic objectives of FASRB and priority areas measures

The key purpose of FASRB is to ensure transboundary cooperation in prescribed objectives: Establishment of an international regime of navigation on the Sava River and its navigable tributaries; Establishment of a sustainable water management in the Sava River Basin, and undertaking of measures to prevent or limit hazards, and reduce and eliminate adverse consequences, including those from floods, ice hazards, droughts and incidents involving substances hazardous to water (FASRB, 2002: 4). What is repeatedly important to emphasize, large river basins need to have a good and quality exchange of information between competent authorities and communities throughout the basin, as well as to improve their interoperability. Therefore, the FASRB is valuable Agreement, which can ensure stated claim – as it defines general principles of cooperation and data exchange by providing regulation, structure and procedures.

Accordingly, the objectives mentioned above will be presented in the subchapters 3.1., and 3.2., and the objective “establishment of an international regime of navigation on the Sava River and its navigable tributaries” will be further elaborated in accompanying Strategy for implementation of protocols to the FASRB - river navigation response (as part of WACOM’s Project Output Number T1.1).

### 4.1 Establishment of a sustainable water management

The aim, as the FASRB emphasize, is development of cooperation on management of the Sava River Basin water resources in respect to the sustainability and integration. It is stipulated in Article 11 of the FASRB that “the Parties agree to cooperate on management of the waters of the Sava River Basin in a sustainable manner, which includes integrated management of surface and ground water resources, in a manner that shall provide for:

- a. Water in sufficient quantity and of appropriate quality for preservation, protection and improvement of aquatic eco-systems (including flora and fauna and eco-systems of natural ponds and wetlands);
- b. Waters in sufficient quantity and of appropriate quality for navigation and other kinds of use/utilization;
- c. Protection against detrimental effects of water (flooding, excessive groundwater, erosion and ice hazards);
- d. Resolution of conflicts of interest caused by different uses and utilizations; and
- e. Effective control of the water regime” (FASRB, 2002: 7).

Also, special focus is on achieving environmental objectives of EU Water Framework Directive.

In order to achieve the expected aims and ensure continuous efforts of all stakeholders, there are two “instruments” developed for this purpose: the *Sava River Basin Management Plan* (Sava RBM Plan) and the *Programme of Measures* (PoM) at the basin level. In next section (Section 4.) dedicated to state of implementation, the actions undertaken for this achievement are underlined and further elaborated.

## 4.2 Prevention/limitation of hazards and elimination/reduction of related consequences

Implementation of measures to prevent or limit hazards, reduce and eliminate adverse consequences, as the third objective of FASRB, has its “foothold” in flood management and its segments: prevention, preparedness and response.

Foundations for deepening of cooperation in flood management can be found in *Protocol on flood protection to the FASRB* by which the following is agreed:

- preparation of the *Program for Development of the Flood Risk Management Plan* in the Sava River Basin;
- undertaking of the *Preliminary Flood Risk Assessment*;
- preparation the *Flood Maps*;
- development of the *Flood Risk Management Plan in the Sava River Basin*;
- establishment of the *Flood Forecasting, Warning and Alarm System in the Sava River Basin*;
- exchange of information significant for sustainable flood protection (ISRBC, 2010:4).

Further more, the *Protocol on Flood protection* stipulates in the Article 11, that countries shall undertake appropriate measures for establishment and maintenance of preparedness, as well as measures related to flood defense emergency situations. Also, they shall ensure that those measures include the measures for mitigation of transboundary impacts. Additionally it is emphasized that in case of flood defense emergency situations, each Party shall undertake the measures mutually agreed upon in the *Flood Risk Management Plan*, including the water level monitoring as long as the emergency impacts exist, and, there on, inform the countries on whose territory the flood emergency defense situation has arisen (ISRBC, 2010: 7).

All of the above mentioned activities have been partially or fully successfully implemented or being gradually implemented (as ongoing or planned activities) with appropriate stakeholders involvement. Here the special emphasis is on Permanent expert groups (PEGs) which are established for addressing key issues in navigation (PEG NAV), river basin management (PEG RBM), accident prevention and control (PEG APC) and flood prevention (PEG FP) and support the achievement of FASRB objectives.

By carrying out the activities outlined here, the preconditions for adequate flood protection are created, which will be based on the assumptions of the already developed *Flood Risk Management Plan* in order to strengthen the flood resistance in the Sava River Basin.

## 5 Implementation potential of FASRB protocols

As part of FASRB implementation, various activities were undertaken. In 2014, the *Sava River Basin Management Plan* (Sava RBMP) was adopted (taking into account *EU Water Framework Directive*), from which we can point out an overview of measures for water management issues (to be implemented on a basin-wide scale), as well as the presented possibilities of integration of water protection in developments in the Sava River Basin. As the ISRBC emphasizes, “the main strength of the Sava RBMP is that it has managed to closely match the requirements of the EU WFD and address all significant water management issues of the basin-wide importance, while establishing integrative principles for water management, and containing joint “Programme of Measures for the Sava River Basin” (ISRBC, 2021c). In preparation of this plan, a wide number of various institutions and experts were involved and because of that, it can be understood as joint effort in meeting the preconditions for more successful water management in the Sava River Basin. Most importantly, it testifies of the existence of an adequate level of awareness that the cooperation is one of the main factors of efficient implementation of the FASRB.

In 2019, the *Flood Risk Management Plan in the Sava River Basin* (Sava FRMP) is developed, which is aligned with requirements of *Directive 2007/60/EC*, on reduction and management of flood risks to human health, environment, cultural heritage and economic activity and also took into account effects of severe flooding from 2014. The objectives of Sava FRMP are: avoidance of new risks; reduction of existing risks; strengthening resilience; raising awareness; and implementing solidarity principle (ISRBC, 2019: 1). Sava FRMP also encompasses conclusions of preliminary flood risk assessment in Sava River Basin; flood hazard and risk maps with focus on mutual interest of ISRBC countries; catalogue of measures; mechanisms of coordination and cooperation in the flood emergency situations, and other relevant segments which are beneficial and usable to relevant stakeholders.

In general, alongside mentioned documents, an assessment of flood management practices was conducted from which the recommendations in the field of water management can be derived, various tools are developed – such as GIS map, hydrological and hydraulic models of Sava River, etc. Based on efforts done under the *Framework Agreement on the Sava River Basin* it can be said that it represents a good platform to exchange knowledge, experience and best practice, analyze them and shape into principles that have great implementation potential – local and regional. Also, it facilitates cooperation and improves it by connecting all ISRBC countries, and specifically institutions responsible for civil protection and water management.

### 5.1 Stakeholders – competent authorities and resources

As stipulated in the *Framework Agreement on the Sava River Basin*, national institutions (competent authorities) which are nominated by the Parties (i.e. ISRBC member countries) are responsible for FASRB implementation, under the coordination of the ISRBC which is also obliged for developing of common policy. As part of FASRB, competent national authorities are responsible for the implementation of *Protocol on Flood Protection* and further *Protocol on Emergency Situation* (as well as *Protocol on Navigation Regime*, which is not part of this Strategy).

Under ISRBC there is a number of bodies responsible for the implementation of the FASRB (a total of 20 institutions, according to the data on ISRBC Web Page). From Bosnia and Herzegovina, 9 responsible national bodies (Ministry of Communications and Transport of BiH; Ministry of Foreign Trade and Economic Relations of BiH; Ministry of Agriculture, Forestry and Water Management of the Republic of Srpska; Federal Ministry of Agriculture, Water Management and Forestry; Ministry of Transport and Communications of the Republic of Srpska; Federal Ministry of Transport and Communications; Ministry of Spatial Planning, Civil Engineering and Ecology of

the Republic of Srpska; Federal Ministry of Environment and Tourism and Government of the Brčko District), 2 from Croatia (Ministry of Sea, Transport and Infrastructure and Ministry of Economy and Sustainable Development); 5 from Republic of Serbia (Ministry of Agriculture, Forestry and Water Management; Ministry of Construction, Transport and Infrastructure; Ministry of Foreign Affairs; Ministry of Environmental Protection of the Republic of Serbia, Republic Hydro-meteorological Service; Republic Geodetic Authority) and 4 from Republic of Slovenia (Ministry of Foreign Affairs; Ministry for Environment and Spatial Planning; Ministry of Economic Development and Technology; Ministry of Infrastructure)

Without going into the analysis of the contribution of each institution in FASRB implementation, which is not the focus of this Strategy, we will just point out which of the stakeholders are most responsible for each area individually regulated by the flood protection and water management Protocols (civil protection and water management institutions). Those are also listed in Scheme 1.

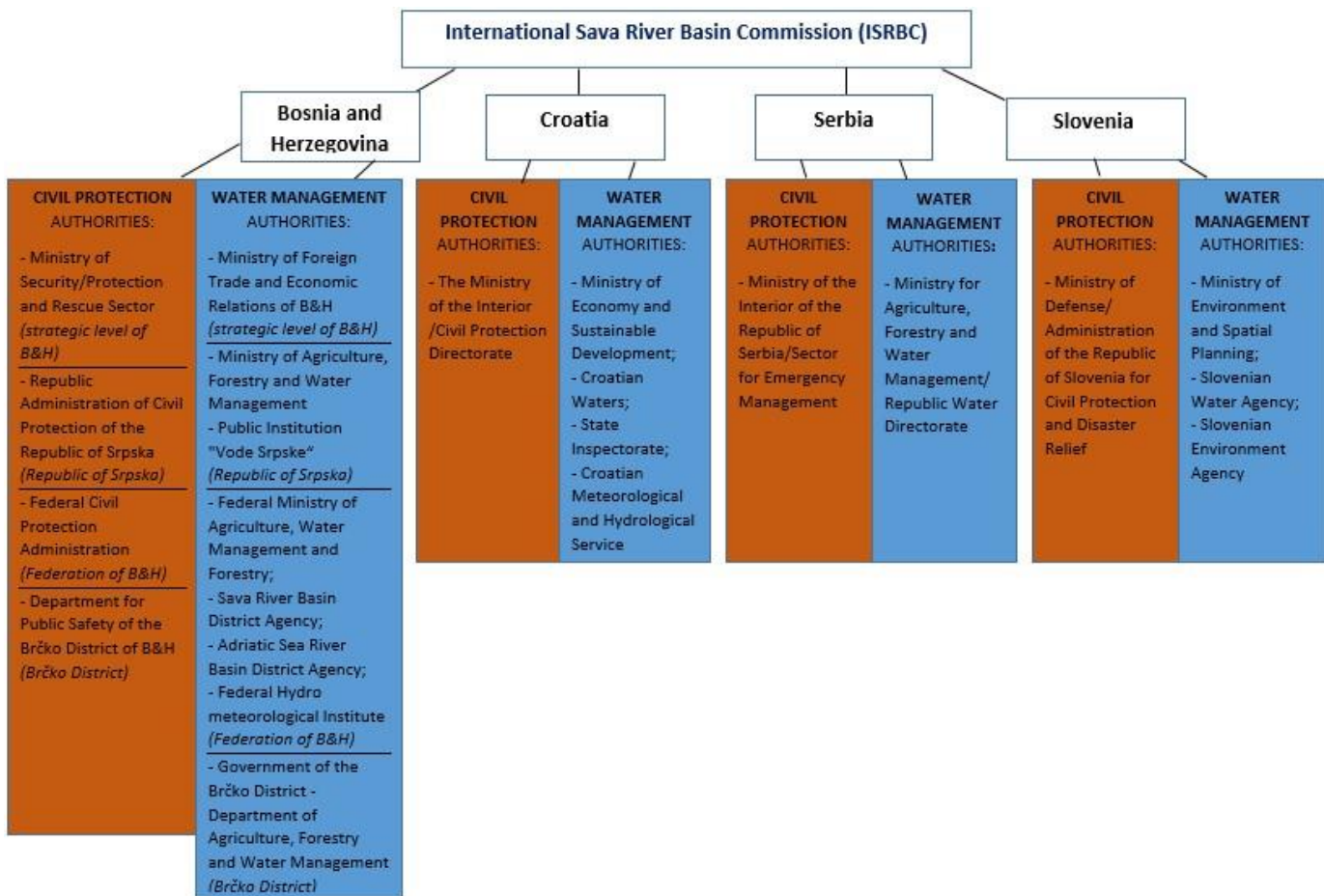


Figure 3: Schematic overview of institutions responsible for the implementation of the FASRB protocol

In **Slovenia**, in the field of civil protection, the strategic level is Ministry of Defense, and tactical level is Administration of the Republic of Slovenia for Civil Protection and Disaster Relief (UZRS) - a constituent body of the Ministry of Defense. At the operational level, there are UZRS branches operating throughout Slovenia, regional and local communities. In the field of water management

strategic level is a Ministry of Environment and Spatial Planning, and on the tactical level, competent authorities are Slovenian Water Agency and Slovenian Environment Agency. Operational level competent authorities are Regional and municipal civil protection headquarters (Slovenian water agency employees are members of these headquarters); state concessionary services; Local communities on artificial water reservoirs and spill surfaces for protection of urban areas; Holders of granted water rights; and different industries and public services.

In the field of water management strategic level is a Ministry of Environment and Spatial Planning. At the tactical level, competent authorities are Slovenian Water Agency (DRSV) and Slovenian Environment Agency (ARSO). DRSV and ARSO are bodies within the Ministry of Environment and Spatial Planning, and cooperation is of vital importance during floods and accidental pollution. Operational level competent authorities are Regional and municipal civil protection headquarters (Slovenian water agency employees are members of these headquarters); state concessionary services; Voluntary and professional fire brigades; Local communities on artificial water reservoirs and spill surfaces for protection of urban areas; Holders of granted water rights; Different industries and public services on different infrastructures and public private partners.

In Slovenian overview, we have noticed a relevant number of involved stakeholders in water management on operational level – not only of public, but also private sector with special attention to companies which are providing public service on 8 water management areas as concessionaires. As one of the most emphasized activities of FASRB implementation (public participation and stakeholder involvement) this can be pointed out as good practice.

In **Croatia**, for the civil protection (including accidental pollution and floods) at the strategic level competent body is the Civil Protection Directorate of the Ministry of the Interior that coordinates civil protection tasks on behalf of the state. At tactical and regional levels, the responsible bodies are the counties, while towns and municipalities are responsible at the local level. In case of accidental pollution in terms of civil protection, the strategic level is formed by the ministry in charge of water management - Ministry of Economy and Sustainable Development, the State Inspectorate, the Civil Protection Directorate and Croatian Waters (including the Main Flood Defense Centre). At the tactical level, tasks are performed by lower-level organizational units using the system 112. In case of water pollution by vessels, Croatian Waters monitor the implementation of measures from the aspect of water management, i.e. monitor the implementation of measures to avoid water status deterioration. At the operational level, there are accredited laboratories and authorized companies that have a solution for performing activities in this area.

In the field of water management, on the strategic level regarding floods is the Ministry of Economy and Sustainable Development, Croatian Waters (including the Main Flood Defense Centre), the State Inspectorate, the Croatian Meteorological and Hydrological Service and the Civil Protection Directorate. The tactical level is represented by the departments of Croatian Waters, other competent state administration bodies, regional self-government units and legal entities, certified companies for preventive, regular and emergency flood defense tasks, and reservoir managers. At the operational level, flood defense management is carried out at the level of defended areas. Defended areas are the basic units for the implementation of flood defense.

Key available resources in the field of civil protection in Croatia are in large number of members (professionals and volunteers) participating in the operational forces of the civil protection system, (fire brigades, Croatian Mountain Rescue Service, Croatian Red Cross) as well as civil protection brigades and commissioners, and associations of citizens and legal entities. The operational forces have significant material resources at their disposal, which are organized on the basis of identified risks, and supported by the Armed Forces of the Republic of Croatia, police and emergency medical responders. The cities, municipalities and counties are responsible for



coordinating the activities of participants of civil protection system and operational forces in their area of competence.

The main center for the implementation of the National Plan of Measures consists of the members from: the Ministry in charge of water management (currently the Ministry of Economy and Sustainable Development) and the State Inspectorate; the central state administration body in charge of protection and rescue (currently the Ministry of the Interior, Civil Protection Directorate) and Hrvatske vode (Croatian Waters). The functional units of the main center are the following: the Communication Unit (performs operational duty, reception and transfer of information) – seat at the Civil Protection Directorate; the Expert Unit (performs expert judgement of potential consequences of water pollution, organizes and coordinates the implementation of measures) – seat at Hrvatske vode (Croatian Waters); Decision-Making Unit (decides on the taking of necessary measures, proclaims the water risk level, and coordinates the work of the functional units of the Main Center) – seat at the Ministry in charge of water management. Regarding water management and accidental pollution, there is a system of (24/7) shift workers of the functional units. Croatian Waters who are equipped with a basic set of equipment. Companies that perform remediation of accidental pollution have a sufficient number of employees with adequate expertise, basic and additional equipment for performing activities and permits related to waste management. Also, these companies have a 24-hour standby.

Regarding water management in the part of flood protection, equipment and technical means are stored in field flood protection centers and special warehouses of Croatian Waters.

In this overview of procedures, resources and tools in civil protection and water management fields of Croatia, especially it needs to be emphasized the cooperation of two competent bodies, each for their field of expertise – Civil Protection Directorate of Ministry of the Interior and Croatian Waters which are the example of good practice and should be applied in other countries of Sava River Basin.

For **Bosnia and Herzegovina**, it should be taken into account that the Civil Protection System and Water Management System is structured in accordance with the political system, and competencies are divided on the basis of established administrative-territorial units. There are several levels of government: level of Bosnia and Herzegovina; entity level – Republic of Srpska (unitary) and the Federation of Bosnia and Herzegovina (divided into cantons); and district level - Brcko District of Bosnia and Herzegovina.

Competent bodies in the field of civil protection at the level of Bosnia and Herzegovina are: the Council of Ministers of Bosnia and Herzegovina, i.e. the Ministry of Security; while at the entity level the competent bodies and services are the Republic Civil Protection Administration of the Republic of Srpska, the Federal Civil Protection Administration; and at the Brcko District level – Department for Public Safety. As for the institutions of Bosnia and Herzegovina, the holder of tasks and duties in the field of civil protection is the Ministry of Security of Bosnia and Herzegovina, which performs its role through the Protection and Rescue Sector. At the level of the Republic of Srpska, the competent bodies at the strategic, operational and tactical level are the Government of the Republic of Srpska and the Republic Administration of Civil Protection of the Republic of Srpska. At the level of the Federation of BiH, the competent bodies at the strategic, tactical and operational level are the Parliament of the Federation of BiH, the Government of the Federation of Bosnia and Herzegovina and the Federal Civil Protection Administration. For the Brcko District, the competent authorities are the Government of the Brcko District of BiH and the Department for Public Safety of the Brcko District of BiH (for the area of the Brcko District of BiH).

In the field of water management, on the level of Bosnia and Herzegovina, Ministry of Foreign Trade and Economic Relations of BiH is responsible for the coordination of activities and harmonization of plans of entity authorities and institutions at the international level - in the areas

of environmental protection, development and use of natural resources, which also includes coordination of activities in water management. In the Republic of Srpska, the water management bodies are the National Assembly of the Republic of Srpska, the Government of the Republic of Srpska, the Ministry of Agriculture, Forestry and Water Management and the Public Institution "Vode Srpske". The following bodies are competent in the Federation of Bosnia and Herzegovina: Federal Ministry of Agriculture, Water Management and Forestry - Water Sector, Sava River Basin District Agency, Adriatic Sea River Basin District Agency, and Federal Hydrometeorological Institute, and for Brcko District: the Government of the Brcko District of BiH - Department of Agriculture, Forestry and Water Management. The Federal Civil Protection Headquarters decides on the use of federal forces and means of civil protection and allocates them to endangered areas - the available resources are activated in accordance with the Protection and Rescue Plan of the Federation of BiH.

Regarding the available resources, at the strategic level of Bosnia and Herzegovina, according to the Assessment of the threat from natural and other disasters of Bosnia and Herzegovina, including floods and accidental pollution, no forces have been organized and resources have been procured (at the time of the incident, BiH rely on the support of the Ministry of Defense and the Armed Forces). In the area of civil protection at the level of the Republic of Srpska, cities and municipalities, in accordance with the assessments of the threat from natural disasters and other accidents forces for flood response are formed and funds procured. The Republic of Srpska, through its competent bodies, conducts active defense activities and implements protection and rescue measures in cases of floods or pollution. At the federal level, in accordance with the *Assessment of Vulnerability to Natural and Other Disasters of the Federation of BiH*, protection and rescue services have been established to respond to floods and accidental pollution, which are filled with people, but are partially equipped and trained. Also in area of civil protection at the level of the Brcko District of BiH, in accordance with the relevant regulations, forces have been formed to respond to floods. In terms of resources in water management, in Bosnia and Herzegovina, water management is primarily the responsibility of the entities and the Brcko District of BiH. At the level of Republic of Srpska, in case of accidental water pollution, equipment and personnel are managed by the relevant Ministry of Agriculture, Forestry and Water Management together with professional services of the Public Institution "Vode Srpske" in cooperation with the Republic Water Inspector, Republic Administration of Civil Protection. Through its Constitution, has defined the competence over the management, rational use and protection of water in an integral manner and in the general interest.<sup>1</sup>. At the level of the Federation of BiH, the *Federal Operational Plan for Incidental Pollution of the III degree of endangerment* has formed functional groups. The Agency for the Sava River Basin - Sarajevo has the means to enable the on-site investigation, equipment for documenting the situation on the ground, personal protective equipment and equipment for testing water quality. In the area of civil protection in the Brcko District of BiH, in accordance with the assessment of the threat from natural and other disasters and floods, forces were formed and funds were procured to respond to accidents.

Although there are various challenges in implementation of civil protection and water management procedures (which are also accordant to the FASRB protocols), such as lack financial resources for the procurement and equipping of competent authorities, it is evident that in the Bosnia and Herzegovina efforts are made and the initial framework is established.

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<sup>1</sup> The Law on Waters 2006 accepted the greatest values and knowledge from the water sector from this area, as well as the knowledge and experience of the modern European view on the manner of water management. This means that the law has followed an integrated management approach waters and thus defined key areas through: • characterization of waters, water resources and water facilities; • territorial water management with the development of Strategies, Programs and Plans; • use of water by abstraction for human use, irrigation, technological needs, use for electricity production, fish farming, navigation, sports, etc.; • protection of waters from pollution, definition of protected and sensitive areas and • protection from harmful effects of water, regulation of watercourses, etc.

In **Serbia**, in the field of civil protection regarding accidental pollution and floods competent body on strategic level is the Ministry of the Interior of the Republic of Serbia - Sector for Emergency Management which is responsible for the tasks in the field of civil protection related to prevention, preparedness, reaction and recovery.

In the field of water management related to accidental pollution and floods, the strategic level is the Ministry for Agriculture, Forestry and Water Management. Within the ministry is an administrative legal body - The Republic Water Directorate that performs activities related to: water management policy; multipurpose use of water; water supply except water distribution; water protection; implementation of water protection measures and planned rationalization of water consumption; regulation of water regimes; monitoring and maintaining the water regime that forms and crosses the border of the Republic of Serbia; inspection supervision in the field of water management as well as it performs other tasks in this field. At the tactical level, Republic and Province authorities are responsible for managing the first order water courses, while local authorities govern second order water courses (smaller rivers, streams, etc.). The most competencies and tactical responsibilities in management of the first order watercourses is entrusted to the public water management companies.

Key resources of civil protection in Serbia, are under the jurisdiction of the Sector for Emergency Management which has a number of limitations both in terms of human and technical capacities. Lack of trained staff and technical capacities within the Sector of Civil Protection is compensated by the engagement of police, army and firefighting forces in the emergency response actions. In water management, public water management companies possess flood prevention, control and protection equipment which is accordingly used but in which could be also further invested.

We can use the additional input that Serbia provided in the national analysis, which is based on the awareness of issues of national emergency management system - in terms of fragmentation of institutional framework and procedures, as well as insufficient capacities for the prevention, preparation and response to disaster. Not only in Serbian case, this is also seen on all other countries and it can be mirrored to challenges related to the FASRB implementation as well.

### **5.1.1 Operational procedures and tools used in civil protection and water management**

In **Slovenia**, operational procedures in the field of civil protection in relation to accidental pollution and floods are defined in the *National plan for Protection and Rescue* and based on the size of the affected area, the state, regional or local *Flood Protection and Rescue Plan* is applied. In case of floods, the Slovenian Environment Agency (ARSO) monitors and simulates the water levels and based on the forecast and classification of the expected flood event, different operational procedures are initialized. ARSO issues a hydrometeorological warnings in case of perceiving the possible emergency situations and informs the Notification Center of the Republic of Slovenia, which forwards the notifications to entities of individual area (Regional notification center commander of Civil protection, and others). Operational procedures include activation of forces at national level and tools for protection and rescue. In case of accidental pollutions in the preparation of protection and rescue plans for major accidents with hazardous substances, the plan is not defined at the state level, but at local level – municipalities and companies, institutions and other organizations.

For the area of water management, the operational procedures in case of accidental pollution are defined in line with the existing contingency plans for accidental pollution at state or regional level as well as at the level of individual stakeholders in the water management (e.g. hydropower plants). Each group involved in the response to accidental pollution events performs the activities

that are predefined and in line with the scope of their work (coordination, active involvement at site etc.). The same procedures are valid for the case of floods.

The tools which are used in Slovenia for the civil protection and water management needs are: Application for flood damage assessment AJDA; Program for approximate calculation of maximum dam brake wave flow PREGPORUS; different applications (System on reporting on interventions and incidents / disasters SPIN; A tool for quick response in case of oil-spill RAZLITJE; A tool regarding dangerous goods Nevarne snovi; System for monitoring SMOK); different kind of monitoring and communication tools; SCADA systems; and additionally on international level - Industrial Accident Notification System of the United Nations Economic Commission for Europe and AEWS are used, among others. Principal International Alert Centers are also part of 112 system in Slovenia.

In **Croatia**, the Civil Protection Directorate (in the field of civil protection) and Croatian Waters (in the field of water management) are in charge of monitoring all developments and events at any level (operational, tactical and strategic) and character (local, or transboundary). The main implementation tool that the Civil Protection Directorate has at its disposal are the 112 centers which are deployed in each county where they perform tasks, coordination, communication and sharing of information necessary for local and regional self-government, and report to the OCCZ (i.e. Civil Protection Operational Center), which coordinates the activities of the 112 centers and performs tasks of state importance. In parallel, the Main Flood Defense Centre as the central organizational unit of Croatian Waters is competent for the management of regular and emergency flood defense in accordance with the provisions of the *National Flood Defense Plan*. The Main Flood Protection Centre provides central management, main coordination, and establishes a system of communications and information on the situation in flood defense. [These](#) two institutions are complementary in activities in flood defense and have very close cooperation. In the events of strategic importance, the Civil Protection Directorate mobilizes its operational forces, while Croatian Waters, which do not have their own operational forces, activate their subcontractors. In the event of a large-scale danger, legal entities and citizens from endangered area are obliged to participate in flood defense. In case of incident on local level, the same operational logic is applied. In activities at the strategic level, other operational forces of the civil protection system are also included such as: Croatian Mountain Rescue Service, Croatian Red Cross and professional and volunteer fire-fighting brigades.

Croatian Waters have adopted the *Operational Plan of Measures of Croatian Waters* in case of accidental and sudden water pollution. The *Operational Plan of Measures of Croatian Waters* determines the measures of water protection in the following cases: Accidental pollution; Accidental pollution that does not require the declaration of the degree of endangerment of water; Accidental pollution for which the endangerment of waters is of I and II degree. Croatian Waters have also developed *Internal Procedures for the implementation of the Operational Plan of measures in the event of accidental water pollution*.

In case of the incident, operational procedures at state level of civil protection activities are coordinated by the Civil Protection Directorate, and water management is undertaken by Croatian Waters and State Inspectorate.

In the field of civil protection, various Monitoring and situational awareness tools/systems are in use. For monitoring and early warning system, the Civil Protection Directorate has the CoordCom IC system and the SFERA system in their 112 centers; as well as GIS support, the ZEOS system (Croatian version of ICS Geographic Information System) and NICS (Next Generation Incident Command System), which is in the development phase. In the field of water management, the ICT system or systems are not used in the accidental pollution, while flood defense monitoring systems – situational awareness and system for up-to-date monitoring of the hydrological regime

on watercourses and other waters in the Republic of Croatia has been established. Also, In the case of large-scale transboundary sudden pollution AEWS and PIAC are used.

In **Bosnia and Herzegovina**, in terms of civil protection, and related to operational procedures, within the Ministry of Security of Bosnia and Herzegovina, there is the Operational-Communication Center BiH 112, whose main role is coordination of communication between BiH institutions, entities and Brcko District of BiH, from the moment of receiving information on event to the completion of disaster response activities. In the Republic of Srpska, as well as at the state level of BiH, the framework law on protection and rescue of people and material goods from natural or other disasters in BiH is being complied with. There is The Republic Operational-Communication Center which operates under the *Decree on the Organization and Functioning of the System of Surveillance, Information and Operational Procedures in the Field of Civil Protection*, and the tools used are the Next generation incident system (NICS) as Disaster Risk Analysis System (DRAS) – UNDP's disaster risk analysis system, which is being implemented at the local level. In Federation of Bosnia and Herzegovina despite the lack of standard operative procedures in civil protection field, there is an established protocol of everyday use and exchange of data with the agencies for the water areas of the Sava River and the Adriatic Sea, the Federal Hydrometeorological Institute, as well as other providers of relevant information. The alert system is used as a tool, which is under the authority of the operational centers of civil protection of municipalities / cities and cantons and serves to inform and alert the population in emergency situations, and also like in the Republic of Srpska, NICS and DRAS tools. In the Brcko District of BiH, in case of floods with possible consequences for people and material goods, an alert and notification system is used as a tool, which is under the jurisdiction of the Public Security Department of the Brcko District of BiH.

In terms of water management, relevant is the Strategy of approximation to the EU acquis communautaire<sup>2</sup> in the field of environmental protection of Bosnia and Herzegovina, where the operational part of the activities lays on the entities, while the state defines policy, basic principles, coordinates activities and harmonizes plans of entity authorities and institutions internationally. The Republic of Srpska Integrated Water Management Strategy 2015-2024 is in force in the Republic of Srpska. The goal of the Strategy is to achieve unified management and fully harmonized water regime in the territory of Republic of Srpska, in each of its two regional river basins (Sava and Trebisnjica), through the creation of a legal framework for efficient functioning of the water sector. One of the main goals of the Strategy of Integrated Water Management of the Republic of Srpska 2015-2024 is to ensure sufficient quantities of quality water to supply water to the population. The procedure in case of incidents at the level of Republic of Srpska is described in the *Law on Waters*, and operational procedures included the *Flood Defense Plan in Republic of Srpska*. The tools, which are used are AEWS, PIAC<sup>3</sup> (it should be stressed that PIACs are operational 24/7 in SI and HR, only), FFWS platform, MIKE<sup>4</sup> system, and several national web applications developed by public institution "Vode Srpske". The Republic Hydrometeorological Institute issues warnings of possible extreme meteorological and hydrological events which are sent to all relevant institutions in the flood defense system, 2-3 days prior. In the Federation of Bosnia and Herzegovina, in the case of incidental pollution, the *Rulebook on Procedures and Measures in Cases of Accidents on Waters and Coastal Water Land* is followed. For the implementation of flood protection measures, during the immediate danger of high (flood) waters, during floods and elimination of the consequences of floods, operational flood defense plans are applied: Federal operational flood defense plan and cantonal operational flood defense plans. In case of occurrence of incidental pollution with possible transboundary consequences, the procedure is in accordance with the *Federal Operational Plan for Incidental Pollution of the III*

<sup>2</sup> Plant operators (potential polluters) are required by environmental regulations to install their own emergency notification and alert system.

<sup>3</sup> PIAC – Principal International Alert Centers

<sup>4</sup> A computer program that simulates in two dimensions flows, waves, sediments and ecology in rivers, lakes, estuaries, bays, coastal areas and seas.

*degree of endangerment*, and as tools AEWS, PIAC, WISKI<sup>5</sup>, FFWS platform, MIKE and operating system for the Una, Sana and Vrbas basins, are used. In Brcko District In case of incidental pollution, the *Environmental Protection Strategy of the Brcko District of BiH for the period 2016-2026* is followed.

The Republic of Srpska has a water information system-RVIS, which is a form of quality monitoring based on the technology of geographic information systems (GIS). Public institution "Vode Srpske", in the previous period, has financed the development of several WEB applications for entering alphanumeric data, which enable a simple and secure way of entering and overview of data:

- Application "Water cadastres",
- Application "Book of Waters",
- Application „Water management“, VIS module which consists of three submodules:
  - 1. Flood risk management plans, hazard maps and flood risk maps for the entire territory of Republika Srpska;
  - 2. Regional river basin management plans, and
  - 3. Erosions and torrents.

In addition to these web applications, Web GIS browsers have been developed that enable quick and easy display, review and analysis of spatial data. Data entered into the Water Information System (RVIS) are collected from republic bodies and organizations, local self-government units, economic entities whose activities have an impact on the water regime, public companies in the field of water management. Legal and natural persons have the right to get the insight in the Water Information System, and based on the request submitted to the Public Institution "Vode Srpske", they even have the right to use data from the VIS.

In **Serbia**, operational procedures in the field of civil protection are stipulated in the *Law on Disaster Risk Reduction and Emergency Management* which emphasizes mutual coordination, harmonized procedures and actions plans which should be based on cross-sectoral cooperation and exchange of information and experiences relevant to risk reduction. In practice, emergency management at the state level is regulated to coordinate and manage protection and rescue in emergencies, formed by emergency headquarters and the system is based on a gradual and local approach - crises are resolved first by the civil protection forces of the territory of the municipality or city where they occurred. In case that the incident surpasses the local capacities, civil protection forces from the Republic level are engaged.

In the water management, flood defense and operational procedures in case of floods are regulated by the *Law on Waters*. The Law envisages the development of a General Plan (scheme of institutional organization in flood defense management) and Operational Plan (containing data necessary for the operational implementation of flood defense, criteria for declaring flood defense, names of managers and names of flood defense entities, manner of alerting and notification) for Flood Defense. State-level flood defense include defense against high waters (external and internal) and ice congestion and can be regular or emergency. Local self-governments are in charge of flood defense on second-tier watercourses (Regional/local level) following the *Local Operational Plan for Flood Defense*. Operational procedures in case of accidental pollution are partially regulated by the *Law on Waters*, the *Law on Environmental Protection*, the *Law on Navigation and Ports on Inland Waters* and the *Law on Waste*. PWMC Srbijavode and Vode Vojvodine are responsible for the remediation of pollution accidents if the pollution originates from a neighboring country, from an unknown source or in the case when the polluter does not have its capacity to repair the damage.

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<sup>5</sup> A system for collecting, storing and controlling real time data

Related to the tools, in Serbia is used: Siren alarm system; Early warning system (Meteo alarm and Hydro alarm); Water information system (VIS); European Flood Awareness System; AEWS and PIAC.

When observing operational procedures and tools used in civil protection and water management in ISRBC countries it can be seen that they are in different phases of development and possibilities to achieve adequate level of both systems, although all countries work continuously on that. General strategic objectives of FASRB and priority areas measures are outlined in all member states. All countries use tools developed under FASRB and ISRBC, some of them (Serbian example) are stipulating in their legislation the principles of FASRB protocols, etc. It seems that the same denominator of the challenges is the lack of (firstly) financial and human national resources in implementation of objectives that are in compliance with FASRB. Additionally, which is in greater extent more possible to solve, is the necessity of further emphasis on the involvement of the international organizations, i.e. ISRBC, ICPDR, EU institutions, etc. in supporting efforts of their member states. Some of the ways will be suggested in the section on recommendations, among other relevant ways of facilitating FASRB implementation, such as increasing of operational capacities of PIACs in order to improve preparedness and response to emergency situations among all member countries – where it is fully developed in some (Croatia, Slovenia) and on the way of improvement in others (Bosnia and Herzegovina, Serbia).

## 6 Recommendations to FASRB protocol implementation – stakeholder’s oriented

When drafting strategies and protocols, as well as all other documents, the main focus should be placed on the potential of implementation of tools, plans and other segments of the documents that are being developed. In order to achieve the expected level of implementation, there should be some structured ways of engaging the competent national authorities in charge of achieving the objectives set by the common frameworks for cooperation.

**This Strategy is based on several basic assumptions (theses) in the analysis of the current situation:**

- I. **SOVEREIGNTY** – The existing systems in Slovenia, Croatia, Bosnia and Herzegovina and Serbia are based on sovereignty in shaping the concept of water management, flood defense systems, civil protection, and other relevant areas covered by the Sava River Basin Framework Agreement. Also, in all countries there is an legislative framework on the operational level, and it is strategically emphasized the importance of these areas in the relevant national documents (i.e. strategies). These are presented in more detail in the introductory part of this document.

The states of the Sava River Basin, through plans and other documents, prescribe the procedure and necessary measures related to the competencies of individual institutions, adjusted to the established systems in their countries. In action plans, if a certain incident occurs, it is important to determine and, in practice, implement a *chain of command* that defines responsibilities. At the top of the chain is the manager of the institution which is responsible for each of the areas of activity and who manages the teams in charge of the response. Adherence to the hierarchy defined by the chain of command and clearly defined tasks ensure better organization of response/reaction to the incident, characterized by coordinated action. The full functionality of such a chain is a challenge because solutions must be made at several levels and information must be adequately exchanged among all stakeholders. In addition to the chain of command, which is closely linked to the sovereignty of decision-making, attention should also be paid to maintaining span of control, both based on quality information with which national systems maintain "situational awareness".

The sovereignty allows states to develop and finance incident response capacities, within their own needs, but also based on the responsibility for their population and their material resources. What is the practice in most countries, is greater investment in operational capacity and activities, while less is invested in prevention - from early warning systems, database development, population education, spatial planning and development plans in general. Additionally, the need for further investment in incident management and coordination systems should be emphasized. On those issues, WACOM project also aims to raise awareness of the needs of the development and prevention segment among stakeholders (competent authorities for water management and civil protection) and better coordination at the transnational level in the event of transnational incidents.

- II. **DEVELOPING IMPLEMENTATION FRAMEWORK** - Considering transnational (multinational) perspective, bilateral and multilateral agreements (primarily the *Framework Agreement for the Sava River Basin*, but also relevant documents prescribed, such as the future *Protocol on Emergency Situations to the Framework Agreement on the Sava River Basin* and the *Protocol on Flood Protection to the Framework Agreement on the Sava River Basin*, which was emphasized earlier), they represent connective tissue which enables harmonization of instructions, rules and actions for the establishment of a quality



water management system between the countries in the Sava and the Danube Basins. Legally binding norms provide a general framework, but what the WACOM project recognizes as a challenge, it is necessary to provide an *implementation framework*. Agreement implementation can often be insufficiently successful, despite the fact that implementation monitoring mechanisms are prescribed, as is the case in both analyzed protocols. Practice shows that there is a greater possibility of implementation in countries that have adequate capacities (financial, human, etc.), while in other countries, despite the will and desire to implement the provisions of bilateral and multilateral agreements, this is not feasible due to lack of capacity.

In terms of harmonization of legislation and national methodologies that would facilitate the implementation of the *Framework Agreement for the Sava River Basin*, special emphasis should be placed on drafting and adopting all necessary planning documents and supporting those countries that have not yet drafted their documents. Flood risk assessments and plans should be adopted as well as comprehensive national and local flood emergency plans, before it is achieved at the international level. The focus should be on joint preparedness, which could include regular joint international civil protection and water management sector exercises, and discussions of lessons learned from real events in any of the above-mentioned formats (workshops, forums, conferences...).

- III. **IMPROVING RESPONSE BY IMPROVED INFORMATION EXCHANGE** – The conducted analysis of existing Agreements and Guidelines, as a particularly relevant segment, the exchange of information is highlighted in order to enable a better, faster and more integral response to incidents (primarily floods and pollution). An additional challenge in the event of an incident, can be badly structured and incomplete data or poorly managed databases and insufficient data exchange, so software solutions to support the water management system and civil protection system should be systematically developed and implemented. The same applies to the use of early warning data from international sources - from their acquisition to exchange. Protocols for receiving and transmitting information (on the state of river water levels, forecasts of extreme weather events, etc.) at all operational levels exist in the Sava River Basin countries.

An efficient and reliable flood forecasting and exchange of information and warnings system can significantly reduce the risk to people and property. For large river basins, good and quality exchange of information between competent authorities and communities, but also between institutions, is important. Therefore, it is necessary to further improve interstate water cooperation through a joint agreement on a single/unified forecasting and monitoring system (or model) to be agreed in advance between the parties as the main tool for information exchange within the basin.

It is necessary to highlight the activities of the Permanent Expert Group for Accident Prevention and Control (PEG APC) which supports the work of the International Sava River Basin Commission in implementing the *Framework Agreement on the Sava River Basin* and through the Principal International Alert Centers (PIAC) ensures exchange of information on measures for prevention of industrial accidents and extraordinary impacts on the aquatic ecosystem; coordinates the implementation of the Danube Emergency Warning System; and supports the upgrade of a coordinated or joint warning and alarm system in the Sava River Basin for extraordinary impacts on water and aquatic ecosystem, among other tasks. Primarily, the operation of the APC is reflected in testing and maintenance of Accident Emergency Warning System (AEWS) and updating hazardous facilities and locations whose operations may result in an incident. In 2019 ICPDR has adopted updated *AEWS Operations Manual* in order to increase the efficiency of the system in all countries in the Danube basin.

The activities of Permanent Expert Group for Flood Prevention (PEG FP) should also be highlighted. PEG FP is an expert body of the Sava Commission that deals with flood issues and prepares strategic documents for this area. Protocol on Flood Protection to the FASRB and Sava FRMP was prepared by PEG FP. In addition, it provides contributions and assistance in expert matters to the Sava Commission regarding the coordination of operational work and further development of the Sava Flood Forecasting and Warning System; coordinates all activities related to floods in the Sava River Basin (with relevant activities at the level of the Danube River Basin); participates in the preparation and implementation of flood risk management projects; and participates in the activities necessary for the establishment, upgrade and maintenance of the information systems of the Sava Commission and related data exchange.

**Addressing the assumptions (theses) in question, this Strategy proposes the following recommendations aimed at improving coordination, communication and cooperation between different institutions both within countries and then between countries.** These are focused on: improved information exchange; identification of priorities and directions of development; building a "smart" water management system.

### **Improved information exchange**

In the part related to the pollution, it is necessary to point out:

1. The necessity to have an information on Crisis Headquarters (that are in charge of implementing procedures and measures from the Intervention plan and other action plans) - which ones have been activated or needs to be activated; what is their competence and area of activity; how they collect and interpret information; whether there is readiness at all levels of organization (local, state).
2. *Situational awareness* as a very important segment of incident response and refers to the exchange of information between countries on the state of an incident that is or may be of cross-border effect. Monitoring the situation and gathering information through tools and systems (satellite systems, projection systems, etc.) and sharing and validating this same information can reduce the possibility of making wrong decisions and facilitate both transnational and national incident management. In addition, it is important to share information inter-institutionally, through official channels and developed methodologies (protocols such as the FASRB protocol), and not to obtain it from third parties (for example through the media).
3. It is necessary to communicate in advance and coordinate between the competent institutions what are the objectives of incident management (both at the level of each individual country and in a transnational framework), in order to respond to incidents in a timely and adequate manner (efficient and effective). The objectives can be presented through the exchange of information on the Incident Action Plan (IAP). The IAP should also define, how the information on the scope, complexity and potential impacts of the incident (including transboundary impact) is collected, analyzed and presented, which is directly related to situational awareness. Such (shared transnational) plan allows everyone in the chain of command to be informed in advance of the objectives, procedures, and activities carried out in the event of an incident within the cross-border framework.
4. Identify in advance the potential significant sources of emergency pollution by collecting data on facilities with hazardous substances (under the SEVESO directive obligations, the registers of such facilities in ISRBC counties are publicly available), by monitoring the impact of facilities within the scope of Industrial Emissions Directive (IED), etc.

5. Defining sites to be considered in terms of pollution, which refers to: a) sites that are potentially more exposed to pollution (with their identification, it can be invested more in the prevention segment to prevent or reduce the effects of the incident), and b) sites that facilitates the intervention on watercourses to, for example, facilitate access to civil protection forces or other operational forces which remove pollution.

In the part related to the floods, it is necessary to point out::

1. ISRBC Flood forecasting system, as analysis and practice have shown, contributes significantly to national forecasting and warning systems, thus ensuring better preparedness and application of mitigation measures to reduce the consequences of floods in the Sava River Basin. In addition to the existing tools used by institutions dealing with hydrometeorological activities and flood protection in their countries, Sava FFWS represents added value to these tools.
2. Same as in the part related to pollution (elaborated in more detail above), in case of floods, it is necessary to: a) have information on the Headquarters (which have been activated or needs to be activated, what their tasks are, how they collect and interpret information, whether there is readiness at all levels of organization (local, state), whether they are regularly trained); establish situational awareness mechanisms among ISRBC Member States; and c) communicate and coordinate within the competent institutions the objectives of incident management in order to respond to them in a timely and adequate manner by adopting an action plan.
3. Collect information on significant flood protection objects (e.g. embankments, canals, etc.) through a register of those objects which should be developed in some countries and improved in others, and then regularly update them with the necessary information on: a) the condition of these objects; b) maintenance; c) which are the protocols for intervention on flood defense infrastructure with regard to the site where they are located and taking into account structural measures to reduce flood risk.
4. Defining sites to be considered in terms of floods, which refers to: a) sites that are potentially more exposed to flood threat (with their identification, it can be invested more in the prevention segment to prevent or reduce the effects of the incident), and b) sites which have priority for flood protection - Areas of Potential significant Flood Risk (APSFRR), that can be determined by modeling.

### **Identification of priorities and directions of development**

According to the analyzed systems in the Parties to the FASRB, one of the basic priorities and expectations through which the easier implementation of the protocol in the field of water management (*Protocol on Flood Protection to the Framework Agreement on the Sava River Basin*) would be realized, is that all countries have a Flood Defense Center that would ensure active monitoring of watercourses and infrastructure and would direct the resources in accordance with the prioritization. In Croatia, such a Center exists within Croatian Waters for 10 years, Serbia has just established its center within Srbijavode, and Slovenia and Bosnia and Herzegovina do not have their centers. Under the presumption that all countries have Flood Defense Centers, there would be the opportunity of better implementation of Sava GIS/HIS systems and all other common tools developed by the ISRBC.

In the part related to the **pollution**, APC/AEWS tools are already implemented in 112 centers (in Croatia and Slovenia) and 24/7 operational center in Serbia, but they need to be further upgraded and interconnected with civil protection systems (emergency warning and response systems), which refers to PIACs in BiH and Serbia that are not interconnected. In Serbia, efforts are

underway by the authorities, primarily from the Republic Water Directorate, to relocate the PIAC and make it fully operational within the competence of the Sector for Emergency Management.

All institutions responsible for the civil protection system in ISRBC countries are trained in incident management systems (ICS), such as the Next Generation Incident Command System (NICS) in Croatia, Serbia, BiH or SVOD (Slovenia) which are in case of emergency oriented towards better standardization in the exchange of information in real time, access to databases and information in the field, operational forces, geolocations, meteorological data, etc.

The GIS system in ICS integrates information in a way that enables *faster decision making* in emergency management and therefore it is relevant that FASRB signatory countries are using it. There are also bilateral co-operation mechanisms that strengthen the response to emergencies, but what has been identified as a need is that co-operation within the Union's Civil Protection Mechanism needs to be better developed. Besides Slovenia, Croatia and Serbia, which are members of this mechanism, Bosnia and Herzegovina has also acquired the conditions for full access to the Mechanism through the EU project "EU for Better Civil Protection - Capacity Building and Preparation of Bosnia and Herzegovina for the European Union Civil Protection Mechanism". This is a good example which can be used for the following recommendation.

As not all countries (Slovenia, Croatia, Bosnia and Herzegovina, Serbia) have the same human and financial resources, consideration should be given to acquiring additional funds in the form of a joint project under the auspices of the EU or UN to address identified shortcomings and support further development and implementation of funding through specific mechanisms. In this way, capacities within the countries, between them and in the entire Sava River Basin, can be strengthened. One example of such solutions is the WACOM project, which is based on already adopted protocols between Member States, but upgrades them with innovative tools that support cooperation and common situational awareness, thus improving the preparation and implementation of cross-border response measures. By bringing together project partners from four countries (Slovenia, Croatia, Bosnia and Herzegovina and Serbia) which are engaged in various fields of activity - water management, civil protection, navigation and research institutions, national public bodies, and by facilitating their dialogue, the goal is to achieve better coping capacity of all national authorities involved, with an improved definition of the roles and tasks of the response, and by developing a common operational environment.

## **Building a "smart" water management and sudden and accidental pollution systems**

Institutions from the countries involved in the WACOM project have received data, information and insight into the processes through previous analyzes and drafted documents - all this together forms the basis for deeper involvement of stakeholders, once their gaps and challenges are transparent and the need to address them is recognized on the strategic level. In addition to the contribution to the analyses (which were conducted in the form of the questionnaire), stakeholders' involvement can be encouraged through workshops, meetings, forums or conferences - creating the conditions for open dialogue.

We are currently in an industrial revolution 4.0 based on digital transformation which uses artificial intelligence, the Internet of Things, blockchain technology and additional modern solutions. This approach is correlated with the 5.0 society called super smart society. What both concepts have in common is that they complement each other and bring a significant increase in efficiency by using all modern technologies and solutions, so that all advanced technological solutions are contributing to the improvement of the quality of life of people.

In order to build a "smart" water management system, all available technology, software solutions and artificial intelligence should be used to connect existing and build new systems that will make a significant step forward in the observed area, and it is very necessary due to expected climate change.

**In conclusion, a holistic approach is mandatory, given the needs of all countries and stakeholders and the necessity to overcome economic and institutional barriers that often hamper the changes needed to establish an appropriate incident response system.**

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