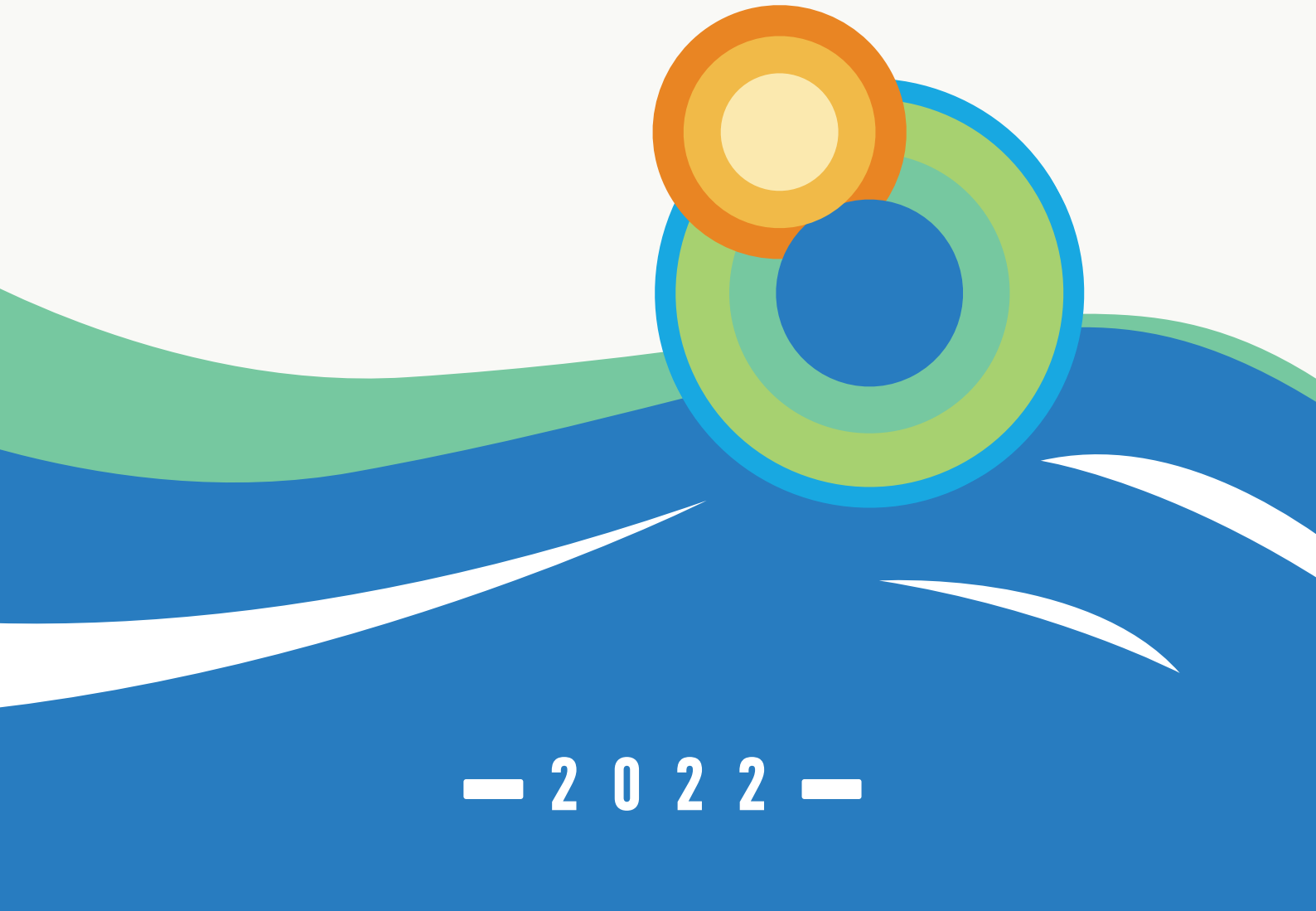
INTERNATIONAL SAVA RIVER BASIN COMMISSION

2nd SAVA RIVER BASIN MANAGEMENT PLAN



2022

2nd Sava River Basin Management Plan

The Parties to the Framework Agreement on the Sava River Basin (Bosnia and Herzegovina, Republic of Croatia, Republic of Serbia, and Republic of Slovenia) approved this Plan at the 9th Meeting of the Parties held in Zagreb (Republic of Croatia) on December 9, 2022.

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- ISRBC Secretariat for facilitation, preparation of the draft document, and overall coordination.

Disclaimer

The 2nd Sava RBMP is drafted based on an official data and information delivered by the Parties to the Framework Agreement on the Sava River Basin (2002) and Montenegro. Where needed, other data sources have been used. Sources other than the competent authorities have been clearly identified in the document.

A more detailed level of information regarding the river basin management and planning in the Sava River basin is available in the 2nd national RBMPs in the Republic of Slovenia and the Republic of Croatia, in the 1st RBMPs for the Sava River Basin in Bosnia and Herzegovina (RBMPs for the Sava River Basin in Federation, Republika Srpska and Brčko District Bosnia and Herzegovina). At the time of the 2nd Sava RBMP preparation, in the finalization phase are the 3rd national RBMPs in the Republic of Slovenia and the Republic of Croatia, the 2nd RBMPs for the Sava River Basin in Bosnia and Herzegovina (RBMPs for the Sava River Basin in Federation, Republika Srpska and Brčko District Bosnia and Herzegovina) and the 1st national RBMP in the Republic of Serbia while in Montenegro the 1st RBMP is adopted.

The 2nd Sava RBMP should be read and interpreted in conjunction with the RBMPs from the riparian countries. Where inconsistency may have occurred, the national RBMPs are likely to provide more accurate information.

An overall contribution to the 2nd Sava RBMP development has been provided by the experts from the institutions listed below:

Republic of Slovenia: Ministry for Environment and Spatial Planning (MOP), Slovenian Water Agency (MOP), Slovenian Environment Agency (MOP).

Republic of Croatia: Ministry of Economy and Sustainable Development, Ministry of the Sea, Transport and Infrastructure, Croatian Waters, State Hydrometeorological Service of Croatia, State Institute for Nature Protection, Croatian Geological Survey, University of Zagreb - Faculty of Science, The Institute of Economics, Zagreb.

Bosnia and Herzegovina: Federal Ministry of Agriculture, Water Management and Forestry - Sava River Basin District Agency, Ministry of Agriculture, Forestry and Water Management of the Republika Srpska - Public Institution Water of Srpska, Department for Agriculture, Forestry and Water Management, Government of Brcko District Bosnia and Herzegovina.

Republic of Serbia: Ministry of Agriculture, Forestry and Water Management-Republic Water Directorate, Ministry of Environmental Protection, Republic Hydrometeorological Service of Serbia, Ministry of Environmental Protection-Environmental Protection Agency, Public Water management Company “Srbijavode”, Public Water Management Company “Vode Vojvodine”, Institute for Nature Conservation of Serbia, Institute for Nature Conservation of Vojvodina Province, Institute for Water Management “Jaroslav Černi”, University of Belgrade-Institute for Biological Research "Siniša Stanković".

Montenegro: Ministry of Agriculture, Forestry and Water Management-Water Directorate, Water Administration, Institute for Hydrometeorology and Seismology.

In cases, countries were not able to provide information needed, gaps are noted in the text. The available data presented in this document are examined and presented to the best of available knowledge. Nevertheless, inconsistencies cannot be ruled out.

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List of Acronyms

AEWS	Accident Emergency Warning System
AL	Republic of Albania
AQC	Quality Control
AMI	Areas of mutual interests
ARS	Accidental Risk Spot
AWB	Artificial Water Body
BA	Bosnia and Herzegovina
BAT	Best Available Technique
BOD	Biochemical Oxygen Demand
CAP	Common Agricultural Policy
CBA	Cost Benefit Analysis
CF	Cohesion Fund within
CIS	Common implementation Strategy
CLC	CORINE Land Cover
COD	Chemical Oxygen Demand
DPSIR	Driver Pressure State Impact Response
DRB	Danube River Basin
DWPA	Drinking Water Protected Area
EAFRD	European Agricultural Fund for Rural Development
EC	European Commission
EEA	European Environmental Agency
EIA	Environmental Impact Assessment
EMFA	European Maritime and Fisheries and Aquaculture Fund
E-PRTR	European Pollutant Release and Transfer Registers
ERDF	European Regional Development Fund
ESF	European Social Fund
ETC	European Territorial Cooperation
EU	European Union
FASRB	Framework Agreement for the Sava River Basin
FIP	Future Infrastructure Project
GDP	Gross Domestic Product
GWB	Ground Water Body
GWh	Gigawatt-hour
HE	Hydropower plant
HMWB	Heavily Modified Water Body
HPP	Hydropower Plant
HR	Croatia
HYMO	Hydromorphology
IAS	Invasive Alien Species
ICPDR	International Commission for Protection of the Danube River
ISRBC	International Sava River Basin Commission
IED	Industrial Emission Directive
IPA	The Instrument for Pre-Accession Assistance
IPPC	Industrial Pollution Prevention and Control
IWT	Inland Water Transportation
ME	Montenegro
MFF	Multi Financial Framework
MS	Member State
MW	Megawatt
PA	Protected area

PAH	Polycyclic Aromatic Hydrocarbons
PE	Population Equivalent
REACT EU	Recovery Assistance for Cohesion and the Territories of Europe
RB	River Basin
RS	Serbia
SEA	Strategic Environmental Assessment
SI	Slovenia
SRB	Sava River Basin
SWB	Surface Water Body
SWMI	Significant water management Issue
TE-TO	Thermal power plant
TN	Total Nitrogen
TNMN	Transnational monitoring network
TP	Total Phosphorus
UWWT	Urban Waste Water Treatment
WFD	Water Framework Directive

1 Introduction and background

1.1 Introduction

Water resources, as a source of life, habitat for many important ecosystems, representing basis for socio-economic development, require dedicated management, careful protection, and conscious use.

Water framework directive (60/2000/EC)[1], (WFD) as a complex piece of EU legislation, provides a framework, directions, strategies, and instruments for the protection of all waters, with a wider perspective: to promote sustainable water use, based on a long-term protection of available water resources. In the Article 13. WFD, as a tool for its implementation, defines river basin management plans, that should be prepared for each river basin district on the EU territory. Furthermore, for its implementation on transboundary river basins extending beyond the boundaries of the EU, WFD stipulates Member States (MS) to endeavour establishing appropriate coordination with the relevant non-MS, with the aim of achieving the objectives of WFD throughout the river basin districts, and to produce joint river basin management plans.

According to the WFD environmental objectives, EU MS should aim to achieve 'good status' of all waters and to prevent its deterioration. Of five Sava River Basin (Sava RB) riparian countries, two, Republic of Slovenia (Slovenia, SI) and Republic of Croatia (Croatia, HR), are MS while Bosnia and Herzegovina (BA), and countries carrying the status of the candidate countries for the EU membership, Republic of Serbia (Serbia, RS), and Montenegro (ME), are not members of EU therefore not legally obliged to fulfil the WFD requirements.

However, as it is stipulated in the Article 3 of the Framework agreement on the Sava River Basin[2] (Framework Agreement, FASRB), "…the Parties are decisive to cooperate on the basis of, and in accordance with, Directive 2000/60/EC of the EU Parliament and Council of October 23, 2000, establishing a Framework for Community Activities in the Field of Water Policy (WFD)", and to make all efforts towards implementation of the WFD, on national and the shared international river basins.

With the aim to enhance basin wide policy framework for prevention of further deterioration or/and improvement of the status of all waters and protected areas and to strengthen collaboration towards long-term and sustainable use of the water resources within the Sava RB, 2nd Sava River Basin Management Plan (2nd Sava RBMP) has been developed in accordance with WFD requirements, following the provision of the Article 12 FASRB: "The Parties agree to develop joint and/or integrated Plan on the management of the water resources of the Sava River Basin and to cooperate on its preparatory activities".

[1] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

[2] https://www.savacommission.org/UserDocsImages/05_documents_publications/basic_documents/fasrb.pdf

1.2 Cooperation in the Sava River Basin

For successful, harmonized, and sustainable river basin management and planning in the context of the international Sava RB, close transboundary cooperation of all competent authorities, institutions, and relevant experts is of a crucial importance.

During 16 years of its work (established in 2005), International Sava River Basin Commission (Sava Commission, ISRBC) represents the platform for the Sava RB transboundary cooperation. ISRBC has been established for the purpose of the implementation of the FASRB. As a unique international agreement, FASRB which integrates many aspects of water resources management, was signed by the riparian countries, Slovenia, Croatia, Bosnia and Herzegovina, and Yugoslavia (subsequently Serbia and Montenegro, and then Serbia), and entered into force in 2004. Cooperation of the ISRBC and Montenegro is based on Memorandum of Understanding, signed in 2013.

The specific feature of the ISRBC within the family of European basin organizations, provided by the FASRB, is the integration of navigation and environmental protection issues within one institution. This provides to the ISRBC the broadest scope of responsibilities among European river commissions. The ISRBC has capacity for making decisions regarding navigation and making recommendations on all other issues. The executive body of the ISRBC is its permanent Secretariat.

The implementation of the FASRB considers the realization of the following goals:

- Establishment of an international regime of navigation on the Sava River and its navigable tributaries;
- Establishment of sustainable water management;
- Undertaking of measures to prevent or limit hazards.

The major milestones regarding collaboration within the Sava River Basin are presented on the Figure 1:

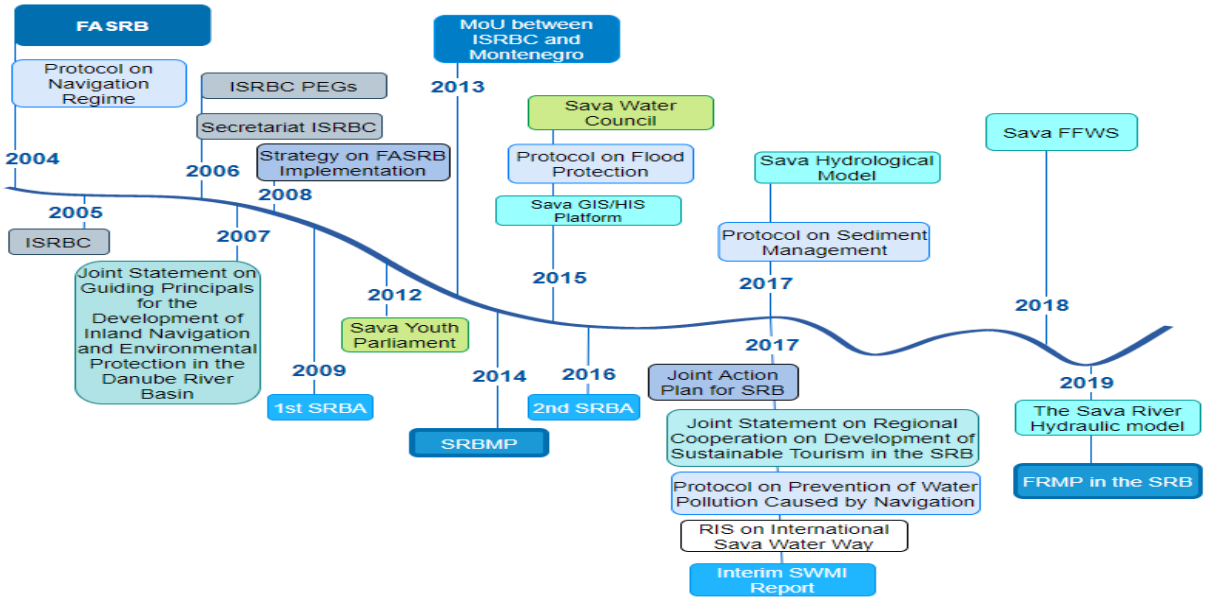


Figure 1: Major steps in collaboration within the Sava RB, since FASRB entered into force (2004-2019)

According to the Article 30 of the FASRB, basis for transboundary cooperation within Sava RB is as well defined by Protocols regulating cooperation regarding the specific issues (Protocol on Navigation Regime (2004), Protocol on Prevention of the Water Pollution Caused by Navigation (2004), Protocol on Flood Protection (2015), and Protocol on Sediment Management (2017)). The full list of Protocols and bilateral agreements within the Sava River Basin can be found in the Annex 1.

1.3 WFD status implementation within Sava RB riparian countries

The implementation of the WFD within the Sava RB started with the development of the 1st Sava River Basin Analysis (SRBA), in line with the requirements of the Article 5 and the Article 6 of the WFD. In the first SRBA the water quality and quantity of the Sava River and main tributaries were analysed, the hydrology and hydromorphology reports were developed, and the integration of river basin management with flood risk management and navigation development was addressed. The first SRBA was accepted by the ISRBC in September 2009, as a good basis for further activities on the development of the Sava RBMP.

The activities on the 1st Sava RBMP development started in 2009, with the technical assistance and direct EU grant to the ISRBC. The 1st Sava RBMP generally followed the methodology and processes applied at the Danube RB level, which have been developed and agreed upon by the Danube RB countries, while applying more detailed criteria for the Sava and the tributaries of the basin wide importance. It has established several integrative principles for water management, including the integration of economic approaches, and aimed for the integration of water protection into other policy areas.

The chapters in the 1st Sava RBMP followed the requirements of the WFD, containing background information and general characteristic of the Sava RB, defining existing pressures for each of the significant water management issues (organic, nutrient, and hazardous substances pollution and hydromorphological alterations, groundwater quality and quantity), and other water management issues like qualitative and quantitative aspects of sediment and invasive alien species. In the 1st Sava RBMP, the inventory of protected areas has been developed, the monitoring networks described, the water status assessment provided, and the preliminary designation of the heavily modified and artificial water bodies presented. The environmental objectives as visions and management objectives for the Sava RB, were set and the exemptions to WFD outlined. The Programme of measures described the necessary steps towards the achievement of good ecological and chemical status of the surface water bodies (SWB) and good chemical status for ground water bodies (GWBs). The issue of the integration of river basin management with flood risk management, navigation, hydropower, and agriculture development was also addressed in the document as well as the climate change adaptation. The 1st Sava RBMP was presented to the main stakeholders and wider public through workshops, meetings, and online consultation. The Parties to the FASRB

approved the 1st Sava RBMP at their Fifth Meeting held in Zagreb (Republic of Croatia) on December 2, 2014.

The process of the WFD implementation continued with the development of the 2nd Sava River Basin Analysis (2nd SRBA) as an update of the first one from the 2009. It was finalized in 2016 and accepted by the ISRBC in June 2017. In parallel also the Report on significant water management issues (SWMI) with the interim overview of implementation of measures was prepared setting out key issues affecting the water environment in the Sava River Basin (2017)-Interim SWMI report. Both documents represent an important step towards preparation of the 2nd Sava RBMP built on the knowledge gained in the process of preparation of the 1st Sava RBMP and on additional information on the relevant issues.

The status of the WFD implementation in the Sava riparian countries (as of August 2022) is the following:

- **Slovenia**: In Slovenia two national river basin management plans have already been adopted. The first one covers the period 2009-2015, and the second one the period 2016- 2021. The development of the 3rd river basin management plan for the period of 2022-2027 is in finalization phase.

- **Croatia**: In Croatia two national river basin management plans were already adopted, i.e., for the period of 2013-2015 (adopted in 2013), and for the period 2016-2021 (adopted in 2016). The third national river basin management plan for the period 2022-2027 is in the finalization phase.

- **Bosnia and Herzegovina**: The WFD is partially transposed through provision of the existing Water Acts in the Federation of Bosnia and Herzegovina and Republika Srpska. Further alignment of the national legislation on integrated water management is expected following the adoption of the relevant secondary legislation. In Bosnia and Herzegovina, the following river basin management plans were adopted, i.e., Sava River Basin Management Plan for Federation of Bosnia and Herzegovina for the period 2016-2021, Sava River Basin Management Plan in Republika Srpska for the period 2017-2021 together with The Strategy of Integrated Water Management of the Republic of Srpska (2015-2024), and River Basin Management Plan for the Brčko District Bosnia and Herzegovina (2016-2021). In Republika Srpska the development of the 2nd river basin management plan is ongoing, while in Federation of Bosnia and Herzegovina the 2nd river basin management plan is finalized and further activities towards adoption in accordance with the legislative requirements are ongoing.

- **Serbia**: Administrative procedures for the adoption of the 1st national river basin management plan is ongoing. PWMCs “Srbijavode” and “Vode Vojvodine” under the coordination of Ministry of Agriculture, Forestry and Water Management – Republic Water Directorate prepared the draft of the plan, with the support of the twinning project with German, Austrian and Dutch experts.

- **Montenegro:** The 1st river basin management plan for the Danube River Basin in Montenegro for the planning period 2021-27 was adopted on the 61st Government session in March 2022.

1.4 Structure of the Sava River Basin Management Plan

The basin wide management process within the Sava River Basin complies the phases of planning and measures implementation. The 2nd Sava RBMP has been developed with the aim to represent the basis for basin wide integrated, technically, environmentally, and economically sound and sustainable water management describing the current status within the basin and measures planned to be implemented to meet the agreed objectives. The 2nd Sava RBMP preparation process represented the platform as well for public and stakeholder consultation and their involvement in the river basin management and planning.

The 2nd Sava RBMP is prepared with updated data and information, in accordance with the WFD requirements, for the six years period 2022-2027, follows the methodology applied and processes on going at the Danube River Basin level and as well the structure and outline of the 1st Sava RBMP.

Significant water management issues (SWMI) for the Sava River basin, organic pollution, nutrient pollution, hazardous substances pollution, hydromorphological alterations and pressures on groundwater quality and quantity, identified and agreed by the Parties based on the pressure's analysis and, stakeholder's consultation performed for the 1st Sava RBMP, are further elaborated in the 2nd Sava RBMP. Furthermore the 2nd Sava RBMP provides in accordance with the data availability an overview of the issues that have been marked as "candidate" SWMIs, and whose comprehensive analysis is planned for the following planning cycles: pressures and impacts on sediments quantity and quality, invasive alien species and water demand management.

Water management issues in the 2nd Sava RBMP are discussed based on the first SRBA Report (2009) at a more detailed scale than for the Danube RBMPs. For the analysis into consideration were taken surface and ground water bodies in accordance with the following criteria:

- Surface Water Bodies on the Sava River and its tributaries with a catchment size >1,000 km^2 and on the rivers with catchment area <1,000 km^{2}defined as of a basin-wide importance (Sotla/Sutla, Lašva and Tinja)
- Trans-boundary and national groundwater bodies which are important due to their size (area >1,000 km^2), and trans-boundary ground water bodies (area < 1,000 km^2) which are important due to various other criteria, e.g. socio-economic importance, significant uses, impacts, pressures, and/or interaction with aquatic eco-system.

Furthermore, SWMIs are, where possible, assessed by widely used analytical framework, as it is suggested in the WFD, Common Implementation strategy (CIS) Guidance Document No.3[3] and Impacts, Driver, Pressure, State, Impact, Response (DPSIR) where, (1) drivers are anthropogenic activities that may have environmental impacts, (2) pressures are direct effect of drivers, (3) state is condition of water bodies resulting from natural and anthropogenic factors, (4) impacts are environmental effects of pressures and (5) response is the set of measures planned to improve or maintain the status of all water bodies.

[3] Common Implementation strategy for the Water Framework Directive (2000/60/EC), Guidance Document No.3 on the Analysis of Pressures and Impacts (2003)

The chapters of the 2nd Sava RBMP, are developed in accordance with the structure of the 1st Sava RBMP, following the logic and requirements stipulated by the WFD.

Chapter 1 provides introduction, background information on cooperation within Sava RB, and status of the WFD implementation in the riparian countries. General characteristics of the Sava RB, including climate conditions, relief, and topography, as well as a brief description of surface and groundwater bodies are presented in the Chapter 2. The Chapter 3 describes existing pressures for each SWMI, and overview of other issues (sediment quality/quantity, invasive species). An inventory of protected areas is provided in the Chapter 4, and the monitoring networks in the Sava RB are described in the Chapter 5. The results of the basin-wide water status assessment are given in the Chapter 6. The WFD environmental objectives, visions and managements objectives for the Sava RB as well as the exemptions according to the WFD Article 4(4) are outlined in the Chapter 7. The Chapter 8 contains an economic analysis of water uses and water services. The Chapter 9 gives an overview of measures to be implemented on the basin-wide scale, for each SWMI and other water management issues. This chapter also includes key conclusions regarding the Programme of Measures, which are of the key importance for the future river basin management and planning in the Sava RB. The Chapter 10 elaborates river basin management integration issues, focusing on the flood risk management, navigation, hydropower production, and agriculture. The Chapter 11 addresses adaptation to climate change. The public participation and consultations activities carried out in the 2nd Sava RBMP preparatory process are summarized in the Chapter 12. Key findings are listed in the Chapter 13, and references are given in the Chapter 14.

The 2nd Sava RBMP also includes 10 Annexes with additional information and as well as 23 Maps which graphically present key information provided in the text.

2 General characteristics of the Sava River Basin

2.1 Basic facts

The Sava RB is a major river basin of South-eastern Europe, with a total area of app. 97,700 km^2, located between 13.67 ºE and 20.58 º E longitudes and between 42.43 ºN and 46.52 ºN latitude. The Sava RB (Figure 2), comprising the 12% of the Danube RB area, represents its most significant sub-basin.

The Sava RB contributes to the characteristics of the Danube RB with its outstanding biological and landscape diversity. It hosts the largest complex of alluvial wetlands in the Danube Basin (Posavina - Central Sava Basin) and large lowland forest complexes. The Sava River is a unique example of river with some of the floodplains still intact, thus supporting the flood alleviation and biodiversity.

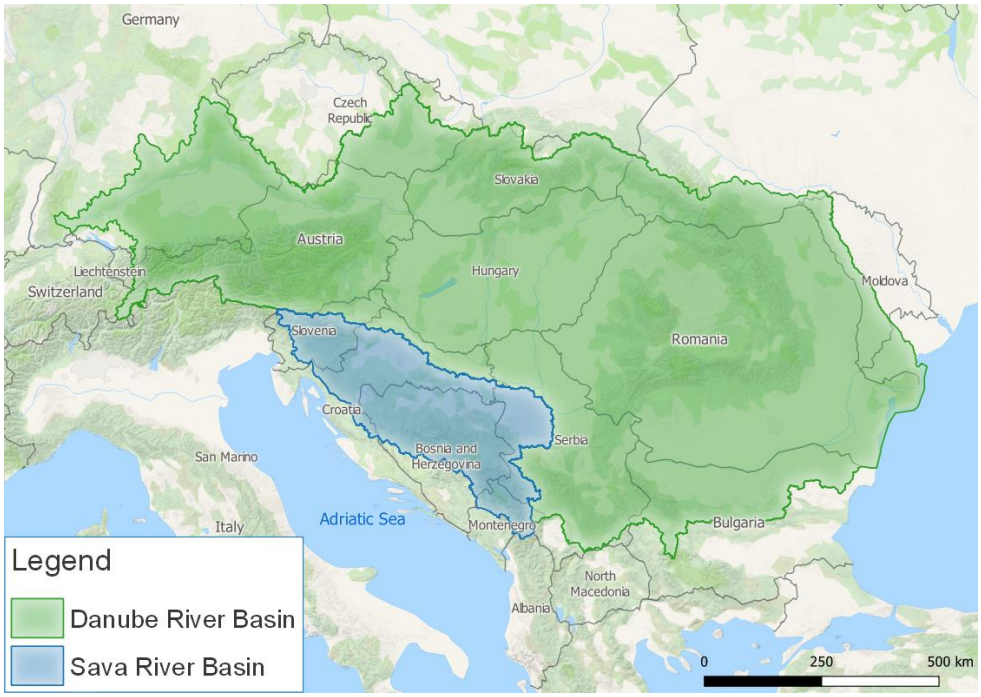
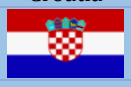


Figure 2: Location of the Sava RB

The Sava RB area is shared among six countries: Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Montenegro, and Albania. Except for Serbia and Albania, its watershed covers from 45 to 70% of the surface area of the other four countries, where its water resources constitute nearly 80% of the total freshwater resources. Data in the Table 1 represents basic figures regarding the countries' share of the Sava RB area. A more detailed overview of the basin location is presented in the Map 1.

Table 1: Basic figures of the Sava River Basin area

	Republic of Slovenia	Republic of Croatia	Bosnia and Herzegovina	Republic of Serbia	Montenegro	Republic of Albania
						
	SI	**HR**	**BA**	**RS**	**ME**	**AL**
Total country area [km²]	20,273	56,542	51,129	88,361	13,886	27,398
Share of national territory in the Sava RB [%]	57.9	44.9	75.0	17.1	46.7	0.7
Area of the country in the Sava RB [km²]	11,734.8	25,373.5	38,349.1	15,147.0	6,488.8	179.0
Share of the international Sava RB [%]	12.1	26.1	39.4	15.6	6,7	0.2

The total population of the five riparian countries (Albania is not included since only negligible part of the basin area belongs to its territory) is approximately 18 million, and almost half of this number resides in the Sava RB. Particularly, the number of population living within the Sava RB, in comparison to the total population of the riparian countries' accounts for Slovenia 61%, for Croatia 50%, for Bosnia and Herzegovina 88%, for Serbia 26% and for Montenegro around 33%.

2.2 Climate

The Sava RB is situated within a region characterized by the dominant moderate climate of the northern hemisphere, which is modified by the influence of relief. Thus, mountainous zonal climate characteristics are present especially in the eastern and southern part of the area. Cold and hot seasons are clearly defined. The winters can be severe with abundant snowfalls, while the summers are hot and long. Climate conditions within the basin can be classified into three general types:

- Alpine climate;
- Moderate continental climate;
- Moderate continental (mid-European) climate.

An alpine climate prevails in the upper Sava RB in Slovenia. A moderate continental climate dominates in the right tributaries' catchment areas within Croatia, Bosnia and Herzegovina, Serbia, and Montenegro, while a moderate continental (mid-European) climate primarily features in the left tributaries' catchment areas that belong to the Pannonian Plain.

Average annual air temperature for the whole Sava RB was estimated to be approx. 9.5°C. Mean monthly temperature in January falls to approx. -1.5°C, whilst in July it can reach almost 20°C.

The precipitation amount and its annual distribution are fairly variable within the basin. The average annual rainfall over the Sava RB is estimated to be approximately 1,100 mm. The average evapo-transpiration for the whole catchment area is approx. 530 mm/year.

2.3 Relief and topography

The landscape within the Sava RB is diverse. The mean elevation of the basin is approximately 545 m a.s.l. The elevation of the Sava RB ranges between 71 m a.s.l. at the mouth of the Sava River in Belgrade (Serbia) and 2,864 m a.s.l. (Triglav, Julian Alps). Mountainous relief (the Alps and the Dinarides) dominates in the north-west part of the basin, which is part of Slovenia and the southern part where particularly rugged terrain is a feature of Montenegro and northern Albania. The general relief characteristics of the basin are illustrated in the Figure 3.

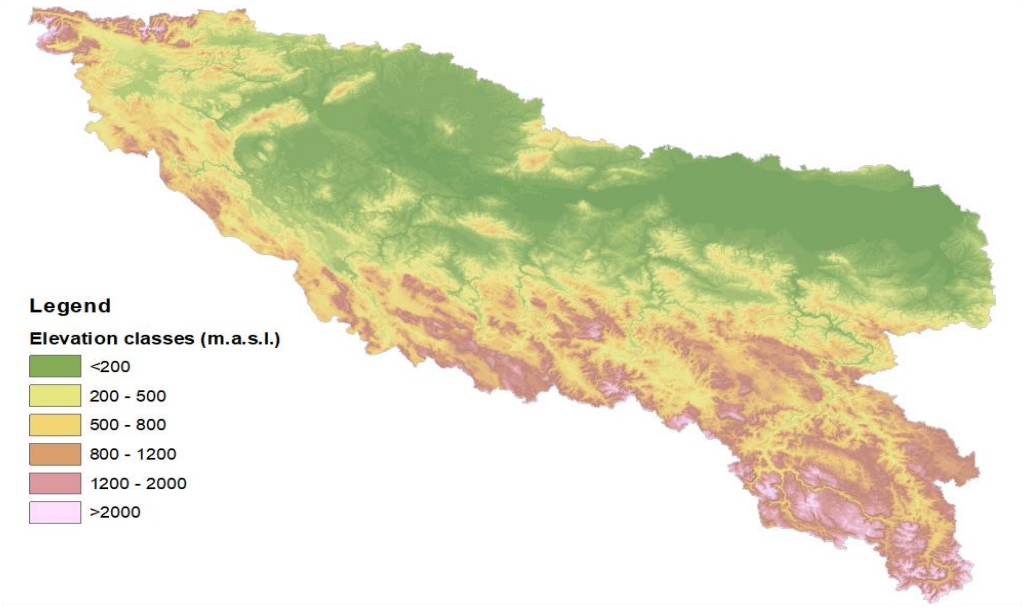


Figure 3: Relief of the Sava RB

The mountains of Montenegro include some of the roughest terrain in Europe. They average more than 2,000 m in elevation and occasionally exceed a height of 2,500 m a.s.l. (the peak of Bobotov Kuk in the Durmitor Mountains). The northern part of the Sava RB is situated in the Pannonia Plain, which is characterized by fertile agricultural land. According to the FAO classification, the dominant slope in the basin is moderately steep. The mean value of the slope in the Sava RB is 15.8 %.

2.4 Land cover

For an overview of the land cover in the Sava RB, the EEA Corine database for Europe was used, and representation of different land use patterns for the entire area of the Sava RB is shown in the Figure 4.

Distribution of the main land cover classes indicates that more that 50% of the basin are forests and semi-natural areas while 40% of the area is occupied by agriculture. Artificial surfaces, wetlands and inland waters comprise 3,6% of the total basin area.

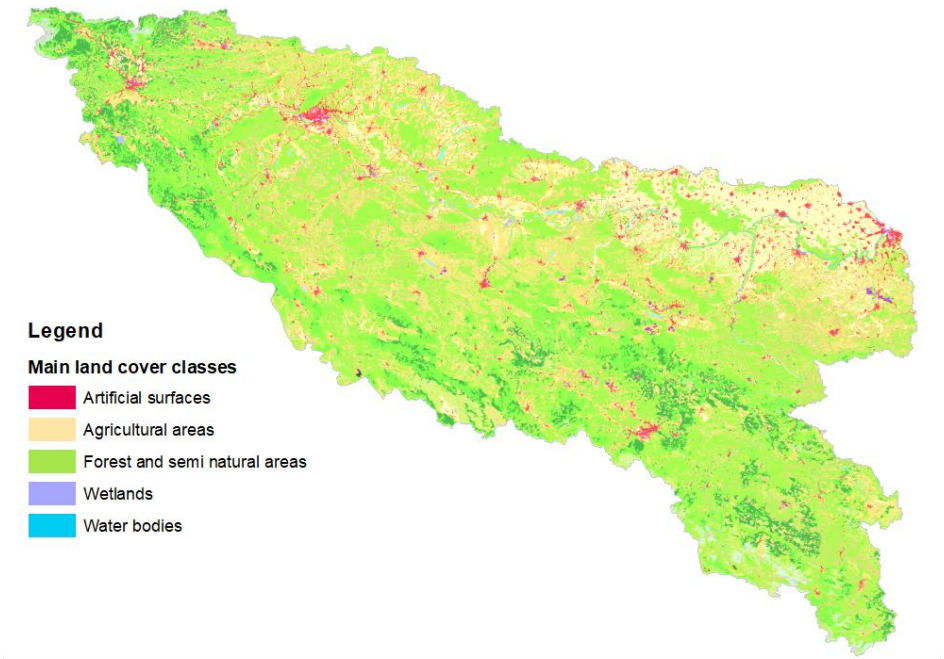


Figure 4: Distribution of main land cover classes in the Sava RB

The comparison between the main land cover/land use classes in the Sava RB, according to Corine2000 (used in the 1st Sava RBMP) and Corine2018, shows the difference in land use between two planning cycles which is represented in the Table 2.

Table 2: Comparison of the main land cover uses within Sava RB (1st and 2nd SRMBP)

Land class	1st Sava RBMP		2nd Sava RBMP		Change (2000-2018)		
					per class		basin share
	Area (km²)	Share	Area (km²)	Share	(km²)	(%)	
Artificial surfaces	2,251.03	2.3%	2,761.20	2.8%	↗ 510.17	↗ 22.6	↗ **0.5%**
Agricultural areas	40,824.17	41.9%	38,977.01	40.0%	↘1,847.16	↘ 4.5	↘ **1.9%**
Forests and semi natural areas	53,582.13	55.0%	54,876.84	56.4%	↗ 1,294.71	↗ 2.4	↗ **1.4%**
Wetlands	81.17	0.1%	90.62	0.1%	↗ 9.45	↗ 11.6	**~0%**
Inland water (water bodies)	618.49	0.6%	636.68	0.7%	↗18.19	↗ 2.9	↗ **0.1%**

For the analysis, versions Corine Land Cover CLC2000, and CLC2018 referring to land cover/land use status of year 2000, and 2018 (Version 2020_20u1 prepared in May 2020)[4] are applied. The detailed land cover classes in the Sava RB, according to the Corine 2018 are presented in the Map 2.

[4] https://land.copernicus.eu/pan-european/corine-land-cover/clc2018

2.5 Surface water in the Sava River Basin

2.5.1 Description of the Sava River and its main tributaries

The Sava River is formed by two mountainous streams: the Sava Dolinka (left) and Sava Bohinjka (right). The Sava River has a length of 945 km from the confluence of these headwaters near Slovenian town Radovljica until it joins the Danube in Belgrade (Serbia). Together with its longer headwater, the Sava Dolinka River in the north-west, the Sava River measures 990 km.

At the confluence of the Sava River with the Danube is in Belgrade (1,170 rkm of the Danube),its average discharge is approx. 1,700 m^3/s, which results in a long-term average unit-area-runoff, for the complete catchment area, of about 18 $l/s/km^2$.

The list of basic characteristics of the Sava River and its tributaries, identified as of a basin wide importance (criteria for the selection described in the Chapter 1.4) and taken into consideration for the further analysis in the 2nd Sava RBMP, is provided in the Table 3. The detailed hydrological features are described in the 2nd SRBA Report.

Table 3: List of the rivers in the Sava RB included in the Sava RBMPs

River name	River basin size (km^2)	River length (km)	Sava RB countries sharing the river basin	Tributary order	Confluence to the Sava/tributary L-left side R-right side
Sava	97,713.2	944.70	SI, HR, BA, RS, ME	-	-
Ljubljanica	1,860.0	40.00	SI	1st	R
Savinja	1,849.0	93.60	SI	1st	L
Krka	2,247.0	94.70	SI	1st	R
Sotla/Sutla	584.3	89.70	SI, HR	1st	L
Krapina	1,237.0	66.87	HR	1st	L
Kupa/Kolpa	10,225.6	118.3	SI, HR, BA	1st	R
Dobra	1,428.0	104.21	HR	2nd	R
Korana	2,301.5	147.62	HR, BA	2nd	R
Glina	1,427.1	112.22	HR, BA	2nd	R
Lonja	4,259.0	47.95	HR	1st	L
Česma	3,253.0	105.75	HR	2nd	L
Glogovica	1,302.0	64.48	HR	3rd	R
Ilova (Trebež)	1,796.0	104.56	HR	1st	L
Una	9,828.9	157.22	HR, BA	1st	R
Sana	4,252.7	141.10	BA	2nd	R
Vrbas	6,273.8	235.00	BA	1st	R
Pliva	1,325.7	31.45	BA	2nd	L
Orljava	1,618.0	93.44	HR	1st	L
Ukrina	1,504.0	80.9	BA	1st	R
Bosna	10,809.8	272.00	BA	1st	R
Lašva	958.1	55,20	BA	2nd	L
Krivaja	1,494.5	74.3	BA	2nd	R
Spreča	1,948.0	147.28	BA	2nd	R
Tinja	904.0	88.10	BA	1st	R
Drina	20,319.9	335.67	ME, BA, RS	1st	R

http://land.copernicus.eu/pan-european/corine-land-cover/clc-2000/view

River name	River basin size (km²)	River length (km)	Sava RB countries sharing the river basin	Tributary order	Confluence to the Sava/tributary L-left side R-right side
Piva	1,213.3	40,49	ME	2nd	L
Tara	1,834.2	141.53	ME, BA	2nd	R
Ćehotina	1,351.3	141,67	ME, BA	2nd	R
Prača	1,018.5	62.67	BA	2nd	L
Lim	6,116.3	282.89	AL, ME, RS, BA	2nd	R
Uvac	1,596.3	117.70	RS, BA	3rd	R
Drinjača	1,090.6	90.00	BA	2nd	L
Bosut	2,943.1	132.18	HR, RS	1st	L
Kolubara	3,638.4	86.70	RS	1st	R

Source: SRBA Report (2009) and SavaGIS (2021).

The important sub-basins of the Sava RB, defined by Sava RB riparian countries are presented on the Figure 5.

Figure 5: Important sub-basins in the Sava RB

The area of the Sava RB comprises the territory of the four different eco regions, in particular, eco-regions No.4 *Alps*, No.5 *Dinaride Western Balkan*, No. 6 *Hellenic Western Balkan*, and No. 11 *Hungarian lowlands* (in accordance with WFD ANNEX XI, MAP A, System A: Ecoregions for rivers and lakes).

A major part of the basin, 64% of the territory, is located in the ecoregion No.5 *Dinaric Western Balkan*, 31% is located within the eco-region No. 11 *Hungarian lowlands*. The north-west part of the basin belongs to the eco-region No. 4 *Alps* with 4,5% of the basin territory, while 0,5% of the Sava RB at the southeastern part belongs to the eco-region No.6 *Hellenic Western Balkans*.

The ecoregions in the Sava RB according to the WFD are shown on the Map 3.

2.5.2 Delineation of the surface water bodies

Surface water bodies are, in accordance with the Art 2. WFD, discrete and significant elements of surface water, identified based on their specific characteristics in the context of the WFD's purposes, objectives, and provisions. The data sets related to the SWBs for the 2nd Sava RBMP are compiled from the information provided by the riparian countries, through the ISRBC's common data sharing platform, Sava GIS.

In comparison to the SWBs taken into consideration in the 1st Sava RBMP, numerous changes are introduced through the new delineation, which was, in the previous planning cycle, performed in all riparian countries, except in Slovenia. The changes introduced are based on the further and more comprehensive implementation of WFD requirements and more accurate and detailed basis, data and information taken into consideration for the analysis. The introduced advancement, in terms of difference in number and length of the surface bodies represents an added value of the 2nd Sava RBMP in comparison to the 1st Sava RBMPs.

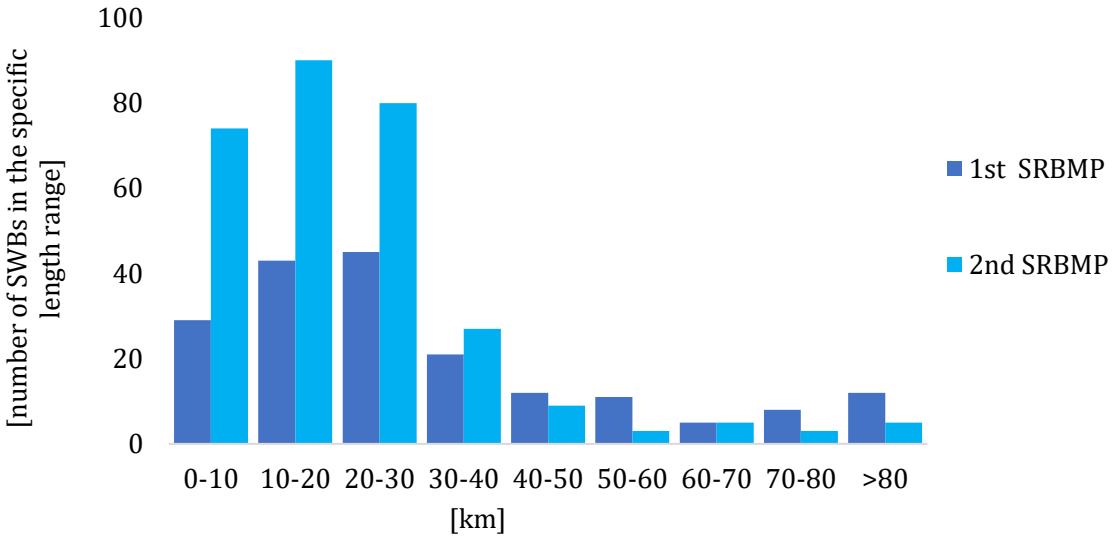


Figure 6: Difference in number and length of SWBs in the Sava RB delineated for the 1st and the 2nd Sava RBMP

For the 2nd planning cycle in the Sava RB, 296 SWBs (47 on the Sava River and 249 on the selected tributaries) are delineated, in comparison with 186 SWBs (28 on the Sava River and 158 on the tributaries) for the 1st Sava RBMP. Of delineated SWBs, 81 (27%) are identified as transboundary (19 on the Sava River and 62 on tributaries), representing a specific challenge for the basin wide planning.

Total length of the delineated SWBs is 6,149.9 km, with the average length of 20.7 km. The longest water body of 88.77 km is in Bosnia and Herzegovina (*The river Sava from the confluence of the Una to the confluence of Vrbas*), and the shortest one of 0.64 km is delineated on the river Kupa in Croatia. Although new delineation is performed, the differences, regarding the boundaries of the delineated transboundary SWBs shared by the neighbouring countries, are still existing.

Of a total number of the SWBs, 78 (24 on the Sava River, 54 on the tributaries) are defined or provisionally identified as heavily modified as and 218 (23 on the Sava River, 195 on tributaries) are identified as the natural ones.

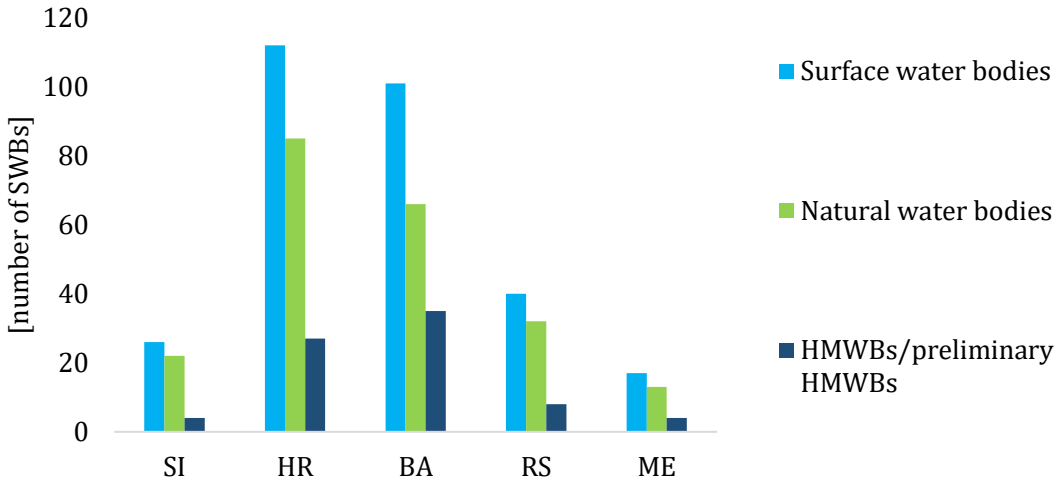


Figure 7: Number of delineated SWBs in the Sava RB per country

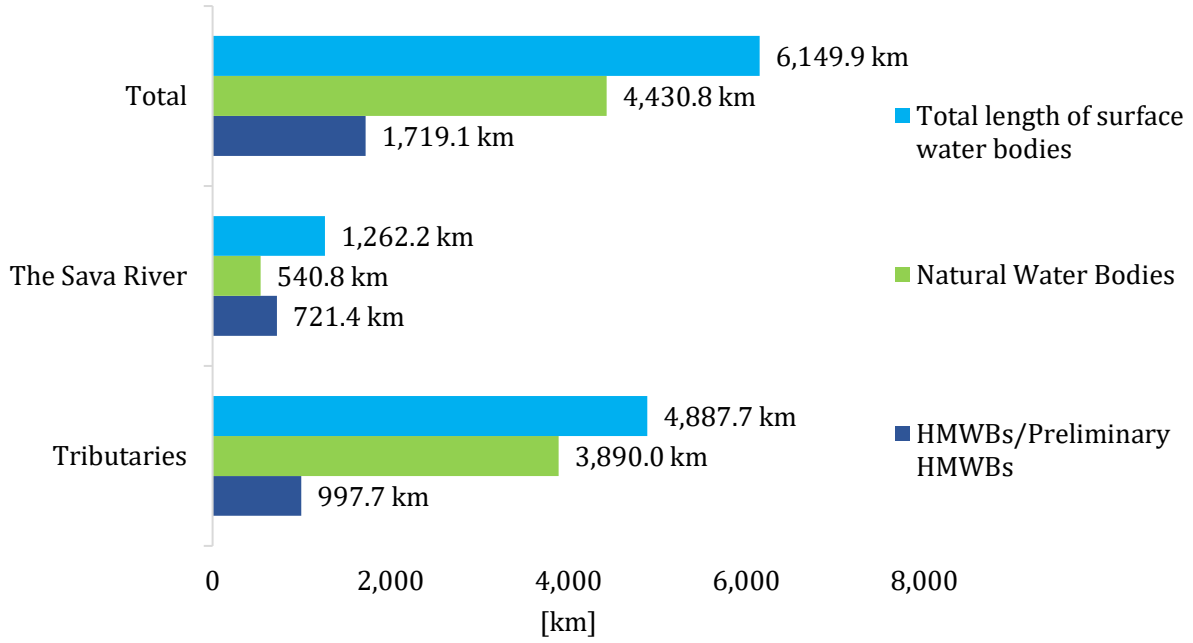


Figure 8: The length (in km) of the delineated natural WBs, HMWBs and preliminary HMWB for the Sava River and its selected tributaries

The total length of the Sava River and its tributaries indicated in the Figure 6, Figure 7, Figure 8 and Figure 9 is different from the real length of river stretches. since the issue related to non-harmonization of the trans-boundary water bodies, remains significant. The length of all delineated water bodies was taken into consideration as the total length of SWBs since different lengths of water bodies on trans-boundary stretches were identified by the neighbouring countries.

Table 4: Share and area of the Sava RB per country; length and number of delineated WBs in the Sava RB

Country	Share of the Sava RB by countries (%)	Area of the country in the Sava RB (km²)	Length of national Sava RB river network (km)*	Number of water bodies (WB) in the Sava RB
SI	12.1	11,734.8	659.0	26
HR	26.1	25,373.5	1,995.3	112
BA	39.4	38,349.1	2,388.1	101
RS	15.6	15,147.0	723.2	40
ME	6.7	6,488.9	384.3	17

** Represents the sum of length of all delineated WBs.*

2.5.3 Heavily modified water bodies

Countries in the Sava RB have designated heavily modified (member states Slovenia and Croatia) or identified preliminary heavily modified water bodies (Bosnia and Herzegovina, Serbia, Montenegro). Preliminary heavily modified water bodies are, due to hydromorphological alteration, substantially changed in their character, but preliminary designation has not yet been confirmed. The indicative list of the HMWBs and provisional HMWBs is provided in the Annex 3 (Table 1) and presented in the Map 5.

On the Sava River, 51% (24 of 47) of the water bodies are identified as heavily modified/preliminary heavily modified, while on the tributaries the share of the heavily modified/preliminary heavily modified water bodies is 22% (54 of 249). Of the total length of the Sava River surface water body of 1.262,18 km, 56% (721,42 km) is designated as heavily modified. On the selected tributaries of total surface water body length of 4,887.72 km as heavily modified/preliminary heavily modified are designated 20% (997.69km).

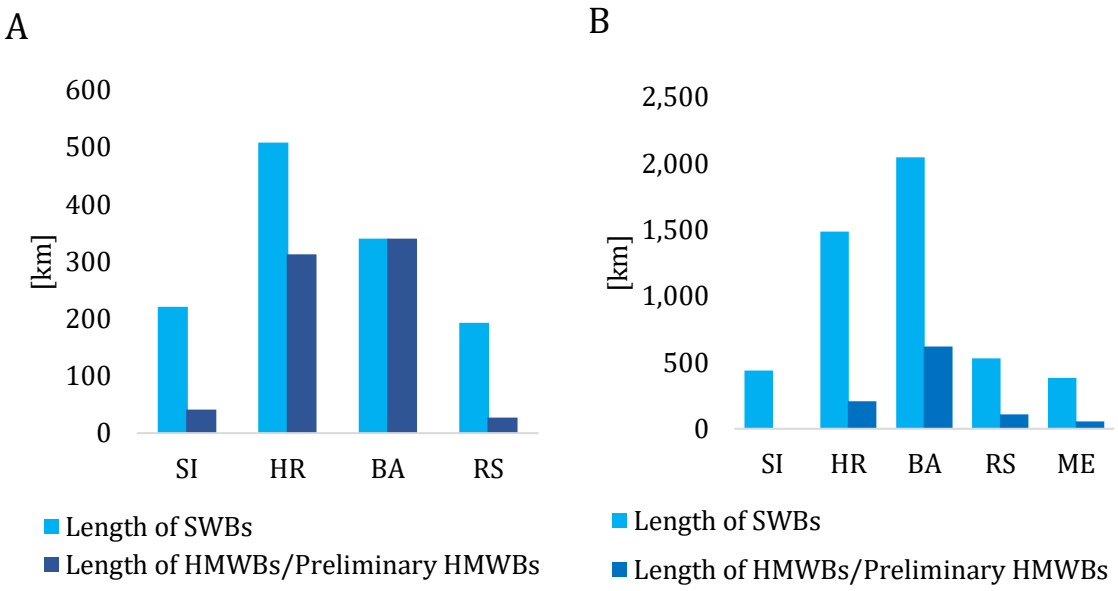


Figure 9: The length of HMWB/preliminary HMWBs on the Sava River (A) and on the selected tributaries (B) per country

The main drivers determining designation or preliminary designation of HMWBs are hydropower production, flood protection, navigation, agriculture, and urban development. Besides flood protection which is recognized as significant driver for HMWB designation for both the Sava River and the water bodies on the important tributaries, on the Sava River dominant driver is navigation while on the tributaries is hydropower production. On the Figure 10, the representation of identified drivers on the Sava River and the tributaries of the basin wide importance is shown.

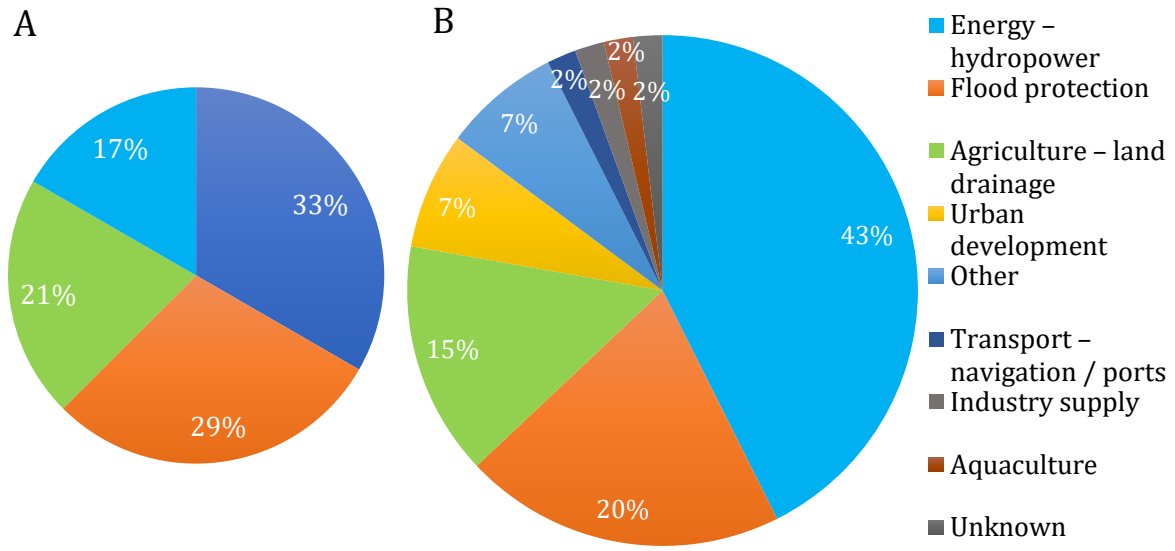


Figure 10: Drivers for identification of HMWB for the Sava River [A] and the tributaries [B]

The most significant drivers, affecting 85% of 78 HMWBs, are hydropower production (27 SWBs), flood protection (18 SWBs), agriculture (13 SWBs) and navigation (9 SWBs). Other recognized drivers affecting 15% of the HMWB are urban development (4 SWBs), other (4 SWBs), aquaculture (1 SWB). For one HMWB the driver for designation is unknown. The drivers within the Sava RB, presented per number of SWBs affected are shown on the Figure 11.

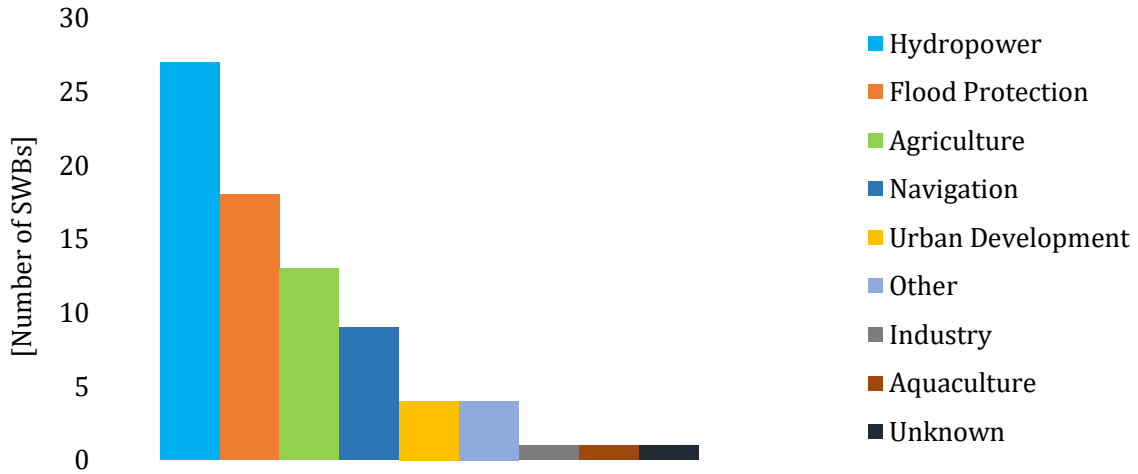


Figure 11: Drivers for HMWB designation per number of the affected SWBs in the Sava RB

2.6 Groundwater in the Sava River Basin

2.6.1 Description of main hydrogeological regions

The Sava RB has a diverse geological structure and a complex tectonic setting. Two main units characterised by a certain type of aquifer (water body) can be discerned. These are the Pannonian Basin, which is dominated by inter-granular aquifers, and the Dinarides where limestone aquifers predominate. The border between the Pannonian Basin and the Dinarides extends approximately along the route Celje-Karlovac-Prijedor-Stanari-Zvornik-Valjevo.

The Pannonian Basin, in the northern part of the Sava RB, forms a clearly defined extensive depression, which features new sediments of great thickness. It is characterized by two main types of aquifers: (1) a block of deposits of Pliocene age, and (2) fluvial deposits of the Sava River and its tributaries. Generally, the water bodies of the Pliocene complex extend over a large area, have an artesian character and the occurrence of wells is relatively limited. They are important with respect to water supply due to their size and with regard to protection against pollution from the surface terrain. The main aquifers comprise the fluvial deposits of the Sava River and downstream sections of its tributaries (Ljubljanica, Krka, Kupa/Kolpa, Una, Vrbas, Ukrina, Bosna and Drina).

Within the Dinarides, the Exterior Dinarides is mainly a part of the Adriatic Basin, while the more extensive Interior Dinarides is part of the Sava RB. The Interior Dinarides have a more heterogeneous lithological composition, but limestone terrains also prevail here. The main aquifers of this region are the karstified limestones of the mountain massifs and karst areas. The discharge of huge amounts of groundwater occurs through powerful karst wellsprings on contact with impermeable rocks.

The extent of the exploitation of the high-quality water potential is currently very low, although it provides the water supply for the majority of the population and industry. Karst terrains in the Sava RB are vulnerable to groundwater pollution due to the relatively rapid flow velocity and the lack of a natural surface protection, especially in regions of active abysses. This can put local drinking water supply at risk of being contaminated from anthropogenic sources, even in the sparsely populated and inaccessible terrains of the Interior Dinarides.

2.6.2 Delineation of groundwater bodies

To enable a reliable assessment of groundwater status, countries have identified ground water bodies, as coherent units in the river basin, to which environmental objectives must apply. The criteria for the delineation of ground water bodies varies among the countries, reflecting different local geological and hydrogeological conditions and data availability on natural conditions and anthropogenic pressures. In general, a hierarchical approach (groundwater ⟹ aquifer ⟹groundwater body), recommended by the CIS Guidance document No.2[5], was applied by all the countries. The ground water bodies were delineated according to the combination of criteria including the geological type, the borders of the surface catchment areas and anthropogenic pressures. Following the provision of Article 5 and Annex II of the WFD an overview of groundwater bodies of a

[5] Common Implementation Strategy for the Water Framework Directive (2000/60/EC) Guidance document no 2 Identification of Water Bodies (2003)

basin-wide importance was prepared, following the criteria for the identification of the groundwater bodies of the basin-wide importance (established in the first SRBA Report, provided in the Chapter 1.4):

For the 2nd Sava RBMP, according to the previously established criteria and based on the new delineation (performed in Bosnia and Herzegovina and Montenegro), the riparian countries have identified 60 GWBs (24 transboundary) which are of interest for the basin wide management and planning (Annex 4; Map 6). In comparison to the 1st Sava RBMP, where 48 GWBs were defined as of basin-wide importance, new delineation represents the result of the studies, research and more detailed analysis made on a national levels towards the better compliance with the WFD requirements.

Table 5: Groundwater bodies of the basin-wide importance in the Sava RB

Country	GWB code	GWB Name	GWB size (km²)	Trans-boundary (Yes/No)
SI	SIGWB1001	Sava Valley and Ljubljana's Marshes	773.5	No
	SIGWB1002	Savinja Valley	109.1	No
	SIGWB1003	Krško Valley	96.8	Yes
	SIGWB1004	Julian Alps in the Sava River Basin	782.8	Yes
	SIGWB1005	Karavanke	403.6	Yes
	SIGWB1006	Kamnik and Savinja Alps	1,112.2	No
	SIGWB1007	Cerklje, Škofja Loka and Polhov Gradec Hills	850.0	No
	SIGWB1008	Posavje Hills to the mid Sotla River	1,791.6	Yes
	SIGWB1009	Lower part of the Savinja River to the Sotla River	1,397.0	Yes
	SIGWB1010	Karst's Ljubljanica	1,306.9	No
	SIGWB1011	Dolenjska Karst	3,354.5	Yes
HR	HRCSGI-14	Kupa	1,027.0	No
	HRCSGN-15	Dobra	755.0	No
	HRCSGN-16	Mrežnica	1,372.0	No
	HRCSGI-17	Korana	1,227.0	Yes
	HRCSGI-18	Una	1,561.0	Yes
	HRCSGI-24	Sutla and Krapina Catchment	1,405.0	Yes
	HRCSGN-25	Lonja - Ilova - Pakra Catchment	5,186.0	No
	HRCSGN-26	Orljava Catchment	1,575.0	No
	HRCSGI-27	Zagreb	988.0	Yes
	HRCSGI-28	Lekenik – Lužani	3,444.0	Yes
	HRCSGI-29	East Slavonija - Sava Sub-Basin	3,328.0	Yes
	HRCSGI-30	Žumberak – Samobor's Mountains	443.0	Yes
	HRCSGI-31	Kupa	2,870.0	Yes
	HRCSGI-32	Una	541.0	Yes
BA	BA_SA_4	Grmeč	823.8	No
	BA_RS_SA_4	Grmeč	199.6	No
	BA_SA_5	Upper Una Catchment	1,171.3	Yes
	BA_SA_6	Mid_Sana Catchment	837.6	No
	BA_RS_SA_6	Mid_Sana Catchment	269.9	No
	BA_SA_7	Upper Sana Catchment	911.9	No
	BA_RS_SA_7	Upper_Sana Catchment	667.9	No
	BA_SA_8	Upper_Vrbas Catchment	1,128.5	No
	BA_RS_SA_8	Upper_ Vrbas Catchment	520.4	No
	BA_SA_9	Mid Vrbas Catchment	226.4	No
	BA_RS_SA_9	Mid _Vrbas Catchment	943.5	No
	BA_RS_SA_10	Lijevče_Polje	595.7	No
	BA_SA_19	Posavina	376.3	Yes
	BA_RS_SA_19	Posavina	808.6	No

Country	GWB code	GWB Name	GWB size (km²)	Trans-boundary (Yes/No)
	BA_RS_SA_20	Semberija	465.1	No
	BA_RS_SA_22	Romanija_Devetak	1,299.5	No
	BA_BD_SA_50	Posavina	309.1	No
RS	RS_SA_GW_I_2	Eastern Srem – OVK	1,593.7	No
	RS_SA_GW_I_3	Mačva – OVK	763.4	No
	RS_SA_GW_I_6	Western Srem - pliocene	1,172.9	No
	RS_SA_GW_I_7	Eastern Srem - pliocene	2,249.0	No
	RS_SA_GW_I_8	Mačva – pliocene	1,577.5	No
ME	ME-1_1	Pivska Mountain	629.9	No
	ME-1_2	Morača	355.2	Yes
	ME-1_3	Brezna-Maglić	702.9	Yes
	ME-2_1	Pljevlja Basin	554.0	Yes
	ME-2_2	Maoče	526.7	Yes
	ME-3_1	Beranska Bistrica	327.7	Yes
	ME-3_2	Pešter	117.0	Yes
	ME-3_3	Komovi	127.8	Yes
	ME-3_4	Prokletije	69.2	Yes
	ME-3_5	Lješnica	239.9	Yes
	ME-4_1	Sinjajevina	406.0	No
	ME-4_2	Kosanica	377.5	Yes
	ME-4_3	Durmitor	429.2	Yes

The diverse geological structure of the Sava RB comprises limestones, sandstones, gravel, and permeable fluvial sediments, which are the main components of the aquifers of the important GWBs. Varied geological formations (with corresponding hydraulic properties of the aquifers) and the varying permeability of the overlying strata provide different protection to GWBs from anthropogenic influence throughout the Sava RB.

3 Significant pressures identified in the Sava RB

Pressures on the water environment, which can challenge the achievement of the WFD environmental (Art 4. WFD) are defined for the Sava RB through Interim SWMI Report as organic, nutrient, and hazardous substances pollution, hydromorphological (HYMO) alterations, and pressures affecting qualitative and quantitative status of ground water. Other issues that are considered as candidates for SWMI's are pressures and impacts on sediment quantity and quality, invasive alien species, and water demand management. The Interim SWMI report, provided the outline for the pressure and impact analysis in 2nd Sava RBMP.

3.1 Surface water

Pressure and impact analysis as an essential analytical part of the DPSIR (Drivers-Pressure-State-Impact-Response) framework, provides important input for the succeeding steps in river basin management and planning, such as establishment of monitoring networks, water status assessments, and definition of an effective program of measures. Following the DPSIR approach, pressure and impact analysis is based on the following steps: identification of the key drivers, identification of the significant pressures, assessment of impacts and assessment of failure to meet WFD objectives. Anthropogenic activities, considered as drivers, can cause multiple pressures to surface and ground water resources. For the Sava RB as the main ones, such as population, industry, agriculture, and drivers introducing HYMO pressure, will be here further elaborated.

3.1.1 Organic pollution

3.1.1.1 Organic pollution from urban wastewater

Potential significance of the pressures that originate from water and sanitation sector, strongly correlate with the number of population and its density, relaying up to water resources. According to the data delivered by riparian countries the population of the Sava RB (excluding Albania) is 8.571 million which in comparison to 8.760 million in the reference year for the 1st planning cycle represents decline by 2.2%. Population data for each Sava country is given below in the Table 6.

Table 6: Sava RB countries – population in 1000s

	SI	HR	BA	RS**	ME	Total*
Total country population*	2,055	4,269	3,791	7,187	621	**17,923**
Population of the country in the Sava RB	1,069	2,135	3,306	1,869	192	**8,571**
Share of the country population living in the Sava RB	52%	50%	87%	26%	31%	**48%**
Share of the population by country in total Sava RB population	12.5%	24.9%	38.5%	21.8%	2.2%	**100%**

**Total number does not include the share of population of Albania. **RS data without Kosovo.*

Agglomerations as "areas where the population and/or economic activities are sufficiently concentrated for urban waste water to be collected and conducted to an urban waste water treatment plant or to a final discharge point" (according to Article 2(4) of the UWWT Directive (271/91/EC)[6] are defined in Slovenia, Croatia, and Serbia. The data related to number of population living within the agglomerations were not available.

The pressure assessment has been done according to the population equivalent loads. Available data on organic and nutrient loads expressed in PE are used for Slovenia, Croatia, and Serbia, while for Bosnia and Herzegovina and Montenegro the load is calculated with approximation that 1 inhabitant represent a load of 1PE. For the analysis of the pressures originating from population, for Bosnia and Herzegovina and Montenegro as "agglomeration", settlements with population with more than 2,000 PE were used. Although designated, agglomeration with population less than 2,000 PE, were not taken into consideration for the analysis (2 agglomeration in Serbia, Subotište and Darosava, and one agglomeration in Montenegro-Žabljak).

Within the Sava River Basin 431 agglomerations >2,000 PE are identified, generating the load of approx. 7.6 million PE. Regarding the agglomeration size, the numerous agglomerations are the ones with PE>2,000-10,000 (314 of 431). However, these agglomerations contribute with 17% (1,318,749 PE) to the total load from agglomerations while agglomerations with PE>10,000 (117 of 431) generate 83% of total load (6,282,071 PE). The load of 3,505,554 PE originates from 7 agglomerations with PE >100,000. Data in the Table 7 shows the distribution of agglomerations according to their size and their contribution to the generated pollution load in the Sava RB.

Table 7: Number of agglomerations and generated pollution load in agglomerations PE>2,000 in the Sava RB – reference year 2016;

Size category of agglomeration	No. of agglomerations in the Sava RB	Generated load, PE	% of generated load in the Sava RB agglomeration classes
>2,000 PE	431	7,600,820	100%
>2,000 – 10,000 PE	314	1,318,749	17%
>10,000 PE	117	6,282,071	83%
>10,000 – 100,000 PE	110	2,776,517	37%
>100,000 PE	7	3,505,554	46%

The difference in comparison to the number of agglomerations (in the 1st Sava RBMP -556 agglomerations) originates from the new designation of agglomerations in Croatia and Serbia. Furthermore, in Bosnia and Herzegovina currently one settlement is represented as one discharge location and approximated as one agglomeration while for the first plan agglomerations were considered on each of the registered waste water discharge point. The highest difference is evident in the number of agglomeration 2,000-10,000 PE.

The difference and significant increase in generated load (in the 1st Sava RBMP total generated load was 6,817,357 PE) originates from, in this plan included agglomeration Belgrade (1,416,572 PE) since it is physically located within the Sava RS. However, waste water from the agglomeration Belgrade is dominantly discharged into the Danube River.

[6] Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment

In assessing the discharged load, agglomeration Belgrade is just partially taken into consideration, accounted the load discharged in the Danube River.

The detailed representation of the number of agglomerations per riparian countries, with the comparison to the 1st Sava RBMP can be found in the Annex 5.

The number of agglomerations above 2,000 PE and the share of the generated load for individual Sava RB countries are given in Figure 12.

Bosnia and Herzegovina has the highest number of agglomerations (settlements) with more than 2,000 PE (173), generating the load of 2,396,979 PE with a share of 31% of the total basin load. Similar share of pollution load (28% and 26%) is generated in 91 agglomerations of Croatia (2,012,057 PE) and 70 in RS (2,140,257 PE) while 89 agglomerations from Slovenia contribute to the basin generated load with 12% of the total load (964,968 PE). Montenegro with its 8 agglomerations with more than 2,000 PE and total load of 86,558 PE generate 1% of the Sava RB's pollution load from agglomerations.

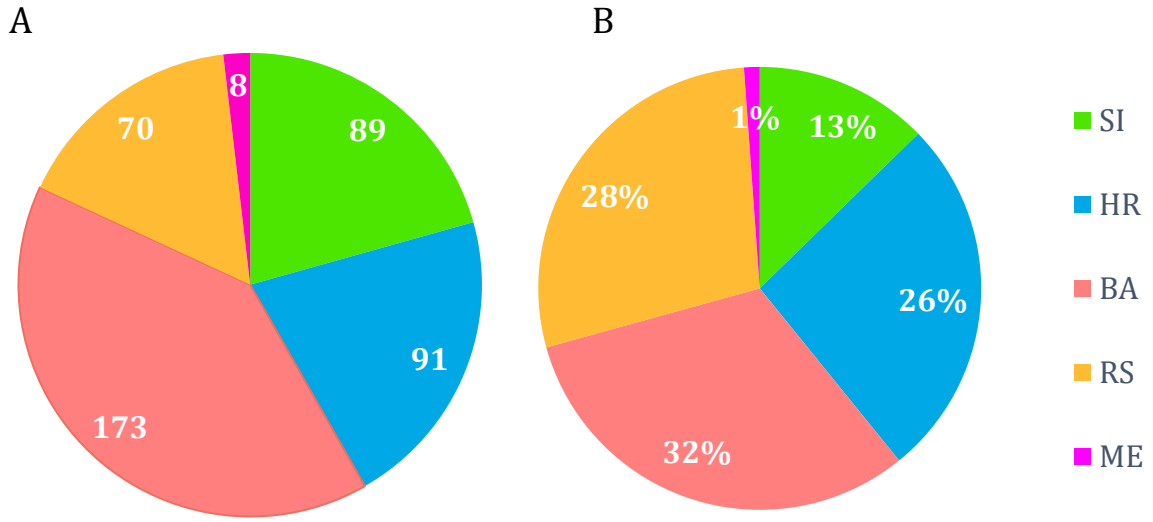


Figure 12: Number (A) of agglomerations >2,000 PE and share (B) of generated load for countries in the Sava RB

Data in the Table 8 shows that 70% (5,427,835 PE) of the generated load in agglomerations >2,000 PE in the Sava RB is collected by the sewer systems of which 50% is treated with some type of the treatment systems (primary or mechanical treatment is taken into consideration as well, due to consistency with the 1st Sava RBMP).

In comparison to the 1st Sava RBMP, increase is evident in the number of PE connected to the sewage network, as well the decrease in PE load, that is neither connected to sewage system nor treated on UWWTPs.

Table 8: Generated load in agglomerations >2,000 PE in the Sava RB – reference year 2016

Sava countries/ Sava RB	GENERATED POLLUTION LOAD (PE)				
	TOTAL	Collected by sewerage system			Not collected
		Total collected	Treated	Not treated	Not treated
SI	964,968	877,643	1,259,802	1,979	87,325
HR	2,012,057	1,452,706	1,229,441	217,855	564,761
BA	2,396,979	1,417,445	503,030	914,416	979,534
RS	2,140,258	1,629,501	130,461	1,499,040	510,756
ME	86,558	50,539	32,366	18,174	36,019
Sava RB	**7,600,820**	**5,427,835**	**3,155,100**	**2,651,463**	**2,178,394**
Sava RB - of total, %	100%	71%	42%	35%	29%
Sava RB -of collected %		**100%**	**58%**	**49%**	

GPL – generated pollution load.

The level of wastewater collection by the sewerage systems in agglomerations >2,000 PE in the Sava RB is summarized in the Table 9, and presented by countries in the Figure 13.

Table 9: Level of urban wastewater collection in agglomerations >2,000 PE in the Sava RB

Country/Sava River Basin	Number of agglomerations with discharge of generated pollution load (PE) into the sewerage system in the following range				
	< 60%	60 – 79.9%	>80%	With sewerage system	Without sewerage system
SI	10	13	65	88	1
HR	28	19	11	58	33
BA	51	32	33	116	57
RS	15	11	14	40	30
ME	5	1	2	8	0
Agglo >2,000 PE	**109**	**76**	**125**	**310**	**121**
Agglo >10,000 PE	**29**	**38**	**45**	**112**	**5**

The share of 28% of all agglomeration PE >2,000 PE are not connected to a sewerage collection system nor to a wastewater treatment plant (in comparison to 40% from the 1st Sava RBMP). Data from Table 9, as well indicates that there are 5 agglomerations >10,000 PE without sewage network, while 44 of 112 of these agglomerations reached collection system coverage higher than 80%.

In total, 125 agglomerations reached the level of sewage network collection rate higher that 80%, while 186 agglomerations PE>2,000 of which 68 with PE>10,000 required significant sewage network extension. Within the basin 25% of all agglomeration have the sewage network coverage below 60%. On the Figure 13, it is shown that in Croatia, Bosnia and Herzegovina and Serbia is app 40% of agglomerations PE >2,000 with no sewage infrastructure, and app 80% of agglomerations with sewage coverage lower that 80%. Considering agglomerations with more than 10,000 PE the coverage >80% in between

25-40% while in Slovenia 90% of agglomerations have coverage of sewage infrastructure higher than 80%. Although to some extent available, data related to individual or appropriate sanitation systems operating within agglomerations have not taken into consideration for this analysis due to lack of reliable and inconsistency of the existing data.

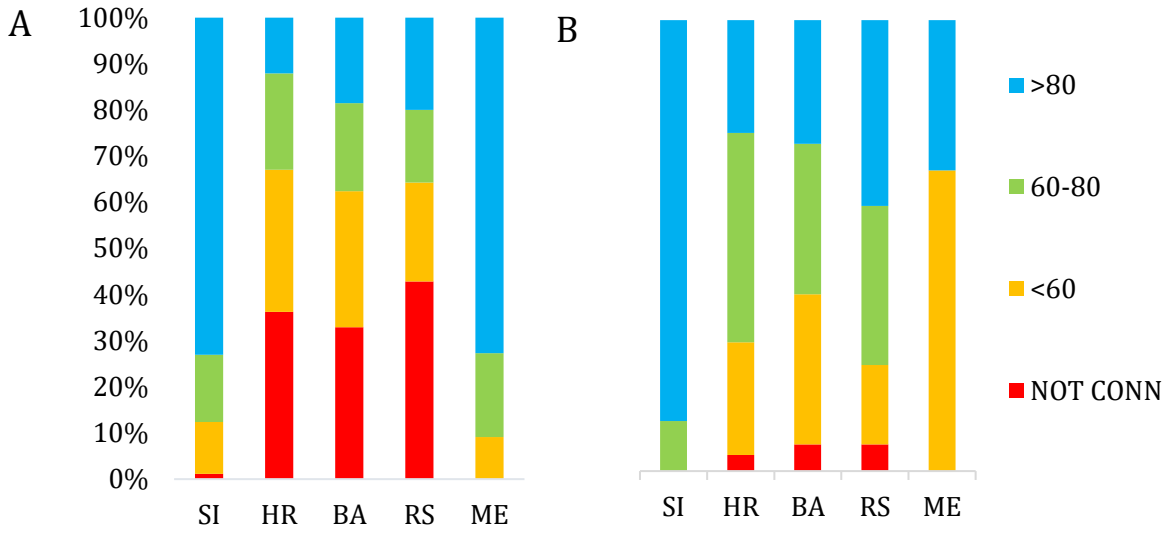


Figure 13: Urban wastewater collection in agglomerations >2,000 PE (A) and >10,000 PE (B) in the Sava countries

Regarding the treatment of the collected sewage, situation differs within the basin, having that requirements and timelines posed upon countries varies. For Slovenia and Croatia, as the member states, the negotiated compliance periods for UWWT Directive (271/91/EC) are defined as 31 December 2015 and 31 December 2023 respectively. Other riparian countries are in different or still in the preparatory phases for EU membership negotiation process where compliance periods will be defined. Montenegro opened the Chapter 27 in December 2018, in Serbia the Government adopted the negotiation position on 21 January 2021 and it is delivered to EU Council on 22 January 2022, while in Bosnia and Herzegovina the accession process is still in its initial phase.

Urban waste water is treated in 133 (30%) agglomerations, where primary or mechanical treatment has been taken into consideration as well, due to consistency with 1st Sava RBMP. Secondary treatment of collected sewage is implemented in 27% of agglomerations (115) and 63 agglomerations have more stringent treatment (all are equipped with nutrient removal). Urban wastewater from 70% of the agglomerations above 2,000 PE in the Sava RB (298 out of 431) is still not treated, however this represents the improvement by decrease of 16% in comparison to the 1st planning cycle. The number of agglomerations whose waste water are discharged after any type of treatment implemented, increased significantly (by 40%) in comparison to the first planning cycle.

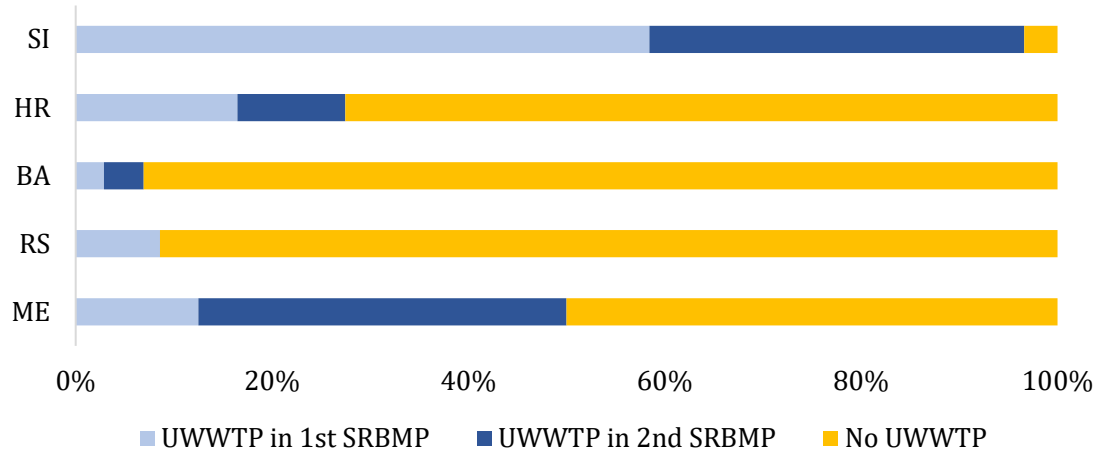


Figure 14: Comparison (1st and 2nd Sava RBMP) of operating UWWTP in agglomerations >2,000 PE

Being the part of the Danube RB which entire is considered as the sensitive area under Article 5(5) of the UWWT Directive (91/271/EEC), for the Sava RB compliance with Directive 91/271/EEC supposes implementation of more stringent treatment level (nutrient removal) for all agglomerations with >10,000 PE.

Of all agglomerations in Sava RB with PE>10,000, 16% (19 of 117 agglomerations) has nutrient removal while from 64% (75 of 117 agglomerations) of agglomerations discharge waste water in the recipients without any type of the treatment applied.

Table 10: Level of urban wastewater treatment in agglomerations >2,000 PE in the Sava RB – reference year 2016

Country	Number of agglomerations >2,000 PE with				
	primary treatment	secondary treatment	tertiary treatment	with treatment - total	without treatment
SI	0	30	56	86	3
HR	8	14	3	25	66
BA	5	6	1	12	161
RS	0	5	1	6	64
ME	0	2	2	4	4
Sava RB total >2,000 PE	**13**	**57**	**63**	**133**	**298**
>10,000 PE	**7**	**16**	**19**	**42**	**75**

The **Figure 15** represents that there is still a high proportion of agglomerations that discharge urban wastewater via sewerage systems into surface water without any of the treatment applied. Data in the Table 10 provides an overview of existing treatment levels in agglomerations PE>2,000 and PE>10,000 throughout the entire Sava RB.

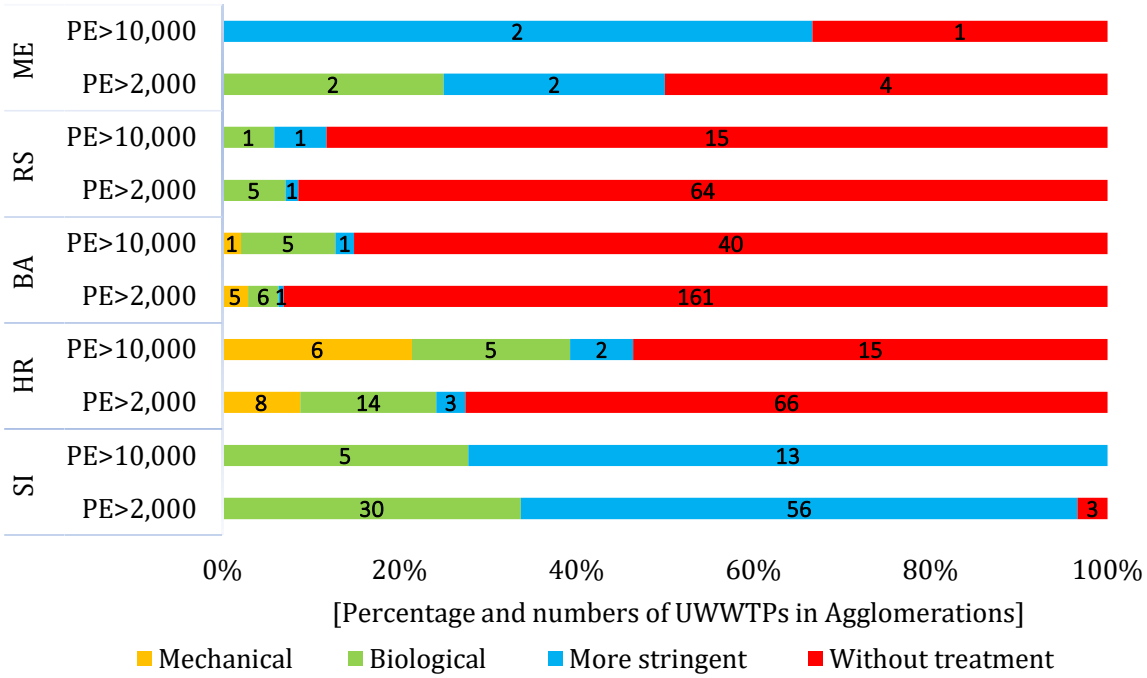


Figure 15: Representation of different treatment levels in agglomerations (>2,000 PE and >10,000 PE) in the Sava RB

The pollution load per countries in the Sava RB, the load collected, and treated with different levels of treatment, accounted for the agglomerations >2,000 PE and > 10,000 PE are also shown in the Table 11.

Table 11: Collection and urban wastewater treatment in the Sava RB - reference year 2016

Country	GENERATED POLLUTION LOAD, PE						
	TOTAL	Collected in sewerage system					Not collected
		primary treated	secondary treated	tertiary treated	treated – total	not treated	not treated on UWWTP
SI	964,968	0	435,023	440,641	875,665	1,979	87,325
HR	2,012,057	127,564	998,893	102,984	1,229,441	217,855	564,761
BA	2,396,979	37,350	445,990	19,690	503,030	914,416	979,534
RS	2,140,258	0	72,959	57,503	130,461	1,499,040	510,756
ME	86,558	0	2,943	29,423	32,366	18,174	36,019
Agglo >2,000 PE in the SRB–PE	**7,600,820**	**164,914**	**1,955,808**	**650,241**	**2,770,962**	**2,651,463**	**2,178,394**
Agglo >10,000 PE in the SRB – PE	**6,282,071**	**143,628**	**1,835,038**	**483,376**	**2,462,043**	**2,371,926**	**1,448,102**

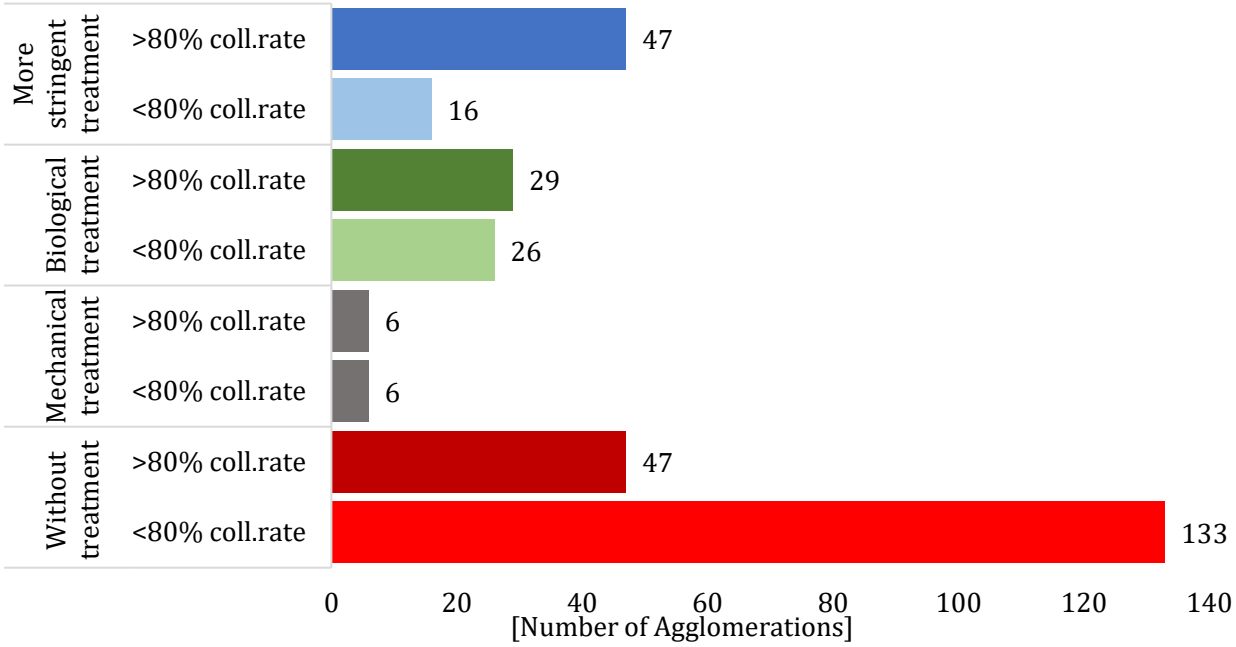


Figure 16: Number of agglomerations per implemented level of treatment and sewage collection rate

A pollution load of 7,600,820 PE was generated in agglomerations above 2,000 PE in the Sava RB in 2016, which represents 145 kt/a BOD_5 and 305 kt/a COD.

The total emission into the water environment in the Sava RB, through sewage networks from agglomerations >2,000 PE, is 55 kt/a BOD_5 and 101 kt/a COD.

Table 12: Generated organic pollution, collected ad discharged in the Sava RB and emissions into the Sava RB from agglomerations >2,000 PE – reference year 2016

		GPL		Current load	Current load		Emissions	
	GPL	BOD	COD		BOD	COD	BOD	COD
Country	PE	t/a	t/a	PE	t/a	t/a	t/a	t/a
SI	964,968	21.132.8	38,743.5	877,643	19,220.4	35,237.4	671.0	3,334.0
HR	2,012,057	44,064.0	80,784.1	1,452,706	31,814.3	58,326.1	13,351.5	21,765.6
BA	2,396,979	52,493.8	96,238.7	1,417,445	31,042.1	56,910.4	27,623.3	50,593.3
RS	2,140,258	46,871.6	85,931.3	1,629,501	35,686.1	65,424.5	13,697.8	25,112.6
ME	86,558	1,895.6	3,475.3	50,539	1,106.8	2,029.2	198.4	363.7
Total	**7,600,820**	**166,457.8**	**305,172.9**	**5,427,835**	**118,869.6**	**217,927.6**	**55,541.9**	**101,169.2**

The Figure 17 provides representation of data from Table 12, and shows the total generated and emitted load of organic pollution in the Sava RB from agglomerations >2,000 PE for the Sava countries.

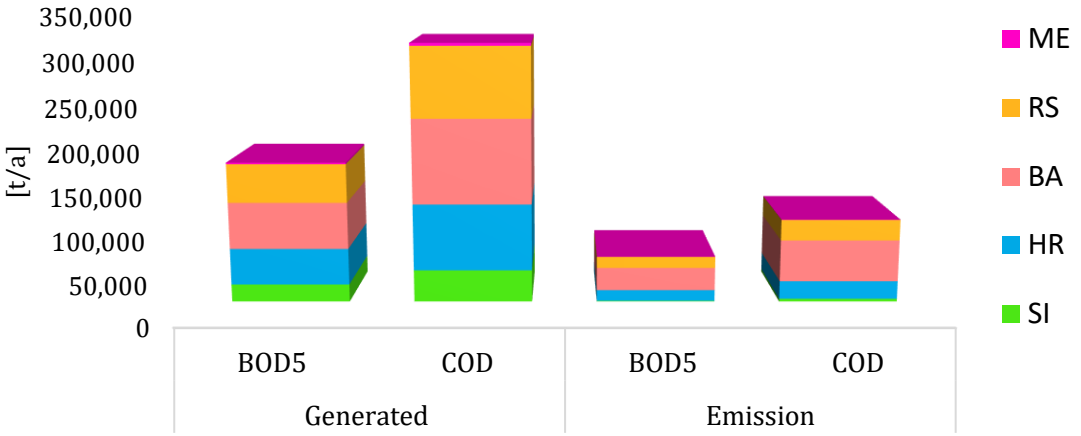


Figure 17: Generated and emitted organic pollution load in the Sava RB from agglomerations >2,000 PE

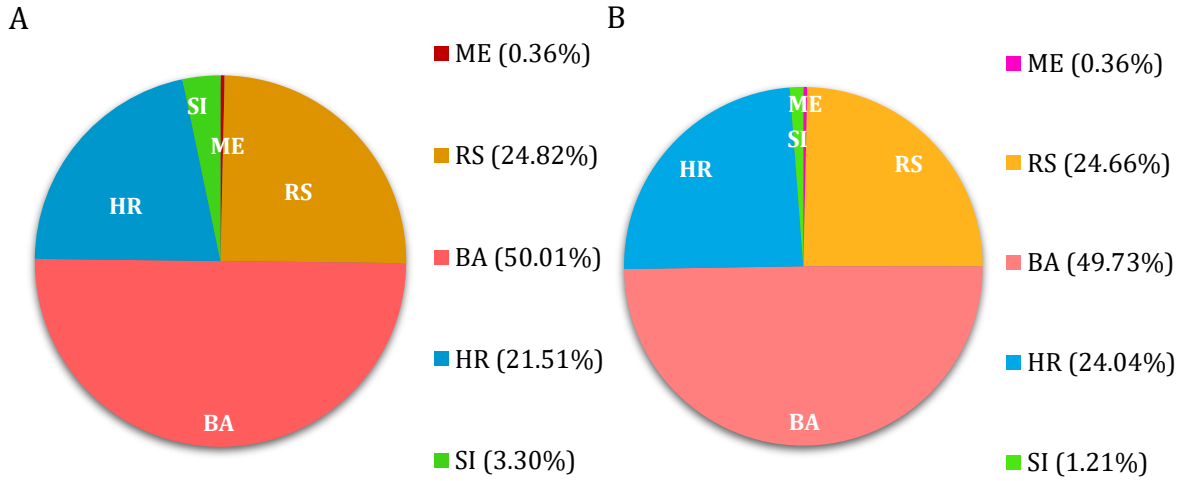


Figure 18: Contribution to the emission load to the surface water in the Sava RB of riparian countries [A] COD and [B] BOD_5

3.1.1.2 Industrial and agriculture organic pollution

The industrial and agricultural facilities can significantly contribute to the organic, nutrient, and hazardous substances pollution to the water environment. With respect to their location within the basin, the characteristic of the load discharged, the recipient capacity and the possibility of the cumulative effect to the water environment, any industrial or agricultural activities can be recognized as a significant in the basin wide context. However due to lack of comprehensive inventory of the significant polluters for the Sava RB, the selection of significant industrial and agricultural polluters has been made by experts from the Sava countries. Here, the compilation of available data, indicating the number of significant industrial facilities, per types, in accordance with European Pollutant Release and Transfer Register (E-PRTR) is presented. The limited data related to the pollutant's emission prevented the further analysis.

In accordance with the data availability, in the Sava RB are located 144 significant facilities of the basin wide importance (facilities type "Waste and waste water management were not taken into consideration since UWWTP are considered in the chapter 3.1.1, while for

facilities for hazardous waste storage and recovery and municipal landfills data were not available). Most of the facilities 21% (30 of 144) were declared as type "animal and vegetable products from food and beverage sector". Of the rest 114 significant polluters 17% (19) are recognized as mineral industries, 16% (18) as chemical industries, 17% (19) are from energy sector, 14% (16) from metal production and processing, and 11% (12) as paper and wood production facilities, 7% (8) as intensive livestock production and type of activity for 13% (15) of the significant facilities is defined as "other".

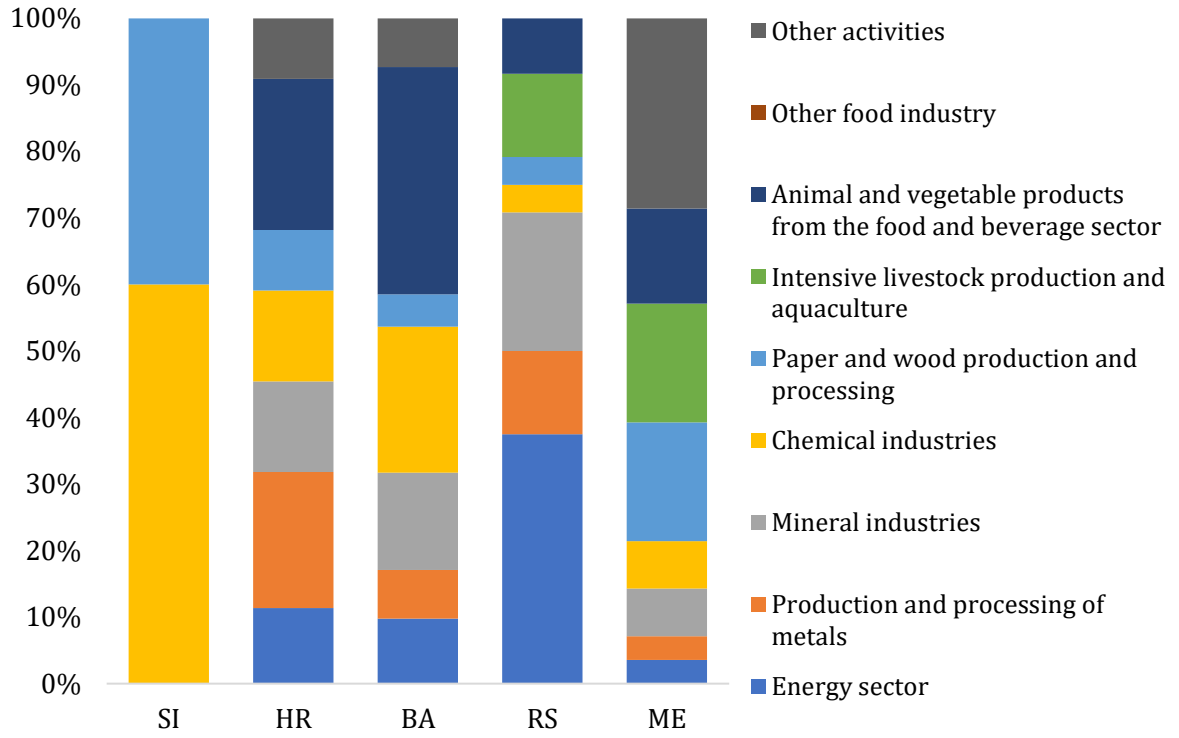


Figure 19: Type of significant industrial facilities per country in the Sava RB

While on the Figure 19, all recognized industrial facilities that can potentially cause significant pressure to the water environment are presented, the data in the Table 13 aimed to present the total annual pollutant load BOD_5/COD from the industrial sector which is discharged into the surface water. The level of details and the availability of the data, differ throughout the basin.

Table 13: Discharged organic load from industrial facilities into the Sava RB

Country	WW discharges from significant industrial pollution sources		
	No. of significant IPS	Organic pollution load	
		COD, t/a	BOD_5, t/a
SI	6**	849.76*	n/a
HR	19**	572.9	173.9
BA	44***	n/a	12,305.5
RS	24	n/a	n/a
ME	28	n/a	n/a

** Data available for TOC (kg/a), calculated here as COD(t/a)*
** * Direct discharge to the recipient*
**** total emission form industrial facilities for Bosnia and Herzegovina Republika Srpska and Brčko district Bosnia and Herzegovina and industrial emission from Federation of Bosnia and Herzegovina accounted for significant industrial polluters.*

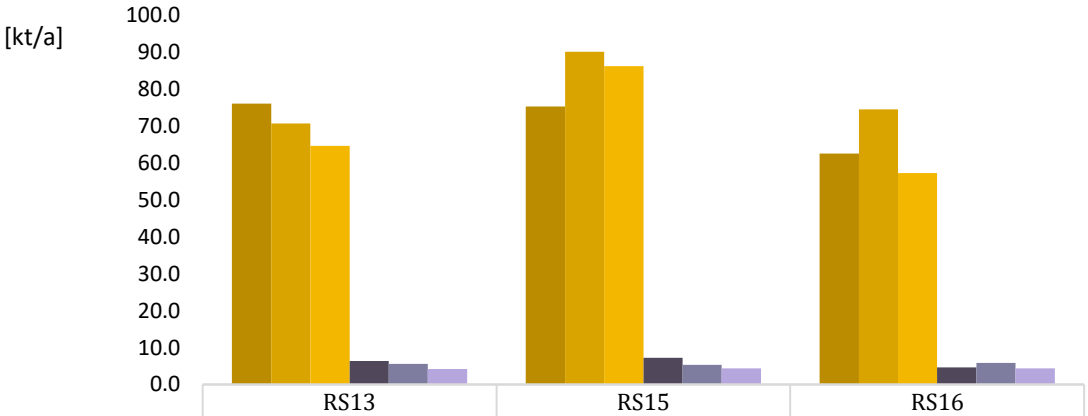
3.1.2 Nutrient pollution

Nutrient pollution can be caused by nitrogen and phosphorus compounds discharged into the water environment. Nutrient pollution may originate from point and diffuse sources. The main drivers for nutrient pollution from point sources are waste water management, industry, and agriculture. The diffuse sources, which are multiple and considered more significant for nutrient pollution, originate from inappropriate sanitation, surface runoffs from urban, industrial, or agricultural areas, atmospheric deposition, sediment transport, tile drainage flow, etc.

Extensive inputs of nitrogen and phosphorus into aquatic environment can lead to eutrophication which causes ecological changes, loss of plant and animal species, deterioration of ecological status, and can have negative impacts on downstream water uses.

As the Danube River tributary with the largest discharge, the Sava River, in the analysed period (2015-2017), contributed to the nutrient load in the Danube RB with approx. 4.4-5.9 kt/a of total P (TP) and by 57.3-74.6kt/a of total N (TN) (which represents the decrease of approximately 15% for TP and 13% of the TN from the 1st Sava RBMP). The data for estimation (see also Figure 20) are based on the water quality data from monitoring sites at Jamena (RS13), Šabac (RS15) and Ostružica (RS16) (ICPDR TNMN Year Book 2015, 2016 and 2017), using discharge data from the monitoring site where available and estimated yearly average discharges for Šabac and Ostružnica, according to the ISRBC's data sharing platform SavaHIS.

The contribution to the Danube RB load, taking into consideration the area of the Sava River sub-basin, is appox. 6.0-7.8 kgTN/ha and 0.45-0.6 kgTP/ha.



	RS13	RS15	RS16
2015 TN (kt/a)	76.1	75.4	62.6
2016 TN (kt/a)	70.8	90.2	74.6
2017 TN(kt/a)	64.7	86.3	57.3
2015 TP(kt/a)	6.3	7.3	4.7
2016 TP(kt/a)	5.6	5.4	5.9
2017 TP(kt/a)	4.2	4.4	4.4

Figure 20: Estimate of the Sava River nutrient load into the Danube River

3.1.2.1 Nutrient pollution from point sources

3.1.2.1.1 Nutrient pollution from urban wastewater

Urban wastewater is a significant source of nutrients (N and P). The most significant urban waste water sources are sewage systems, which are collecting and discharging untreated waste water into the water environment and/or municipal waste water treatment plants, with insufficient treatment level. An overview of urban wastewater treatment levels is provided in Chapter 3.1.1.1 Technologies for nutrient removal are implemented in 63 agglomeration (majority in Slovenia 56). The tertiary treatment is used for N and P removal for generated load of 640,556 PE (ten times increased since the 1st Sava RBMP), which represent 15% of the total collected load of urban wastewater by the public sewerage system discharged within the basin (in comparison with 1.70% from the previous cycle). The nutrient pollution generated, collected with sewage system, discharged within the basin, and emitted from agglomerations >2,000 PE are shown in Table 14.

Table 14: Generated, collected or current load, and emission load of nutrients from agglomerations >2,000 PE in Sava RB - reference year 2016

Country	GPL	GPL		Current load	Current load		Emissions	
		TN	TP		TN	TP	TN	TP
	PE	t/a	t/a	PE	t/a	t/a	t/a	t/a
SI	964,968	3,522.1	625.2	877,643	3,203.4	568.6	996.3	190.3
HR	2,012,057	7,344.0	1,303.6	1,452,706	5,302.4	941.2	4,803.6	839.2
BA	2,396,979	8,749.0	1,552.9	1,417,445	5,173.7	957.1	4,971.8	944.7
RS	2,140,258	7,811.9	1,386.6	1,629,501	5,947.7	1,055.7	2,100.8	430.2
ME	86,558	315.9	56.1	50,539	184.5	32.7	32.7	5.9
Total	**7,600,820**	**27,743.0**	**4,924.4**	**5,427,835**	**19,811.6**	**3,555.4**	**12,905.2**	**2,410.2**

Total emissions from agglomerations >2,000 PE are 12.9 kt/a for TN and 2.4 for TP, representing the decrease of 38% and 51% in comparison to the 1st Sava RBMP for TN and TP respectively.

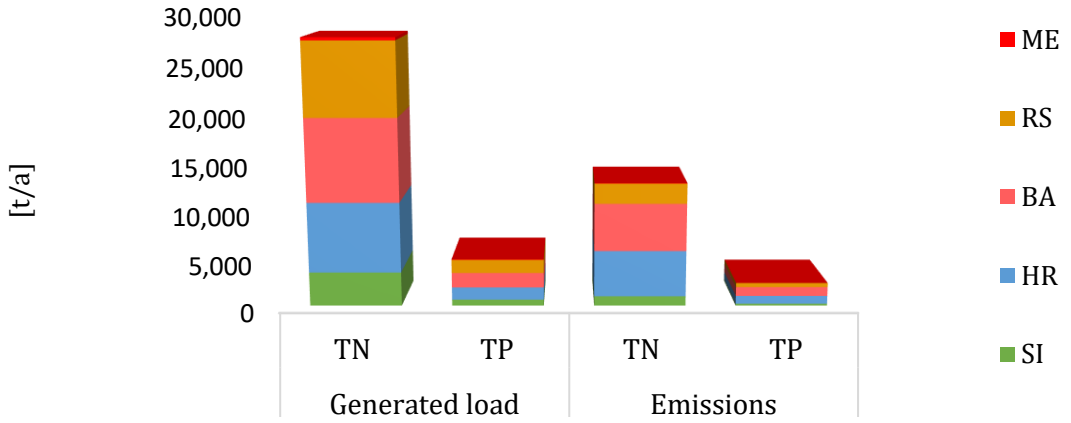


Figure 21: Nutrient emissions from agglomerations >2,000 PE - reference year 2016

3.1.2.1.2 Nutrient pollution from industry

Many industrial facilities are sources of the nutrient pollution. The chemical sector and intensive livestock production are the most important contributors. The available input data on nutrients from the industrial sector in the Sava RB, originating from the significant industrial pollution sources is summarized in the Table 15.

Table 15: Nutrient load discharged from the industrial facilities into the Sava RB – reference year 2016/17

Country	Significant industrial pollution sources	
	TN, t/a	TP, t/a
SI	n/a	n/a
HR*	56.7	2.1
BA**	2,540.6	356.0
RS	n/a	n/a
ME	n/a	n/a

**direct discharge into the recipient*
*** total emission form industrial facilities for Bosnia and Herzegovina Republika Srpska and Brčko district Bosnia and Herzegovina and industrial emission from federation of Bosnia and Herzegovina accounted for significant industrial polluters.*
n/a – data not available.

3.1.2.2 Nutrient diffuse pollution sources

In the Sava RB, there is no systematic data collection that would enable the assessment of the nutrients load to the water bodies, from diffuse sources of pollution. At the ICPDR level, the MONERIS model (Modelling Nutrient Emissions in River Systems) has been developed and applied on the Danube River Basin to estimate nutrient emissions into surface waters from the point and various diffuse sources.

According to the methodology, the MONRIS model is taking into consideration range of the potential sources of the nutrients, comprising anthropogenic activities such as urban areas or agriculture, and natural processes which independently or in a cumulative effect can significantly affect water quality and deteriorate the water status. The MONERIS model calculates the emissions into surface waters via seven independent pathways (point sources, surface runoff, groundwater, tile drainage, atmospheric deposition, and erosion). As the model result, the total emission within the basin is calculated by aggregation of the results from analytical units. For the model purposes the Sava RB is divided into 74 analytical units which represent sub-catchments as a basic model unit and enable model results representation. (Map 9 and Map 10).

The available results presented here, originate from the MONERIS model applied to the Sava River Basin in the development of 2nd SRBA, using data from the period 2009-2012.

The model results showed amount of the nutrient emitted from point and diffuse sources of pollution within the Sava River basin are for TN 103,551.0 t/a and for TP 7,309.0 t/a, which represent 10.65 kg/ha/a and 0.751 kg/ha/a, respectively. Diffuse pathways within the Sava RB contribute to the total emission of TN by 83% and by 55% to emission of TP. The model results estimated total nutrient pollution from diffuse pathways to 86,243.0 t/a for TN (8.86 kg/ha/a) and for 4,060.0 t/a for TP (0.42 kg/ha/a).

The estimated emission from 4 different sources, urban areas, natural areas, agriculture, and background emissions, accounted on the country level within the Sava RB is presented in the Figure 22.

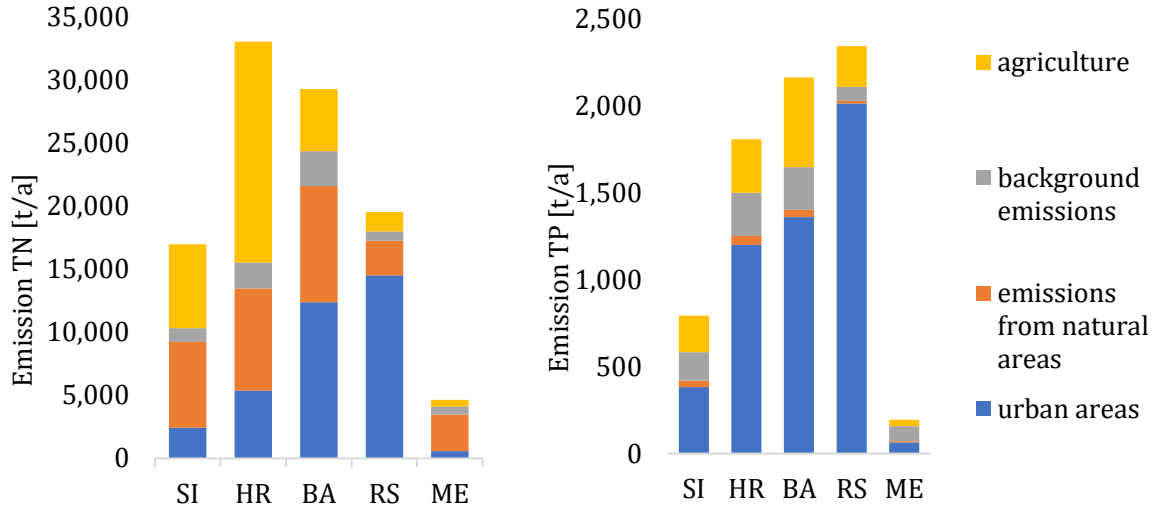


Figure 22: Contribution from the different emission sources to the emission within the basin

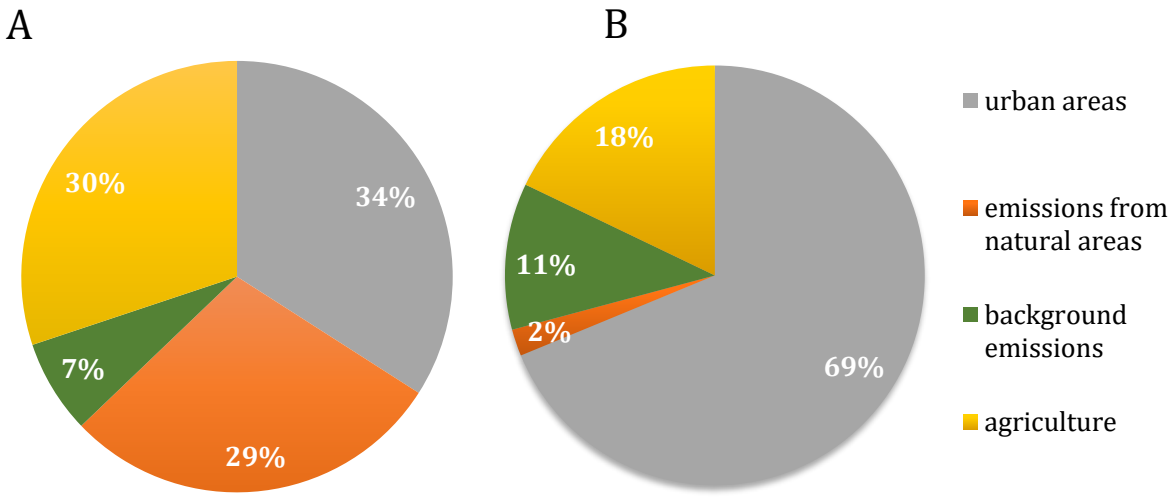


Figure 23: Percentage of the different sources of pollution to the total emission of TN [A] and TP [B]

On a basin level, the dominant source of nutrient pollution are urbanized areas (34% of TN and 69% of TP). Emission from natural areas represents 29% of TN and 2% of TP emission, while agriculture, as a source of nutrients, contributes with 30% to TN and 18% to TP total emission. Background emission which signifies the emission of nutrient under natural conditions account 7% for TN and 11% for TP emission.

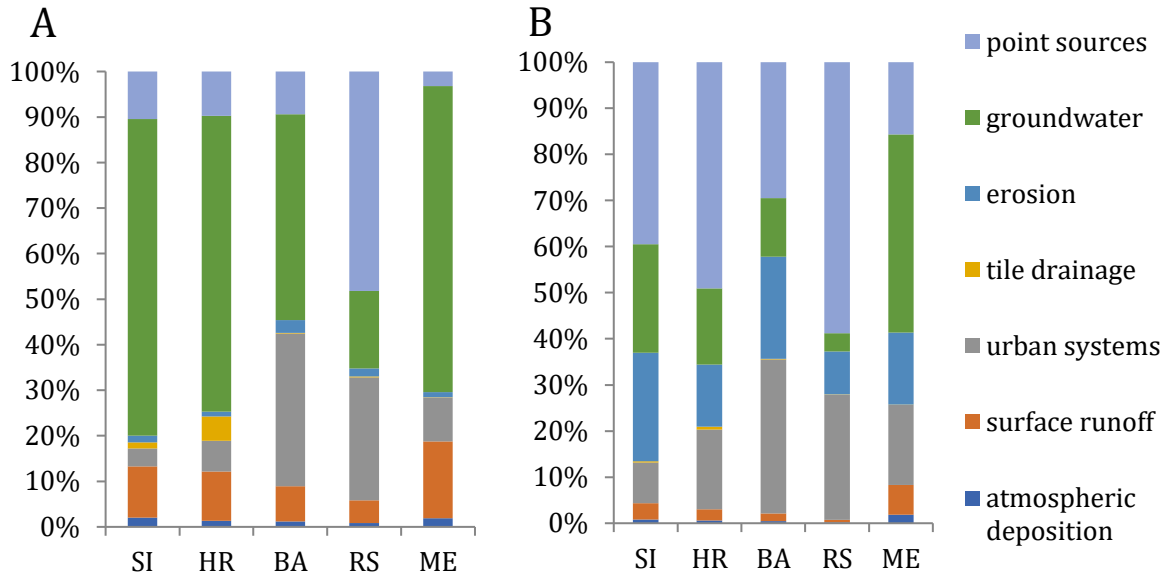


Figure 24: Different pathways of the nutrient pollution within the Sava RB (TN on [A] and TP on [B])

Share of the different emission pathways considered for TN and TP within the MONERIS model are presented per riparian countries on the Figure 24, and on the basin level on the Figure 25.

While the pollution from point sources is directly discharged from sewage and/ or industrial facilities into the rivers, diffuse emissions into surface waters are caused through different pathways, which are in the model divided in the separate flow components. The dominant pathways for both TN and TP are ground water, urban systems, and point sources. Significant amount of TN reaches the rivers through the surface runoff, while erosion is as well significant pathway for TP

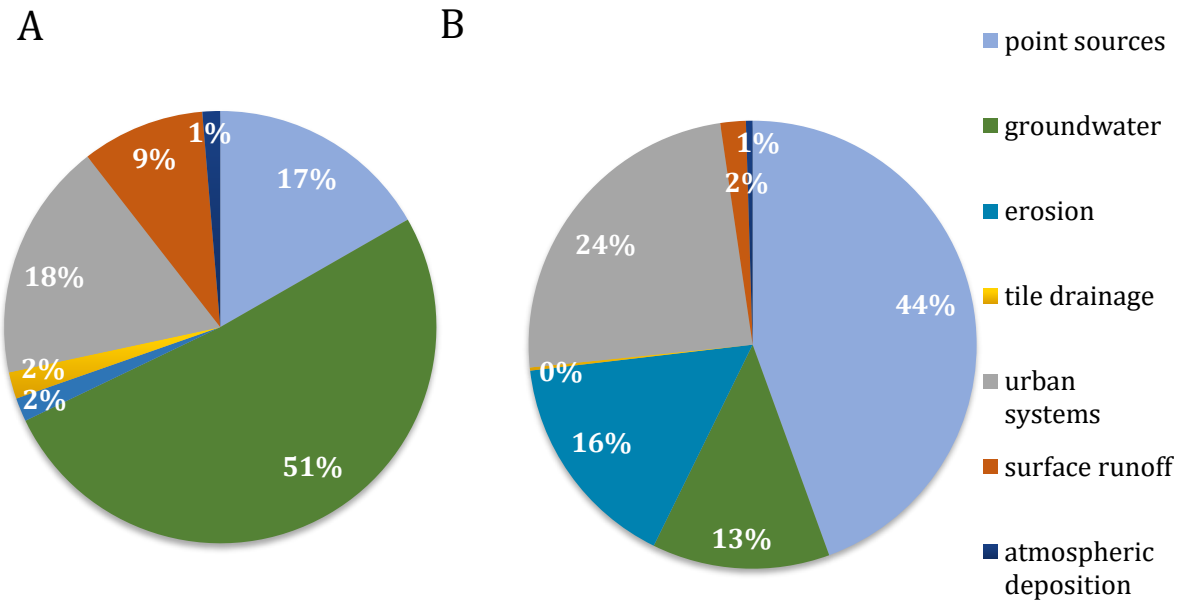


Figure 25: Representation of different pathways for TN [A] and TP [B].

3.1.3 Hazardous substances pollution

Water pollution by hazardous substances have adverse effects on the quality of surface and groundwater, threatening aquatic ecosystems by acute and chronic toxicity towards organisms, causing accumulation of pollutants in the environment and the loss of habitat and biodiversity. Furthermore, it represents a significant risk factor for human health via drinking water or the fish consumption.

Article 16 and Annex 10 of the WFD (as amended by Directive (2008/105/EC)[7] and (Directive (2013/39/EU)[8]) create a mechanism and define a list of priority and priority hazardous substances (45 substances of which 21 priority hazardous) and provide environmental quality standards for annual averages and maximum allowed concentrations. Pollution prevention and control of priority substances should be done through progressive decrease, while complete elimination, suspension of discharges, emissions and losses are foreseen for priority hazardous substances.

Hazardous substances include man-made chemicals (agricultural chemicals and industrial solvents, flame retardants and others), metals, oil and its compounds and numerous emerging substances, personal care products and pharmaceuticals.

The sources of hazardous substances pollution can be point and diffuse. The most significant sources of hazardous pollution substances are industrial activities including metal processing, petroleum and rubber production, thermal power plants, mining with their operating or abandoned tailing dams, landfills and waste dump sites located in the vicinity of surface waters, untreated municipal wastewater discharge points and storm water overflow. The main diffuse source of hazardous substances pollution is agriculture, with plant protection and other chemical products intentionally introduced into the environment. Considering various pathways, types and quantities of pollutants and their prevalence in the environment, atmospheric deposition, navigation, and accidental pollution may also be of a significance for hazardous substances pollution.

The greatest risk to water pollution originates from chemicals, that are widespread and that are continuously entering to the aquatic environment. Further efforts are needed to identify priority substances and other emerging chemicals of the Sava RB wide significance.

3.1.3.1 Hazardous substances pollution – industrial sources

The Sava RB is characterized by various industrial activities, including energy production (thermo/nuclear/hydro power facilities), mining (coal, lead, zinc, bauxite), production of aluminium oxide, metallurgy, glass production, chemical industry, pharmaceutical, textile, pulp and paper industry, tannery, and leather industries, in addition to animal breeding and the food industry – dairies, breweries, etc. that can be recognized as a source of hazardous substances pollution.

[7] Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council

[8] Directive 2013/39/EU of the European Parliament and of the Council of 12 August 2013 amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy

Significant hazardous substances pollution can originate as well form untreated municipal wastewater discharges and leaching from the large number of communal and industrial waste dumps in the Sava RB which can contaminate surface and groundwater.

The monitoring of industrial wastewater in the Sava countries mainly comprises of the monitoring of heavy metals and phenols.

An overview of the available data related to discharge of hazardous substances from significant pollution sources into surface water in the Sava RB is given in Table 16.

Table 16: Hazardous substances load from significant industrial pollution sources into surface water in the Sava RB – reference year 2016/17

Country	As, kg/a	Cd, kg/a	Cr, kg/a	Cu, kg/a	Hg, kg/a	Ni, kg/a	Pb, kg/a	Zn, kg/a	Phenols, kg/a
SI	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1,420.9	n/a
HR	0.2	0.0	0.4	54.1	0.0	1.5	14.6	37.5	0.0
BA	n/a	n/a	2.37*	n/a	0.37	141.0	162.5	n/a	n/a
RS	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	100.0
ME	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

n/a – data not available.
**The data presented in the Table 16 for Bosnia and Herzegovina are not complete and represents the data from federation of Bosnia and Herzegovina, while there is not enough reliable data on emission of hazardous substances in Republika Srpska due to the lack of an adequate polluters inventory, monitoring of particular pollutants, and data related to use and production of these substances in the industries*

3.1.3.2 Use of agricultural pesticides

Pesticides used in agriculture can reach the aquatic environment via different routes. Through diffuse pathways such as spray drift, surface run-off and leaching chemicals that are introduced into the environment. In the aquatic environment, even the residues of these substances and their metabolites can cause significant pollution. However, no comprehensive and up to date basin wide data are available regarding spatial distribution of pesticides use neither their types nor quantities applied.

Available national data not accounted for the Sava RB indicate that fungicides (in Slovenia and Croatia) and herbicides (in Serbia) are the most commonly used plant protection chemicals. According to Slovenian Statistical Office, in 2017, 510 t of active substances in plant protection products were consumed in agriculture in Slovenia; most of them, 413 t, were fungicides, 77 t were herbicides, 19 t were insecticides, and 1.5 t were other plant protection products. For Croatia data are available (RBMP 2016-2021) from 2012 where, about 2,205 t of pesticides or 2 kg of active substances per hectare of arable agricultural land were applied (app 1,106 t of fungicides, 1,031 t of herbicides and 67 t of zoocides). In Bosnia and Herzegovina legislative framework for sustainable use and monitoring of pesticides is established, although systematic data are not available.

3.1.3.3 Accidental pollution

Accidental pollution can significantly affect water environment. Mechanism for prevention and minimization of the risk of accidental pollution events, is established in EU MS by implementation of the Directive Seveso-III-(Directive 2012/18/EU)[9], Extractive industrial waste directive (2006/21/EC)[10] and the Industrial Emission Directives-IED (2010/75/EU)[11], and for non-EU countries by fulfilling the recommendations of the UNECE Convention on the transboundary effects of industrial accidents.

On a Danube Basin level, the ICPDR elaborated a basin-wide inventory of Potential Accident Risk Sites in the Danube River Basin. The ARSs inventory for the Sava River basin encompasses operational industrial sites with a major risk of accidental pollution, due to the nature of the chemicals being produced, stored, or used at the plants, as well as contaminated sites including landfills and dumps in areas liable to flooding. In accordance with the available data within the Sava RB 79 facilities considered to be risk spots for accidental pollution.

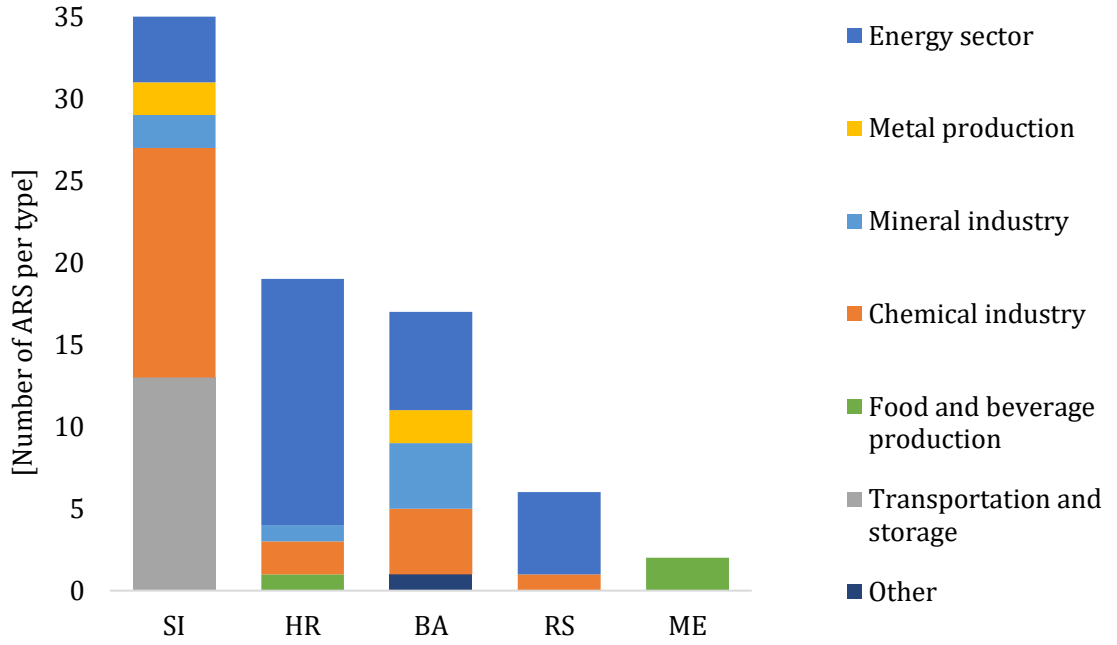


Figure 26: ARS in Sava RB per riparian countries

Regarding the types of industrial facilities representing ARS, 38% is energy sector, 27% chemical industries, 16% sector of transportation and storage, while 20% of facilities that can be considered as ARS comprise paper and wood production industry, animal and food production sector and facilities define as "other sector".

[9] 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

[10] Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC

[11] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control)

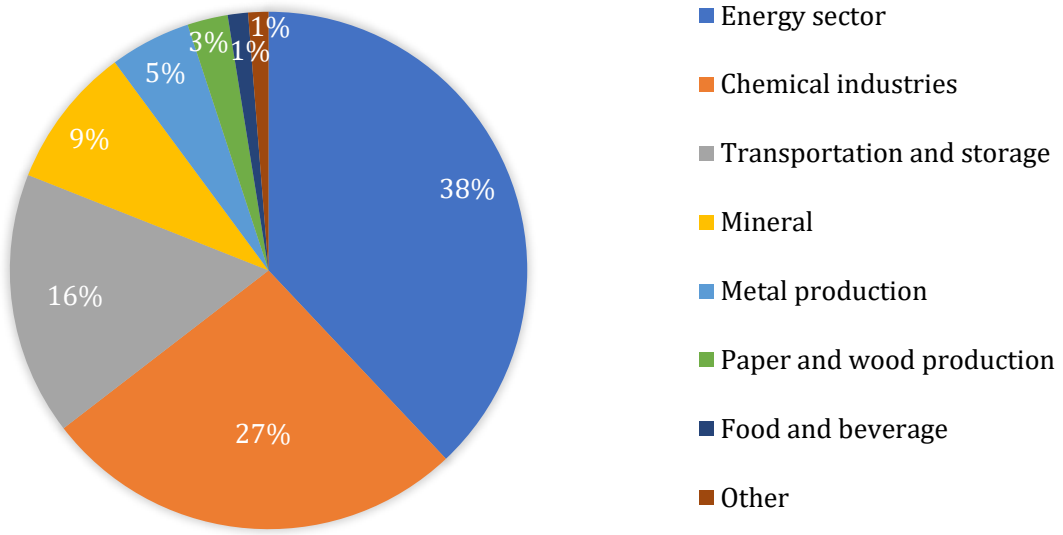


Figure 27: Type of industrial facilities considered as ARS in the Sava River basin

In the field of accidental pollution management, the Parties to the FASRB rely to the Accident Emergency Warning System (AEWS), which has been developed by the ICPDR. The system has been implemented by the Parties through the establishment of the national Principal International Alert Centers (PIAC) and regularly successfully tested.

The Parties to the FASRB have developed the draft Protocol on Emergency Situations to the FASRB which comprises basin wide goals and define activities that will enable adequate prevention, emergency planning, preparedness, communication through alarm and warning system and response based on mutual assistance of the Parties. The Draft Protocol on Emergency Situations was adopted by ISRBC in 2009, and its final harmonization is expected, depending on readiness of the Parties.

3.1.4 Hydromorphological alterations

Hydromorphology (HYMO) represents the physical and morphological characteristics of the river system, river bed, riverbanks, such as river's connectivity with adjacent landscapes and longitudinal as well as habitat continuity. HYMO characteristics are affecting physico-chemical processes in the rivers and defining habitats conditions for aquatic or/and water dependent ecosystems.

As HYMO quality elements of SWBs, WFD recognize hydrological regime, river continuity and morphological conditions. Anthropogenic activities that have profound effects on HYMO characteristics, can cause fragmentation and loss of habitats, with direct and indirect consequences to the structure and functioning of the aquatic ecosystem, and adversely affect ecological status. Key drivers affecting the river systems and creating HYMO pressures of a significant importance within Sava RB, are hydropower production, flood protection, navigation, agriculture, and various water uses.

The significant HYMO pressures recognized in the Sava RB are:

- Hydrological alterations, provoking changes in the quantity and conditions of flow;
- Longitudinal river continuity interruption;
- Morphological alterations and disconnection of adjacent wetlands/floodplains.

Furthermore, future infrastructure project which implementation can cause potential significant HYMO pressures on the river systems in Sava RB, are presented in the Chapter 3.1.4.5.

3.1.4.1 Hydrological alterations

Anthropogenic pressures causing changes in hydrological regime in quantity and flow dynamics can significantly affect water dependent ecosystems, their habitats and other downstream water users. The criteria for the significance assessment within the Sava RB are harmonized with the ones from the Danube basin level (given by the ICPDR HYMO TG). According to the above-mentioned criteria the significant pressures causing hydrological alterations are the following:

- significant impoundment, with length longer than 1 km during low flow conditions;
- significant water abstraction, if the flow below dam is < 50% of mean annual minimum flow for a specific time period (comparable with Q_{95});
- significant hydropeaking, if water level fluctuation is higher than 1 m /day.

According to the criteria, 97 (of 296) SWBs (1,915.7 km of 6,149.9 km) are under significant hydrological pressures (11 on the Sava River (262.6 km) and 86 (1,653.1 km) on the tributaries).

Of the affected 97 SWBs, 9 SWBs (5 SWBs (79.8 km) on the Sava River and 4 on the tributaries (55.1 km) are under the joint pressures of impoundments and significant water level fluctuation and 54 SWBs are under the pressure of impoundment (3 (94.2km) on the Sava River and 51 (875.7km) on the tributaries). Under significant water abstraction are 18 SWBs (2 SWBs (66.4 km) on the Sava River and 16 (316.3 km) on the tributaries). Due to water level fluctuation 16 SWBs (428.2 km) within the Sava River basin are under significant pressured (9 SWBs with fluctuation > 1m/day (1 on the Sava River (22,.2 km) and 8 (232.3 km) on the tributaries while 7 on the tributaries (173.7 km) are assessed with water level fluctuation < 1m/day.

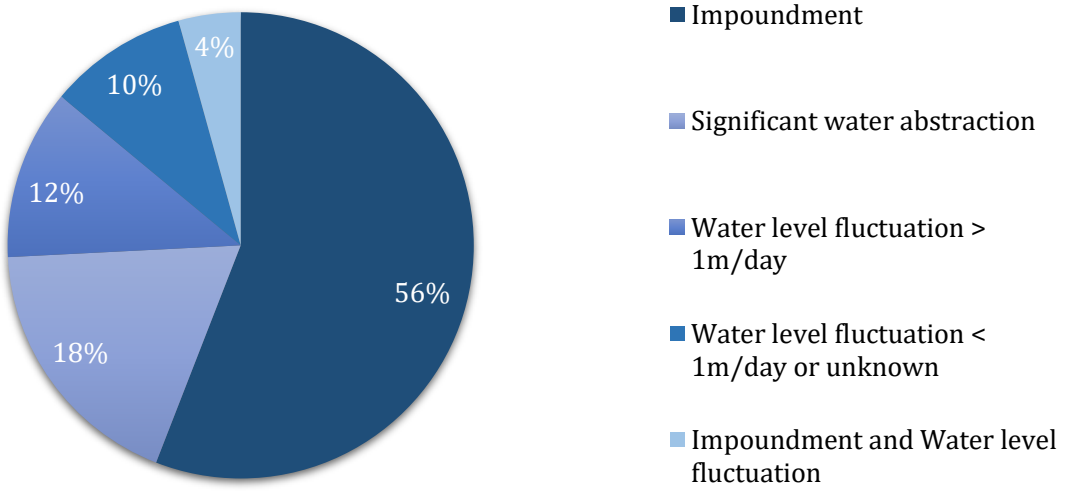


Figure 28: Representation of the hydrological pressure types affecting SWBs in the Sava RB

Impoundment leads to an alteration/reduction in flow velocity in the water body. Hydropower production, as a main driving force, makes impoundments the major type of the hydrological pressures in the Sava RB. In total, within the Sava RB, 63 SWBs (19 transboundary) are under the pressure of impoundments, 8 on the Sava River and 55 on the tributaries. Total length of impounded SWBs represents 174.0 km on the Sava River (14% of the SWBs length) and 930.8 km on the tributaries (19% of the SWBs length). Impoundments are imposed on the SWBs delineated on the rivers Sava in Slovenia, Croatia and Serbia and on the Vrbas, Drinjača, Spreča, Drina and Lim Rivers in Bosnia and Herzegovina, the Kupa, Korana, Česma, Sutla, Orljava, Ilova, Glogovnica and Dobra Rivers in Croatia, on the rivers Drina, Lim, Uvac and Bosut in Serbia and the Piva and Ćehotina in Montenegro). The length of impoundments in different countries is presented in Figure 29.

Significant water abstraction for urban, industrial, agricultural, and other uses, leads to an alteration in the discharge, and can affect water quality in the water body, causing deterioration of the water status. The significant water abstraction affects in total 18 SWBs in the Sava RB, 16 SWBs on the Sava River tributaries, 8 on the rivers Krapina, Česma, Kupa and Bosut in Croatia, 5 SWBs in Bosnia and Herzegovina on the rivers Bosna, Prača and Ukrina and 3 SWBs in Serbia on the Uvac River, and 2 SWBs on the Sava River in one in Slovenia and one in HR.

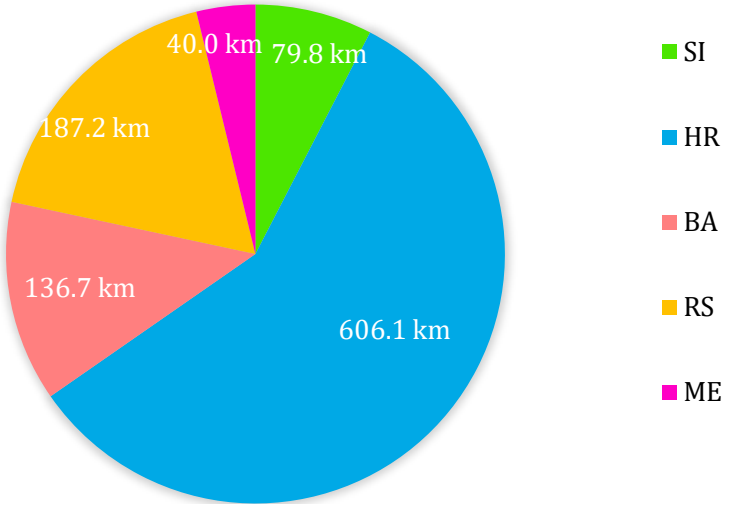


Figure 29: The length of impoundments in the Sava RB

Hydropeaking, as an artificially introduced water level fluctuation caused by hydropower generation, provokes alteration of discharge patterns along the river. The hydropeaking affects, with a difference in the significance, 25 SWBs in the Sava RB (6 on the Sava River and 19 on the tributaries). On the Sava River, on 6 SWBs level fluctuation is caused by hydropeaking, 1 SWB with a water level fluctuation >1m/day and for 5 SWBs with unknown significance. On the tributaries of the basin wide importance, hydropeaking with water level fluctuation is registered on 19 SWBs (on the rivers Dobra in Croatia, rivers Drina, Lim and Vrbas in Bosnia and Herzegovina and rivers Drina and Lim in Serbia).

The hydrological alterations within the Sava RB are shown on Map 11.

3.1.4.2 River and habitat continuity interruption

River continuity interruptions introduced by the transversal hydro-engineering structures such as dams and/or weirs can prevent natural fish migration and consequently negatively affect river ecosystems. Interruptions of river continuity can significantly affect natural river dynamics which may results in the deterioration or not achieving the good water status. Furthermore, physical barriers affecting river continuity can adversely affect river morphology and change the dynamics of the sediment transport.

Within the Sava RB, 35 structures are recognized as the significant river continuity interruptions, directly affecting 31 SWBs (6 on the Sava River and 25 on the tributaries). The dominant type of the structures causing interruptions in 97% of the cases is characterized as dam/weir while 3% of interruption is caused by ramp/sill.

The main driver for interruptions is hydropower production (26 of 33 structures serves for hydropower production). Flood protection is the driver for 3, water supply for 1, and 3 interruptions have the main driver define as "other".

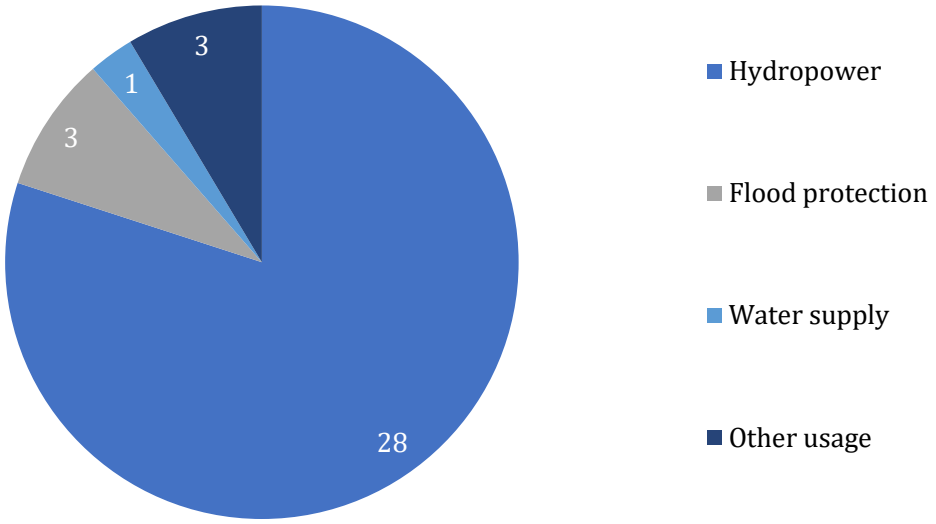


Figure 30: Interruptions of river continuity in the Sava RB

In Serbia, 7 of 8 interruption are multipurpose serving as well for flood protection or water supply. The rivers whose continuity is affected by hydropower production are the Sava (in the upstream part), Kupa/Kolpa, Dobra, Vrbas, Una, Lim, Drina, Uvac and Piva). On the rivers Sutla/Sotla and Bosut, the dam/weir are in function of flood protection on the river Bosna for water supply, and on the river Sava in Slovenia and Croatia, Kolubara in Serbia and Ćehotina in Montenegro, the main function of the interruptions is defined as "Other" serving for the purposes of power plants NEK "Krško", TE-TO Zagreb, TE "Veliki Crljeni" and TE Pljevlja.

An overview of the number of river continuity interruptions (reference year 2016) is provided in the Table 17.

Table 17: Overview of the river continuity interruptions (year 2016)

Country	Barriers	Passable by fish	River continuity interruptions
SI	10	4	6
HR	5	1(partially)	4
BA	10	2	8
RS	8	2	6
ME	2		2
Total*	**35(32)**	**9 (8)**	**26 (24)**
The Sava River	10	5	5
Selected tributaries	25(22)	4(3)	21(19)

**Both BA and RS included in their lists HPP Zvornik and Bajina Bašta, located on the trans-boundary river Drina, and Slovenia and Croatia, included Vonarije, on the transboundary river Sotla/Sutla*

Of 10 interruptions on the Sava River, 4 are passable for fish (HE Brežice, NEK Krško, HE Krško and HE Arto-Blanca), and 1 is partially passable (TE-TO Zagreb), while of 26 (24) interruptions on the tributaries, 4(3) are equipped with functional fish passes - Kolubara (water intake TE Veliki Crljeni) and on the Drina River (HE Zvornik-trans-boundary Serbia and Bosnia and Herzegovina and MHE Ustiprača).

Fish migratory routs are still interrupted or partially interrupted on the rivers Sava, Sotla/Sutla, Dobra, Kupa/Kolpa, Vrbas, Bosna, Una, Lim, Uvac, Drina, Bosut, Piva and Ćehotina.

3.1.4.3 Morphological alterations and disconnetion of adjusted flood plains

Changes affecting river morphology, in terms of river depth and width variations, structure and substrate of the riverbeds and structure of the riparian zones, can adversely influence the river ecosystems. Furthermore, connection of the floodplain/wetlands with the water bodies can be of a significant importance for river basin management planning due to their potential role during flood events, contribution to the ecological water status due to nutrient removal and provision of the habitats for water dependent ecosystems.

3.1.4.3.1 Morphological alterations

In the riparian countries, morphological alterations are identified in accordance with country specific methodologies and the data availability, surface water bodies are categorized in six classes:

- Near natural
- Slightly modified
- Moderately modified
- Extensively modified
- Severely altered
- No information

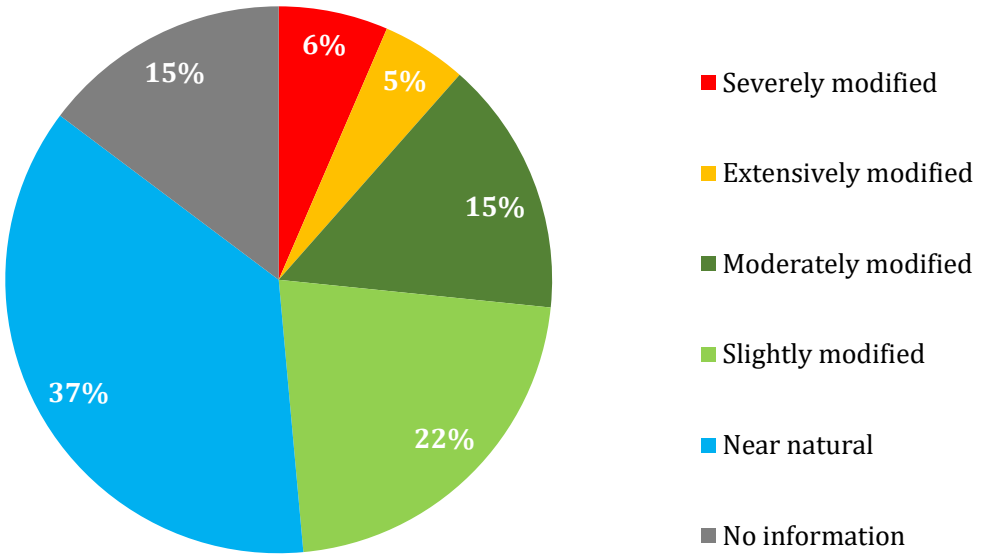


Figure 31: Morphological alteration in the Sava RB per SWB (without ME data)

In the Sava RB, in total 278 water bodies (for Montenegro data were not available) have been assessed to morphological alterations (Figure 31, Map 13). On the Sava River, most of the SWBs where data were available, 32 (of 47), were assessed as slightly modified, 5 SWBs are extensively modified, 3 SWBs severely modified, 2 SWBs moderately modified, and no information was available for 2 SWBs.

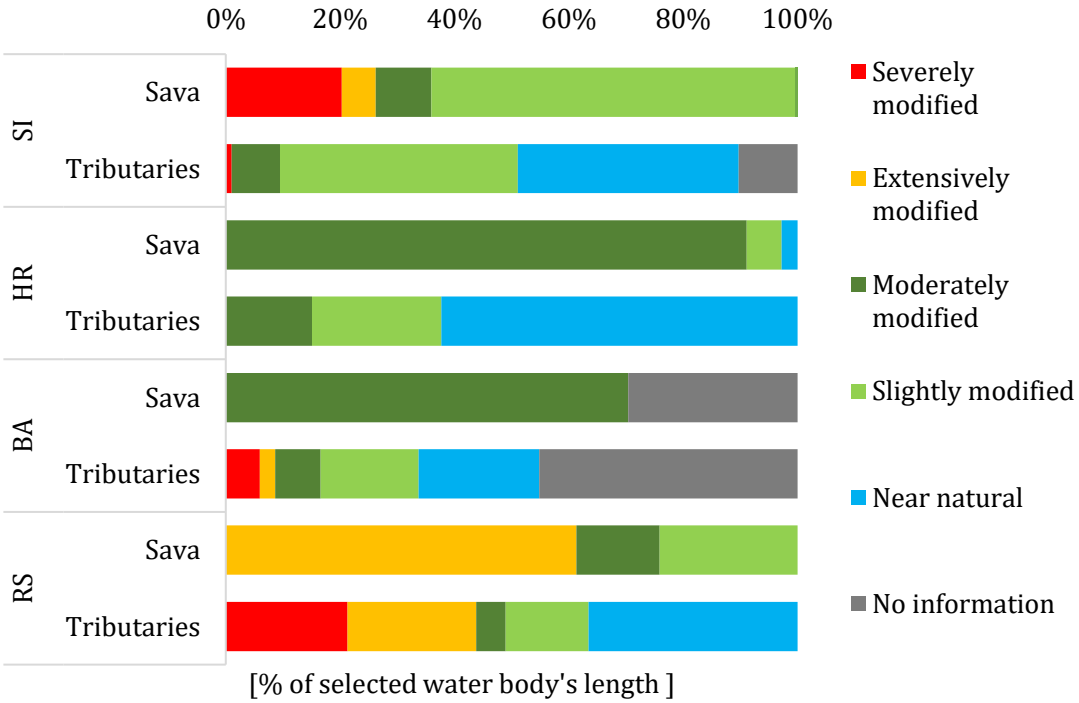


Figure 32: Representation of the morphological alteration in length of the SWBs in the Sava RB per country

3.1.4.3.2 Disconnection of adjacent wetlands/floodplains

According to the data from 1st Sava RBMP, active floodplains comprise 1,900 km^2 of the Sava RB territory and represent 25% of the floodplains area in the entire Danube RB.

Based on the ICPDR criteria, the lateral connectivity interruptions are disconnected wetlands and former floodplains (area larger than 100 ha), with reconnection potential, where restoration measures can support the fulfilment of the WFD environmental objectives.

The area of Obedska bara in Serbia (Figure 33), wetland, inundated marsh, a remnant of the former meander of the Sava River, located along its old riverbed with its diversity of ecosystems and species is identified in accordance with the mentioned criteria.

Figure 33: Overview of the lateral continuity interruptions in the Sava RB

3.1.4.4 Risk assessment - hydromorphological alterations

Risk assessment related to hydromorohlogical alteration is defined in three classes thus SWBs are characterized as "*not at risk*", "*possibly at risk*" and "*at risk*".

Water bodies are assessed based on country-specific methodologies and/or expert judgement (Serbia and Bosnia and Herzegovina). Where possible, monitoring of biological quality elements was used to define the risk imposed on the SWBs.

As "not at risk" are defined SWBs where monitoring results show that river ecosystems are not disrupted, or which do not have any significant anthropogenically introduced hydromorphlogical alterations which can adversely affect the ecology of the river systems and impact ecological status of the water bodies. Where biological quality elements showed deviation, and/or morphological characteristics of the river and riparian zone, flow regime or water level are altered by anthropogenic activities, water bodies are defined as "at risk" or "possibly at risk". As well water bodies are declared "at/possibly at risk" where data for the alteration assessment were not available.

The HYMO risk is assessed on 278 SWBs within the Sava RB (data were not available for ME) of which, 119 SWBs are assessed "at risk", 53 SWBs "possibly at risk" and 106 SWBs as "not at risk".

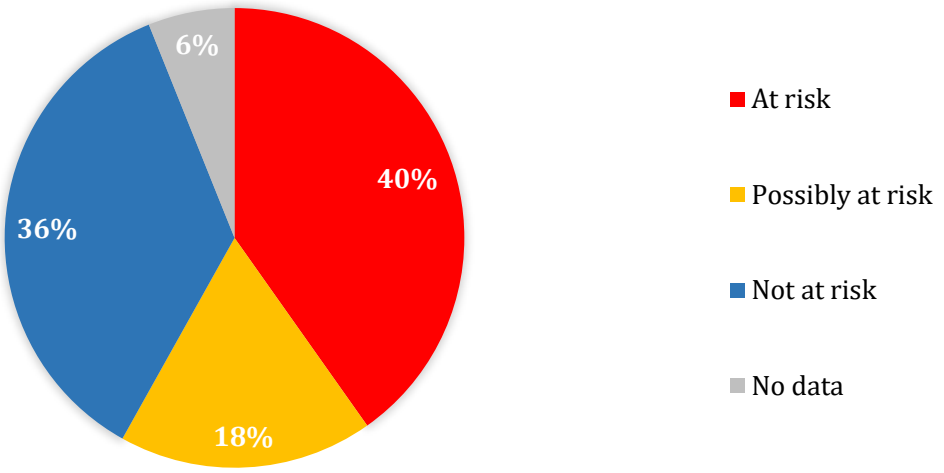


Figure 34: Surface water bodies' hydromorphological risk assessment

Table 18: SWBs on the Sava River under HYMO risk

	SI		HR		BA		RS	
	km	Number of SWBs	km	Number of SWBs	km	Number of SWBs	km	Number of SWBs
At risk	105.16	6	462.79	18	239.58	5	118.35	4
Possibly at risk	112.62	5	31.06	1	100.59	2	74.69	3
Not at risk	3.20	1	14.14	2	0.00	0	0.00	0

Table 19: SWBs on the important tributaries in the Sava RB under HYMO risk

	SI		HR		BA		RS	
	km	Number of SWBs	km	Number of SWBs	km	Number of SWBs	km	Number of SWBs
Possibly at risk	179.05	6	368.45	22	146.59	9	92.61	5
Not at risk	155.15	4	894.57	53	670.28	36	148.40	10
At risk	58.86	3	224.26	16	1,231.01	49	289.18	18

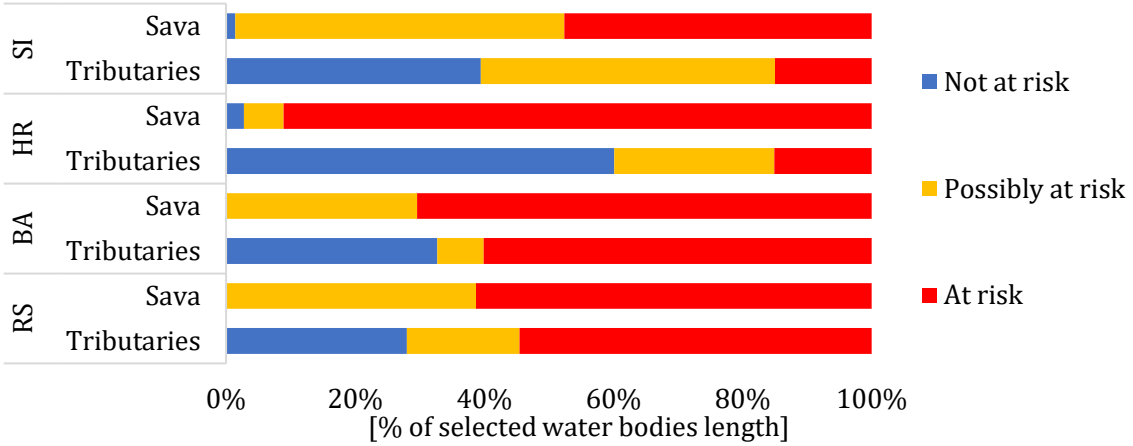


Figure 35: Risk assessment – hydromorphological alterations for SWBs on the Sava River and tributaries

3.1.4.5 Future infrastructure projects

Existing hydromorphological conditions of the SWBs can be further deteriorated if future infrastructure projects (FIP) in sectors of energy production, navigation, flood protection, urban, industrial, or agricultural development are going to be implemented without consideration of their effects on ecology of the river systems.
The criteria for the selection of FIPs of basin wide importance are developed on the ICPDR level and adjusted for the Sava RB. The future infrastructure projects of the importance for the Sava RB satisfy following criteria:

- Strategic Environmental Assessment (SEA) and/or Environmental Impact Assessments (EIA)are performed for the project and
- Project is expected to provoke transboundary effects.

Future infrastructure projects in the Sava RB are planned in the sectors of flood risk management, energy/hydropower energy production and navigation. The future infrastructure project, that satisfied the above-mentioned criteria are planned in 3 basin countries (Croatia, Bosna and Herzegovina and Serbia) while for Montenegro and Slovenia there are no planned FIPs of the basin wide importance in the planning cycle 2022-27.

Of 10 FIPs, 4 are from the flood risk management sector on the rivers Sava, Kupa/Kolpa and the Drina River, affecting 10 SWBs in the Sava River, 8 SWBs on the Kupa/Kolpa River and 1 SWB on the Drina River. Five future projects from hydropower production sector are planned, 3 projects on the on 2 SWBs on the Lim River and 2 projects on the one surface water body on the Drina River. The future project in the sector of navigation is planned on the area of the rivers Sava and the Drina confluence, encompassing 2 SWBs on the Sava River and one water body on the Drina River.

For the future infrastructure projects (list presented in the Table 20, Map 16), it is of the particular importance that environmental requirements are considered as an integral part of the planning and implementation process.

Table 20: The list of the Future Infrastructure Projects in the Sava RB

FIP Name	Sub Catchment /River	SWB	First purpose
Modernization of the left bank Sava dikes	SAVA	HRCSRI0001_009	Flood protection
		HRCSRI0001_008	
		HRCSRI0001_007	
		HRCSRI0001_006	
		HRCSRI0001_005	
		HRCSRI0001_004	
		HRCSRI0001_003	
		HRCSRI0001_002	
		HRCSRI0001_001	
Reconstruction of Dubički dikes		BA_RS_SA_3	
River traning and dredging works on the Sava Drina Confluence		RSSA_7	Navigation
		RSSA_6	
	Drina	RSDR_1_A	
Construction of Drina dikes		BA_RS_Dr_1	Flood protection

FIP Name	Sub Catchment /River	SWB	First purpose
HE Buk Bijela	Drina	BA_RS_DR_8	Hydropower
HE Foča kompenzaciona		BA_RS_DR_8	
HE Mrsovo	Lim	BA_RS_Dr_LIM_2	
Projekat izgradnje HE Brodarevo 1 i HE Brodarevo 2		RSLIM_4_D	
		RSLIM_4_C	
Project "Flood protection system of Karlovac-Sisak area"	Kupa	HRCSRN0004_008	Flood protection
		HRCSRN0004_007	
		HRCSRN0004_006	
		HRCSRN0004_005	
		HRCSRN0004_004	
		HRCSRN0004_003	
		HRCSRN0004_002	
		HRCSRN0004_001	

Of listed FIPs, affecting 27 water bodies on the 4 rivers, the Sava, the Drina, the Lim and the Kupa, the deterioration of the status and transboundary impact for the projects *Construction of HPPs "Brodarevo" I and II* on the Lim River are expected. For the FIPs in the direct catchment of the Sava River, deterioration of the status are not expected for, *River training and dredging works on the Sava Drina Confluence* and *Modernization of the left bank Sava dikes and Modernization of the left bank Sava dikes,* as well as for the project *"Flood protection system of Karlovac-Sisak area" on* the Kupa river, taking into consideration that specific projects will be spatially limited to the local level, without significant transboundary effects. For the FIP *Reconstruction of Dubički dikes* the potential of the status deterioration is not known.

3.2 Pressures on groundwater quality and quantity

According to the data exposed in 1st Sava RBMP groundwater resources can be considered as the vital water supply source for population, industrial activities, and agriculture in the Sava RB. Protection and development of this valuable resource is essential for the sustainable development of the whole region. Anthropogenic activities can pose significant pressure on ground water quantity and quality.

The pressure assessment for ground water bodies of the importance for the Sava RB was available for 15 GWBs (11 in Slovenia and 4 in Bosnia and Herzegovina). According to the data of assessed 15 GWBs, 73% (11 of 15 GWBs) are not affected with significant pressure, while 27% (4 of 15 GWBs) are under significant pressure. Significant pressures are defined as alteration of water level or volume on one GWB, one GWB is assessed as under the significant pressure caused by diffuse pollution from agriculture and one GWB is under the type of pressure defined as "other anthropogenic pressure".

Table 21: Pressures causing poor status of important GWBs in the Sava RB

Significant pressure on ground water bodies	SI	HR	BA	RS	ME	Total
Alteration of water level or volume	-	-	1	-	-	1
Diffuse pollution-agriculture	1	-	-	-	-	1
Other anthropogenic pressures	-	-	2	-	-	2

The main causes of groundwater pollution in the Sava RB, especially important within the areas with high vulnerability of the aquifers, are:

- Intensive agriculture;
- Insufficient wastewater collection and treatment on municipal level;
- Inappropriate waste disposal sites;
- Urban land use;
- Mining activities.

Quantitative pressures, causing alteration of water level or changes in volume of GWBs in the Sava RB, originates in a majority from abstraction of ground water resources intended for water supply, industrial and mining activities and for irrigation in agricultural areas.

For the quantitative pressure assessment, the available data on selected significant water uses are used. The significance criteria, as defined in 1st Sava RBMP is annual abstraction which exceeds the amount of 50 l/s as an annual average.

Of total 60 GWBs the significant water abstraction is registered on 34 GWBs in Slovenia (4 of 11 GWBs), Croatia (8 of 14 GWBs), Serbia (4 of 5 GWBs) and Montenegro (1 of 13 GWBs). For Bosna and Herzegovina data presented here are obtained from the water balance estimation performed for the grouped GWBs, showing that significant uses are assumed on all important GWBs.

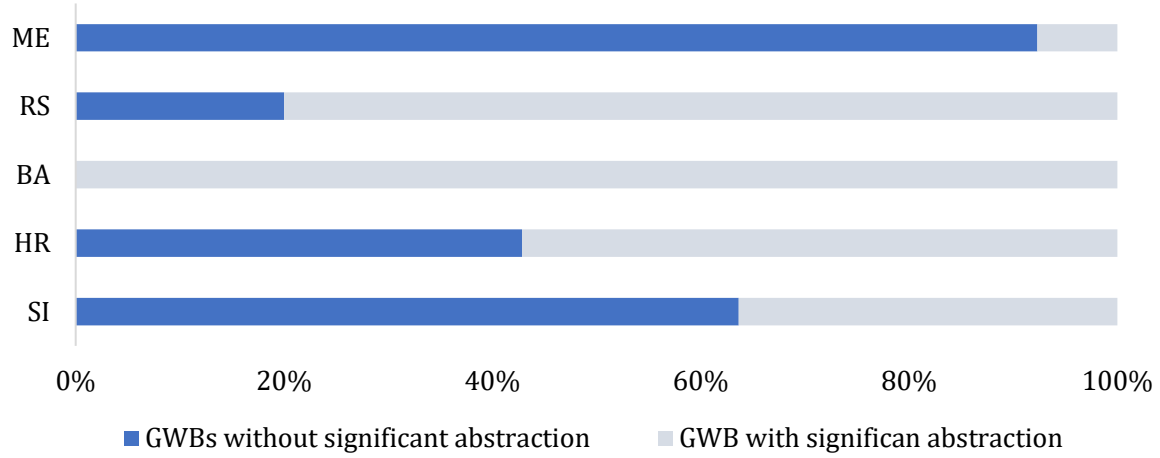


Figure 36: Representation of the share of GWBs with significant water abstractions in comparison with total number of GWBs per country

Data on the significant ground water uses are available per countries in relation with specific GWB, while for Bosnia and Herzegovina in relation to the river catchment and are listed in detail in the Annex 8.

3.3 Other pressures

3.3.1 Pressures and impacts on the quantity and quality of sediments

Pressure and impacts on sediment quantity and quality, has been not characterized as a SWMI, due to the complexity of the issue and several open questions exposed in the 1st Sava RBM Plan. For the 2nd Sava RBM planning cycle, some new data has been collected on the sediment issues.

The basic legal document which regulates the procedures of mutual cooperation related to sustainable sediment management, to protect the integrity of the water and sediment regime in the Sava RB, is the Protocol on sediment management to the FASRB, (entered into force on October 8, 2017), which shall apply to sustainable sediment management and comprise:

- quality issues such as sediment pollution, including risk-assessment, control of source and deposition of polluted sediment; and
- quantity issues such as dredging, erosion and torrent control, reservoir sedimentation and morphological changes.

Some progress has been achieved by the estimation of sediment balance for the Sava River[12], according to available data, with the following main conclusions:

- The size and highly heterogeneous natural characteristics of the Sava RB significantly affect the inflow of water and sediment.
- Significant tributaries bring large sediment load and have a major influence on the hydrologic, hydraulic and sediment regimes of the recipient.
- The heterogeneity of geomorphological and morphological conditions along the course of the Sava River also effects sediment transport and deposition processes.
- The controlled regime of the Iron Gate 1 reservoirs' backwater levels is the most important artificial influence on the sediment transport and deposition processes in the Lower Sava.
- Excavation of material from the Sava riverbed is a relatively important component of these processes, even though the effects of dredging are generally local and depend on the location of the excavation field.
- River training structures and HPP play a significant role in riverbed formation along some stretches of the Sava.

In the Sava River Basin, the regular monitoring on suspended sediment is performed only on gauging station in Slovenia (Sava, Sora, Savinja Rivers- 1 site each, and Croatia (Sava River- 3 sites, Krapina and Kupa/Kolpa River-1 site each).

[12] Project *Towards Practical Guidance for Sustainable Sediment Management using the Sava River Basin as a Showcase* supported by UNESCO Venice Office

Figure 37: Location of the main suspended sediment discharge monitoring stations in the Sava RB

The monitoring data on suspended sediment is available in the Hydrological Year Books for the Sava RB from 2000 up to 2017[13], while more data is also available in the national yearbooks. The bedload measurements are not performed in any of the Sava riparian country.

The sediment quality monitoring is performed at 6 water bodies in Slovenia s (2 reaches at the Sava Dolinka River, 2 sites at tributaries of the Lower Sava River (Krka, Sotla/Sutla Rivers), and 2 sites at the Lower Sava River (Vrhovo-Boštanj, border cross section at Jesenice na Dolenjskem)), at 7 locations in Croatia according to the WFD requirements, at 4 locations on the Sava River (Jamena, Sremska Mitrovica, Šabac, Ostružnica) and many locations on the Drina, Lim, Kolubara and Topčiderka Rivers in Serbia. In Bosnia and Herzegovina, the sediment quality has been performed only occasionally, through specific projects.

According to the Protocol on sediment management to the FASRB, the Parties should exchange data on dredging on yearly basis through the Information on Dredging. The information on planned dredging should be sent to the Sava Commission until the end of current year, while the report on realization of dredging for the previous year should be sent to the Sava Commission until end of March of the current year. The process started in 2019 and three reports have already been developed, i.e., Report on planned dredging for 2019, Report on executed dredging for 2019 and Report on planned dredging for 2020.

The volume of dredged sediment in 2020 is presented in Table 22.

[13] The Hydrological Yearbooks are avaialble at the ISRBC web site.

Table 22: Summary of executed dredging for 2020 per country and river

Country / River	SI	HR	BA	RS	Sum per river
	m³	m³	m³	m³	m³
Sava	58,806	8,750	14,483	266,416	348,455
Una			9,440		9,440
Sana			180		180
Ukrina			32,800		32,800
Vrbas			137,423		137,423
Bosna			568,884		568,884
Drina			327,025	31,875	358,900
EXECUTED	58,806	8,750	1,090,235	298,291	1,456,082
Planned in 2020	47,884	46,300	2,756,759	1,125,000	3,975,943

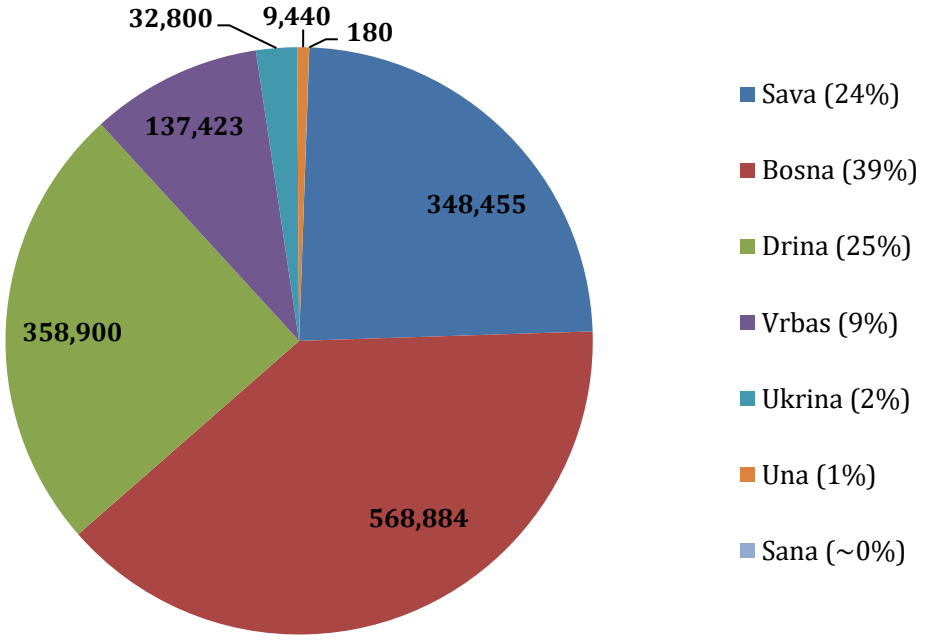


Figure 38: Percentage of planned dredging per river in 2020

3.3.2 Invasive alien species in the Sava River Basin

The Regulation (EU) No 1143/2014 on the prevention and management of the introduction and spread of invasive alien species, providing the effective basis on EU level for dealing with the issue of the Invasive alien species (IAS) contains the following definition: *Alien species means any live specimen of a species, subspecies or lower taxon of animals, plants, fungi or microorganisms introduced outside its natural range; it includes any part, gametes, seeds, eggs or propagules of such species, as well as any hybrids, varieties or breeds that might survive and subsequently reproduce*. IAS are a subset of alien species, for which there is a notable environmental impact, and whose introduction or spread has been found to threaten or adversely impact upon biodiversity and related ecosystem services.

The main pathways for the introduction of IAS into the environment are intentional or non-intentional release, escape from confinement, transport, interconnected waterways, basins, or areas with different geographical and ecological characteristics which provides spreading of different invasive species or further natural spreading. The adverse impacts on native biodiversity of alien species that become invasive are many and varied, comprising competition, predation, parasitism, hybridization, poisoning, disease transmission or interaction with other invasive species, impact on the native species and their habitats including displacement of indigenous species through competition or predation, structural damage to aquatic habitats, and loss of genetic integrity. The threats posed by IAS to native biota, ecosystem function and services, result with economic impacts. This impact is proportional to the number of allochthonous taxa and the density of their communities and disturbance of the natural composition of the species. Invasive alien species represent pressure because they can modify the original biological structure and ecological functioning of aquatic ecosystems.

Based on the recent studies the Sava River is strongly influenced by the IAS with larger impact detected in its lower stretch[14]. The data showed that neozoa dominated macrozoobenthic as well as fish fauna at many places along the Sava making thus their classification a crucial factor in the assessment of the ecological status. The Sava River has been defined as a branch of Southern Invasive Corridor, which links the Black Sea with the North Sea basin via the Danube-Main-Rhine waterway, including the Main-Danube Canal and the main Danube tributaries, underlying that the Sava River might be under the significant pressures of invasive species. Forty two non-native plant species (aquatic and riparian) have been identified along the Sava River, including main channel, wetland area and riparian zone as well as 16 alien macroinvertebrate taxa (GLOBAQUA case studies) and 15 fish species (Simonović et al., 2015).

Among macroinvertebrates, crustaceans and mollusk species were found to be successful invaders of the Sava River. The following species were found to be the most prominent invades: *Corbicula fluminea*, *Dreissena polymorpha* and *Sinanodonta woodiana* (Mollusca) *Faxinus limossus* (Decapoda), *Chelicorophium curvispinum* and *Dikerogammarus haemobaphes* (Amphipoda).

The dispersal of nonindigenous Ponto-Caspian amphipods (*Crustacea: Amphipoda*) in Croatian stretch of the Sava River additionally confirms the high level of biological invasions along the Sava River (Žganec et al., 2018, 2009).

The *Carassius gibelio* (Prussian carp) and *Ameiurus nebulosus* (Brown bullhead) have been assessed as the most invasive among fish species. A strong impact from both long-term and recent stocking with alien hatchery-reared brown trout strains and rainbow trout in the upper rhithron fish communities was recently recognized.

There are also certain records about the introduction of alien trout species (e.g., rainbow trout, brook trout, Arctic charr *Salvelinus alpinus*) and of hatchery-reared brown trout of the Atlantic strain into the appropriate environment of mountain streams throughout the Sava RB, but their impact on the native is still unclear. The main vectors for their entrance into the waters were aquaculturists and fishery managers.

[14] GLOBAQUA Report 2019. Common invader databases for selected river basins: Identification of the level of invasiveness of alien taxa and the biological features of the most successful invaders; Development of risk assessment procedures for different alien invasive species in selected basins.

In order to assess the level of pressure caused by biological invasions, the data on macroinvertebrates collected in the frame of the EU Framework project GLOBAQUA (Navarro-Ortega et al., 2015) along the entire stretch of the Sava River in 2014 and 2015 was used. The level of biocontamination was assessed by using the Site specific BioContamination Index -SBC Index (Arbačiauskas et al., 2008). The SBC assessment is derived from data on the number of non-indigenous species and their abundance in comparison to the total number of species and the community abundance. The index value ranges from 0 ("no" biocontamination) to 4 ("severe" biocontamination). The resulting SBC index based on macroinvertebrates for the Sava River ranged from no contamination and low biocontamination in Slovenian stretch up to moderate, high and severe biocontamibnation in sector downstream Jasenovac to the confluence of the Sava River into the Danube.

Table 23: Available data on invasive fish species

Fish Species	Slovenia sub basins						Bosnia and Herzegovina sub basins						
	Sava	Ljubljanica	Savinja	Krka	Sotla	Kolpa	Vrbas	Bosna	Drina	Una and Sana	Ukrina	Sava	Tinja
Oncorhynchus mykiss	x	x	x	x		x	x	x	x	x			
Salvelinus umbla	x												
Salvelinus fontainalis							x	x					
Salvelinus alppinus							x		x				
Carassius gibelio	x	x	x	x	x	x							
Carassius auratus gibello							x						
Cauratus auratus auratus												x	
Hypophthalmichthys molitrix							x						
Oreochromis niloticus	X*												
Pseudorasbora parva	x		x		x	x					x		
Ctenopharyngodon idella	x	x	x	x			x	x	x	x	x	x	x
Ameiurus spp.	x	X*			x								
Ameiurus nebulosus							x	x	x	x	x	x	
Lepomis gibossus	x	x	x	x	x	x	x	x		x	x	x	
Cyprinus carpio (aquaculture type)	x	x	x	x	x	x							
Acipenser baeri	X*												
Ponticola kessleri	X*												
Total (with*):	3	1	0	0	0	0							
Total (without *):	8	5	6	5	5	5	8	5	4	4	4	4	1

**Data for some species are deficient, the source of some introduced specimen is unknown, and the conformation or introduction is based on individual find*

The most common foreign invasive species, especially in the Slovenian lowland part of the Sava basin, are Tophmouth gudgen, Pumpkinseed and Prussian carp. These three species are found in great densities in regulated parts of watercourses and in accumulation lakes. Recently the presence of Zebra mussel was confirmed in the accumulation lake on Sava River, near Brežice. Chinese pond mussel is present in a pond a few kilometers away from river Kupa/Kolpa. Because of its reproduction through glochidia structure, which attaches itself on the gills of fish, this species will probably spread into river Kupa/Kolpa by the transmission of fish from this pond. In the lowland part of Sava near Čatež, lies a

warm water spring that keeps the water warm enough even during the wintertime, which allows the survival of two tropical species: Nile tilapia and redclaw crayfish. This oxbow is another tributary of Sava River, but before it reaches the main river, the temperature drops considerably, and reproduction of the two species is not possible. Another crayfish species Narrow-clawed crayfish was confirmed in only one location in Slovenia, a pond near the Savinja River.

The introduction of alien taxa not necessarily has consequences to recipient area. Thus, non-indigenous (alien, non-native) taxa could not be considered as *a priori* invasive and highly harmful to native biodiversity. The potential danger of the IAS strongly depends on the individual characteristics of the species. This should be taken into the consideration when identifying priority actions to be taken.

Comparison over the time clearly showed a constant impact of invasive alien species on native biota and a considerable increase of the number of non-native species in the Sava River and the major tributaries. As well in accordance with the Danube River Basin Management Plan (ICPDR, 2015), the whole Danube River Basin is recognized as vulnerable to invasive alien species. Further work has to be done in the field of collecting of information on the distribution of invasive alien species and their influence on native biota. Specific effort should be focused on the development of the effective tools for the assessment of the level of pressures caused by the bioinvasions, as well as for design the appropriate mitigation measures. The assessment shall respect the provisions of the EU Regulation No 1143/2014 on the prevention and management of the introduction and spread of invasive alien species. The importance of further development of the management practice with respect to measures towards suppressing the pressures caused by the IAS is clearly recognized.

Based on analyses of the available information on IAS within the Sava RB, the following can be concluded:

- IAS represents a significant pressure within the region and an important management issue.
- There is a general lack of systematized comparable data on IAS within the Sava RB.
- There is a lack of an effective regulation and clear institutional organization regarding invasive species mitigation in the Sava RB.
- Further work on data collection and development of IAS assessment methods are needed, as well as work on raising capacity of institutions responsible for suppression of biological invasions in the Sava RB.

3.4 Significant pressure and impacts assessment on the SWBs in the Sava RB

The data on the surface water bodies' pressure assessment was available for 189 SWBs. Complete data were available for Slovenia, Croatia, and Serbia, partially for Bosnia and Herzegovina while data were not available for Montenegro.

Table 24: Number of SWBs with significant pressures and impacts (in accordance with available data)

	Number of SWBs		Number of SWBs with significant				Number of SWBs with UNKNOWN IMPACT	Number of SWBs with no data	
			PRESURES		IMPACT				
	Sava	Tributaries	Sava	Tributaries	Sava	Tributaries		Sava	Tributaries
SI	12	14	12	14	12	14			
HR	21	91	21	87	19	63			
BA	7	94	4	10	4	10		3	84
RS	7	33	7	31	7	24	7		
ME		15							15

In a majority, multiple pressures are identified on SWBs in the Sava RB. Different types of significant pressures and the number of SWBs affected, are presented on the Figure 39.

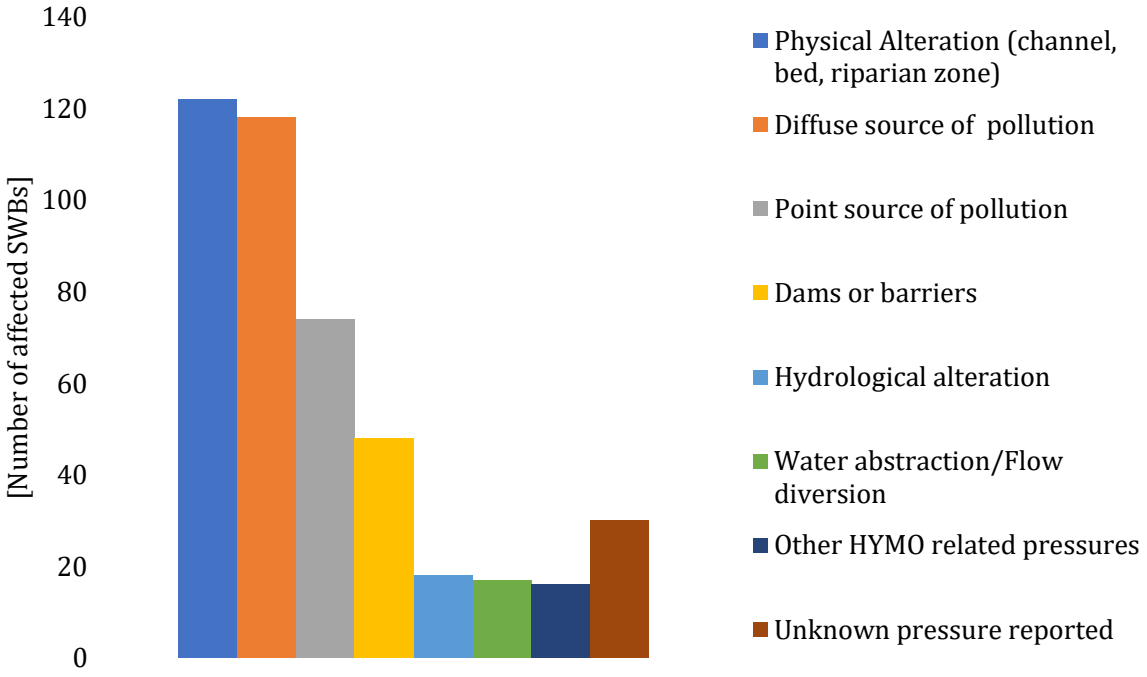


Figure 39: Pressure detected on SWBs in the Sava RB

Of the 189 SWBs with data available, 65% are significantly affected by different kind of physical alteration, of channel, riverbed, or riparian zones, introduced in the purpose of flood protection, agriculture, or navigation. The second significant pressure is diffuse pollution identified on 118 SWBs mainly originated from agriculture in 36% of the cases, 30% from population not connected to the sewage networks and 24% from transportation. Other identified sources of significant diffuse pollution were forestry,

aquaculture, and urban run-offs. The main point source of pollution are discharges of municipal waste water in 39% of the cases, 37% of small industrial facilities, 13% of significant industrial facilities (IED 2010/75/EU) and 13% of other point sources. In 14% of the SWBs where data were available, the significant pressures are defined as unknown, requiring further investigation.

Of 189 SWBs with the available data on the significant pressures, significant impact is identified on 79% (149 SWBs). Specific methodologies for the impact assessment are developed on a country-based level, and for the Sava RB the available data are compiled. The impacts were characterized in 6 categories: organic, nutrient, and chemical pollution, altered habitats due to morphological changes (includes connectivity), altered habitats due to hydrological changes and other significant impact. Different impact types and the number of affected water bodies are presented in the Figure 40.

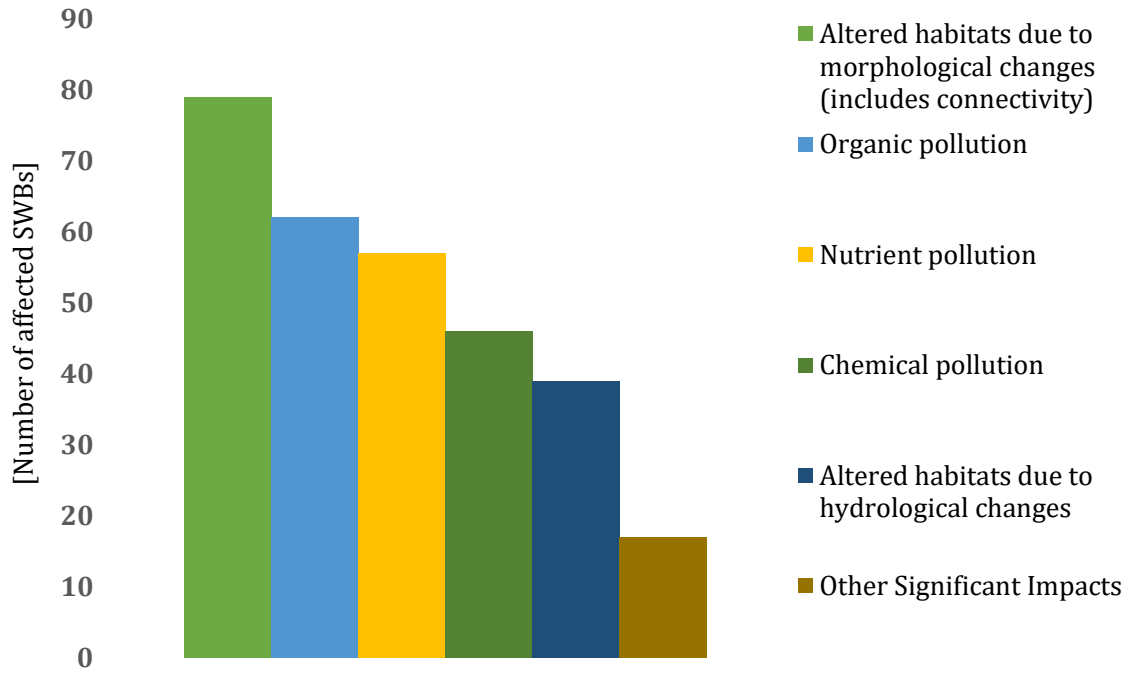


Figure 40: SWBs in the Sava RB affected with significant impact types

Of 149 SWBs with available data, the significant impact was pollution on 78 SWBs (53%), on 54 (36%) significant impact is related to habitat alteration and on the rest of 17 SWBs (11%) the significant impact was defined as other.

4 Protected areas and ecosystem services in the Sava River Basin

4.1 Overview of protected areas according to the WFD

Within designated water dependent protected areas, water protection and preservation is very important factor for definition of appropriate water management practices. Altered water regime in protected areas, in terms of quality and quantity alterations, can significantly affect water dependent ecosystems and intended water uses (water supply, recreation, fishery etc).

The WFD requires the establishment of a register of protected areas (PA), including the details of related water bodies. The register should cover areas identified by the WFD or other related EU Directives. These include five general types of PA:

- Water bodies used for the abstraction of drinking water;
- Areas important for the protection of habitats and/or species where the maintenance or improvement of the status of the water is an important factor in their protection (Natura 2000[15], sites subject to the Birds Directive (2009/147/EC)[16] and the Habitats Directive (92/43/EEC)[17]);
- Nutrient vulnerable zones and sensitive areas, as PA under the Nitrates Directive (91/676/EEC)[18]; and the UWWT Directive (91/271/EEC).
- Areas where measures have been implemented to protect economically significant aquatic species (PA that used to be defined under Directive 2006/44/EC (freshwater fish directive) and Shellfish Directive 79/923/EEC, both repealed by the WFD);
- Bathing waters as PA under the Bathing Water Directive (2006/7/EC)[19]);

All riparian countries fully transposed, in national water legislation, the WFD requirements related to protected areas identification. However, implementation status and further harmonization differs within the basin. While in Slovenia and Croatia harmonization with directive's requirements is finalized and registers of protected areas are established and maintained, in other countries preparatory activities for implementation are still ongoing.

Preparation of the comprehensive protected area inventory on a basin level, was faced with the challenges related to different status of NATURA 2000 network designation within the countries, different harmonization level with EU legislation, lack of registers and/or effective databases of protected areas in non-EU countries, shared responsibilities

[15] Natura 2000 – the network of protected areas based on the Birds Directive (1979) and the Habitats Directive (1992).
[16] Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds
[17] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora
[18] The Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources
[19] Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EE

between national competent authorities regarding designation, maintenance, protection, and monitoring of protected areas.

Preliminary register of protected areas in the Sava RB (larger than 100ha), includes the following:

- Areas for the protection of habitats and/or species that are protected under the relevant international legislations;
- Areas important for the protection of habitats and/or species protected by national legislation;
- A preliminary register of areas used for the abstraction of drinking water - groundwater.

Inventory of the protected areas, in accordance to above mentioned criteria, complies 525 protected areas with the surface area equal or larger than 1 km^2.

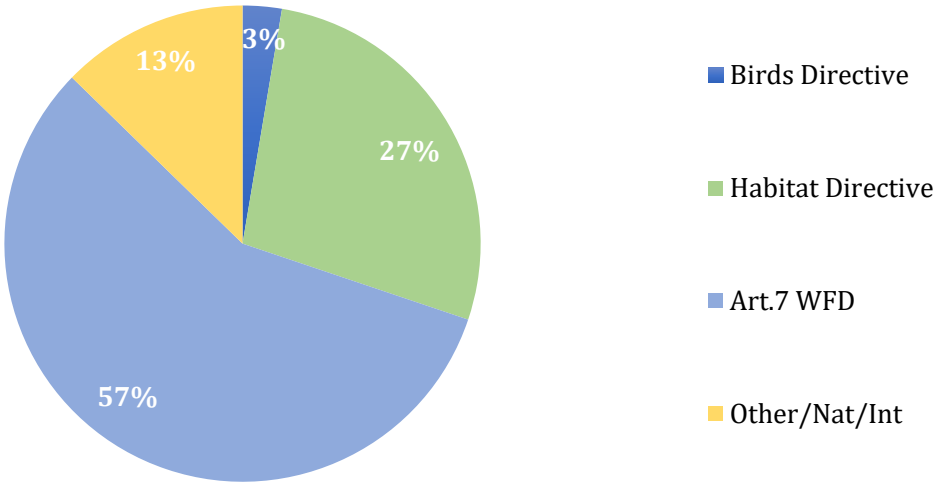


Figure 41: Types of protected areas in the Sava RB

Of 525 protected areas with surface area >1km^2, 301 are protected according to the Art 7. WFD, 145 in accordance with Habitats Directive (92/43/EC) and 14 to Birds Directive (2009/147/EC). Category "Other" states for protected areas (65 within the Sava River basin) which are delineated according to the relevant national legislations and one, (Bardača), although not defined as PA in accordance with the Law on Nature protection of Republika Srpska *(„Official Gazzette Republika Srpska", no. 20/14),* is internationally protected wetland complex-Ramsar site. The data in the Table 25 represents the areas in riparian countries and in the Sava RB, protected under the specific legislation.

Table 25: The area of PA per type of protection per countries

	Birds Directive	Habitat Directive	Art. 7 WFD: Abstraction for drinking water	Other/ National/ International
	(km^2)	(km^2)	(km^2)	(km^2)
SI	240.7	4,865.5	1,649.9	0.0
HR	6,450.0	6,351.3	4,095.2	2,154.1
BA	0.0	0.0	0.0	764.7
RS	0.0	0.0	0.0	1,757.3
SRB	**6,690.7**	**11,216.8**	**5,746.1**	**4,395.9**
% of SRB	**6.88 %**	**11.53 %**	**5.91%**	**4.52%**

Within the Sava River basin 35 GWBs and 124 SWBs are in direct or indirect relation with the protected areas. Of protected areas dependent on ground water bodies, 43% are protected in accordance with Habitat Directive(92/43/EEC), 34% according to Art 7. WFD, 3% in accordance with Birds Directive and 19% in accordance with the national/international legislations. Dependent on SWBs, 65 % areas are protected in accordance with Habitats Directive (92/43/EEC), 25% to Birds Directive (2009/147/EC) and 10% to the national legislations. The data presented in the Table 25 is not complete since the surface area of 10 protected areas in Montenegro is not defined. However, on the Map 17, complete inventory of the protected areas prepared for the 2nd Sava RBMP can be found.

The list of national parks, parks of nature and Ramsar sites within the Sava RB remains the same as in the 1st Sava RBMP. Nine national parks within the Sava RB (Triglav, Plitvice, Risnjak, Sutjeska, Kozara, Una, Tara, Durmitor and Biogradska gora) have total coverage of 221,958.51[20] ha, three parks of nature have total area of 90,921.00[21] ha and seven Ramsar sites[22] within the Sava RB (Bardača in Bosna and Herzegovina, Lonjsko polje and Crna Mlaka in Croatia, Peštersko polje, Obedska bara and Zasavica in Serbia and Cerkniško Lake in Slovenia), comprise total area of 71,673.00 ha.

The list of protected areas includes 121 Natura 2000 sites (total area coverage of 1,790,749.60 ha in comparison with 1,281,663.71 ha in the 1st Sava RBMP which represent increase for 28%). Of all Natura 2000 sites, 14 sites are important for the protection of avifauna (proposed to preserve the bird species enumerated in the Birds Directive (2009/147/EC) and 145 sites are proclaimed as of the Community importance for protection of the habitat types and the species enumerated in Habitats Directive (92/43/EEC). Of all areas protected according to the Habitats Directive (92/43/EEC), 33% are partly protected as well by the 92% of areas protected in accordance with the Birds Directive (2009/147/EC). Areas protected according to both Directives are located mainly within the direct Sava catchment and as well in the sub catchments of the rivers Ljubljanica, Una, Kupa/Kolpa, Krka, Česma, Ilova and Bosut.

a. Drinking Water Protected Areas

According to Annex IV of the WFD, Drinking Water Protected Areas (DWPAs) are areas designated for the abstraction of water intended for human consumption (pursuant to Art. 7 of the WFD). DWPAs include safeguarded zones (significantly smaller than the DWPA) in which measures must be applied to protect the quality of groundwater abstracted for human consumption from deterioration, thereby meeting the requirements of Article 7.3 and Article 4.1(c).

For the purpose of the preliminary basin wide DWPA's inventory, drinking water protected areas with the surface areas larger than 100 ha were taken into consideration. Based on the definition of "groundwater DWPAs" used in the WFD CIS Guidance Document No. 16[23], Sava countries have identified 301 DWPAs according to the Article 7 of the WFD.

[20] Only a part of NP Triglav in Slovenia is within the Sava RB.

[21] Only a part of Park of Nature Papuk is within the Sava RB.

[22] "Ramsar sites", sites selected as Wetlands of International Importance according to The Convention on Wetlands of International Importance from 1971 ("Ramsar Convention").

[23] CIS Guidance Document No.16: Guidance on Groundwater in Drinking Water Protected Areas, 2006.

Table 26: Drinking water protected areas in accordance with Article 7 WFD

	TOTAL		NUMBER		RANGE OF	
	number of GWBs	surface (km²) of GWBs	GWBs with DRW protected areas	of PA sites >1km²	size DRW PA>1km² (km²)	protected surface of GWBs
SI	11	11,978	11	185	1.0-163.2	6%-46.8%
HR	14	25,722	13	116	1.1-624.6	4.35%-50.55%

Non-Member states riparian countries compiled available data and information related to other drinking water protected areas which provide more than 10 m³/day on average, or which are used for water supply for more than 50 people or intended for such a future use. For Bosnia and Herzegovina and Montenegro although the locations of the drinking water protected areas are identified, data related to surface of the protected areas are not available. All available data are listed in the preliminary register and presented in the Annex 9.

4.2 Main pressures on protected areas

Water bodies in PAs are affected by anthropogenic activities. There are several pressures relevant for the PAs within the Sava RB.

In lowland areas, agricultural activities, and urban wastewater (nutrient and organic pollution) may contribute to the degradation of PAs. Pesticides and overuse of fertilizers in regions with intensive agriculture can cause water pollution. Alteration of ground water level and volume, due to the water abstraction, exploitation of river bed material (sand and gravel extraction), change of the water regime (e.g. preventing of periodical flooding as a consequence of embankment and damming) affecting the structure and functioning of water dependent ecosystems, can threaten water dependent PAs.

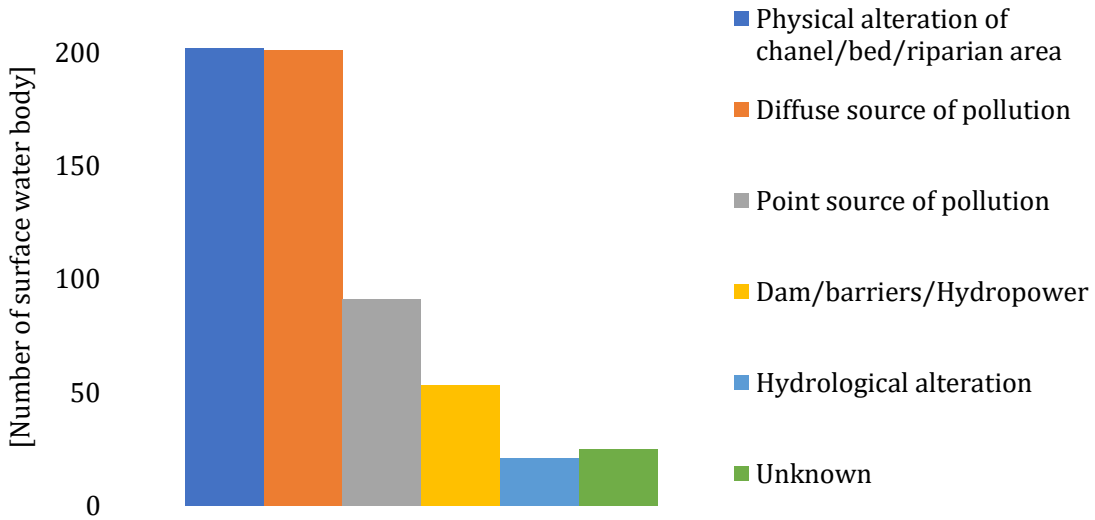


Figure 42: Main types of pressure on SWBs in water dependent protected areas

Main pressures affecting SWBs in connection with protected areas are hydromorphological pressures caused by physical alteration of channel/bad or riparian area and diffuse source of pollution from agriculture and uncollected and untreated waste water.

5 Monitoring networks

5.1 Surface water

5.1.1 Surface water monitoring network in the Sava RB

Following the provision of the requirement stipulate by the Art.8 WFD advancement in all Sava RB countries are made towards the establishment of water status monitoring programmes aiming at coherent and comprehensive overview of water status within each river basin district.

Based on the basin characterization and impact assessment for each period to which a river basin management plan applies, surveillance, operational and when needed investigative monitoring programmes are established.

Surveillance monitoring aimed to assess long-term changes in natural conditions, long term changes due to human activity and to support the development of an operational monitoring program. The surveillance monitoring program includes general physico - chemical and biological quality elements, parameters of the chemical status (priority and priority hazardous substances), special pollutants discharged in significant quantities within the river basin and hydromorphological elements. Operational monitoring is intended to assess the condition of water bodies which are, based on the analysis of human activity's effects and the results of control monitoring, assessed that will not achieve environmental objectives, and furthermore to monitor the effects of pollution reduction measures.

5.1.1.1 National monitoring networks

Slovenia

Slovenia as Member State established its monitoring programme (surveillance and operational monitoring have been implemented and cover most of the relevant quality elements and are performed in the required frequency) in line with the principles of the WFD, which is described in the national RBMPs. The Slovenian Environment Agency is responsible for monitoring. In the period of 2014-19 ecological status of surface waters was monitored and assessed in accordance with the WFD and the chemical status in accordance with environmental quality standards for priority and priority hazardous substances in surface waters set out in the Directive 2013/39/EU concerning priority substances in the field of water policy. In terms of ecological status assessment biological quality elements were used to identify different pollution loads in the rivers. Nutrient load is evaluated in accordance with macrophytes, phytobenthos and phytoplankton and the trophic status. On the basis of phytobenthos and benthic invertebrates saprobic state organic matter load was assessed and, based on benthic invertebrate and fish communities, hydromorphological alteration and general degradation were identified. The assessment of the ecological status also considered general physico-chemical quality elements (nutrients and organic matter load parameters), hydromorphological quality elements (hydrological regime, flow continuity and morphological conditions) and special pollutants discharged into the aquatic environment. The assessment of the chemical status for the water matrix is given based on the performed analysis of the parameters of the chemical status in the water. For the biota matrix, fish are identified as the most

suitable organism for monitoring, while polyaromatic hydrocarbons (PAHs) are monitored in crustaceans or molluscs. For mercury and brominated diphenyl ether, the poor chemical status was extrapolated to other SWBs, where monitoring was not performed because they are ubiquitous pollutants present both in Slovenia and elsewhere in Europe.

Croatia

The whole monitoring system has been revised with the requirements of the WFD. In Croatia the water quality monitoring network is operated by Croatian Waters. Surveillance monitoring of parameters for the assessment of ecological and chemical status is carried out every three years within the duration of the River Basin Management Plan. Exceptionally, supportive physico-chemical and chemical quality elements are monitored each year of the surveillance monitoring cycle. Operational monitoring is carried out continuously, meaning that biological quality elements are monitored every three years, while physico-chemical elements, selected specific pollutants and priority and priority hazardous substances are monitored every year, monthly. Monitoring of hydromorphological quality elements is carried out once in the planning cycle, within the surveillance and operational monitoring. Water status assessment is performed within the River Basin Management Plan and is valid during the period of its validity. Progress in the implementation of measures is monitored by established monitoring programmes.
For the period 2016-2021 the surveillance monitoring network on the territory of the Republic of Croatia was carried out at a total of 119 monitoring stations of which 63 monitoring stations in the Sava RB (17 on the SWB of interest for the basin wide planning). The three-year operational monitoring programme for the period 2016-2018 and 2019-2021 is determined on the basis of the water status determined in the second management plan (RBMP 2016-2021) and carried out at 511 monitoring stations in Republic of Croatia of which 173 monitoring stations in the Sava RB.

Bosnia and Herzegovina

Monitoring of surface waters in the Sava RB in the Federation of Bosnia and Herzegovina is, organized by the Agency for the Sava River Basin Sarajevo who is preparing an annual report on the water status assessment in the Sava RB in the Federation of Bosnia and Herzegovina. The water quality monitoring in Federation of Bosnia and Herzegovina has been put in place, gradually approaching to the WFD requirements since 2011. In the period 2011-2018, in total 276 SWBs (51% of the total number) have been monitored, while each year 50 new monitoring sites have been included. Monitoring frequency is 1-12 times per year. Objectives, definitions, and types of monitoring, as well as normative definitions of ecological and chemical status are taken from the WFD.

The ecological status of SWBs is determined based on biological quality elements (benthic (macro) invertebrates, fish, phytobenthos and macrophytes, phytoplankton) taking into account hydromorphological quality elements, and relevant supporting physico-chemical quality parameters and the presence of relevant specific pollutants. The chemical status of a surface water body is determined according to a list of priority substances and certain other pollutants. The sampling frequency depends on the type of monitoring (supervisory or operational) and ranges from 1-12 times a year.

In 2019, monitoring was carried on 33 monitoring sites covering 24 SWBs (21 SWBs in sensitive and 3 SWBs in less sensitive areas) in areas susceptible to eutrophication and nitrate sensitive zones which have been declared as protected areas.

Surface water quality monitoring in the Bosnia and Hercegovina Republika Srpska is carried out in accordance with the Water Law ("*Official Gazette of the Republika Srpska", no. 50/06, 92/09, 121/12 and 74/17*), the Decree on Water Classification and Categorization of Watercourses ("*Official Gazette of the Republika Srpska", no. 42/01*), WFD and other relevant directives and bylaws, and with Program prepared annually by the Public Institution "Vode Srpske", while the consent to the proposed Program is given by the Ministry of Agriculture, Forestry and Water Management of the Republika Srpska. Monitoring programs are prepared to provide a comprehensive, interconnected overview of the water status of each river catchment.

In the Republika Srpska, monitoring is also being carried out in order to fulfill obligations imposed by international agreements, such as the International Surface Water Monitoring Network (TNMN) established by the ICPDR. It was founded in 1996 as support for the implementation of the Danube River Protection Convention -Danube Convention. TNMN stations were introduced as the backbone of permanent monitoring stations with a specially defined monitoring programme. On the territory of the Republika Srpska, 9 measuring stations of the Sava River are included in the international monitoring - TNMN stations. The list of measuring parameters, for the profiles included in the international surveillance monitoring (TNMN), contains chemical and physico-chemical parameters. The minimum number of measurements and analyzed parameters for TNMN cells is twelve (12) times per year, i.e., once a month. Biological quality elements examined in the previous period on TNMN profiles are phytoplankton, chlorophyll, phytobenthos and macroinvertebrates. The sampling frequency for phytoplankton testing is four (4) times during the year, and for phytobenthos and macroinvertebrate testing two (2) times during the year. Chlorophyll analysis, as one of the mandatory parameters proposed within the TNMN, was performed, with a monthly sampling frequency per year, on only 6 measurement downstream profiles included in the international surveillance monitoring. At the time of sampling for biological and physico-chemical parameters, flow measurements were performed where possible on all measuring profiles.

The water quality monitoring network of Republika Srpska was revised in 2007 on the basis of criteria established within the ICPDR (Summary Report to EU on monitoring programs in the Danube River Basin District designed under Article 8-Part 1). The new approach, in line with the requirements of the WFD, comprising monitoring as a surveillance (at the level of Republika Srpska and international), operational and investigative. All monitoring sites included in the surveillance monitoring network serves as well for the operational monitoring, to facilitate and make data collection more efficient ensuring greater reliability in assessing the status/potential in RBMPs. Furthermore, document defines the quality parameters that will be examined, as well as the frequency of sampling, both annually and during RBMP validity.

At each monitoring site the following measurements are performed: biological quality elements (phytoplankton, chlorophyll, phytobenthos, benthic invertebrates, macrophytes, fish), general physico-chemical parameters that support the given ecological status, priority substances and the specific pollutants defined on the Danube RB level. Monitoring sites for priority substances are determined in accordance with legal regulations which determine the relevant environmental quality standard. For the purposes of operational monitoring, observations are made of biological and hydro-morphological quality elements, which are most sensitive to the pressures posed to the particular water body. Non-biological indicators for assessing the conditions of biological elements of water quality, can complement the use of biological indicators, but they

cannot replace them. The scope of the test should not be less than the test within the surveillance monitoring.

Investigative monitoring is carried out on locations where the cause of environmental quality standards exceedance is unknown, where surveillance monitoring indicates that environmental objectives for SWBs are unlikely to be achieved and if operational monitoring has not yet been established (Assessing impact of accidental pollution, providing information for the establishment of programs of measures, for the achievement of environmental objectives and the determination of special measures, to eliminate the consequences of sudden pollution). Investigative monitoring programs are made in accordance with the specifics needs or issues being investigated. Currently, the water monitoring in the protected areas is not yet officially established.

Serbia

Since 2012, Serbia has established monitoring of surface water status according to the WFD requirements. Systematic monitoring of surface and groundwater quality is the responsibility of the Serbian Environmental Protection Agency (SEPA), and quantitative status is the responsibility of the Republic Hydrometeorological Service of Serbia. In the 2012-2019 period, surveillance monitoring covered from 50 to 64 SWBs, and it included most of the relevant quality elements. Among the biological quality elements (BQEs), the examination of phytoplankton, phytobenthos, and benthic invertebrates has been performed until 2016. In the 2017-2019 period at the surveillance monitoring stations, the examination of macrophytes and fish was carried out within the project funded by the Ministry of Environmental Protection of Serbia. At the surveillance monitoring stations, all relevant physico-chemical quality elements are analysed, with the frequency of investigation required by the WFD. Monitoring includes most of the specific pollutants, and priority and priority hazardous substances, with the frequency of investigation required by the WFD, but since it does not cover all, the overall status assessment has medium confidence level. Operational monitoring is carried out annually at 74 to 77 surface waterbodies, and most of the surveillance monitoring stations are the operational ones at the same time, since the waterbodies on which these stations are situated are not in "good" status. The operational monitoring network is flexible and includes around 20 new water bodies each year. At operational monitoring stations, those quality elements which are the most sensitive to the pressures waterbodies are exposed, and those specific pollutants and priority and priority hazardous substances which are discharged in significant quantity, are analysed. In the 2012-2019 period, monitoring of surface water status covered around 260 water bodies.

Montenegro

Surface water quality monitoring in Montenegro is in an initial stage of the establishment in accordance with the WFD requirements. It is operated by the Institute for Hydrometeorology and Seismology in Podgorica. Parameters and frequencies are focused mostly on the protection of the drinking water abstraction areas.

5.1.1.2 Surface Water Bodies' monitoring in the Sava RB

Surface water bodies' monitoring activities for the status assessment or water monitoring within protected areas are performed in accordance with the national annual/multiannual monitoring programs.

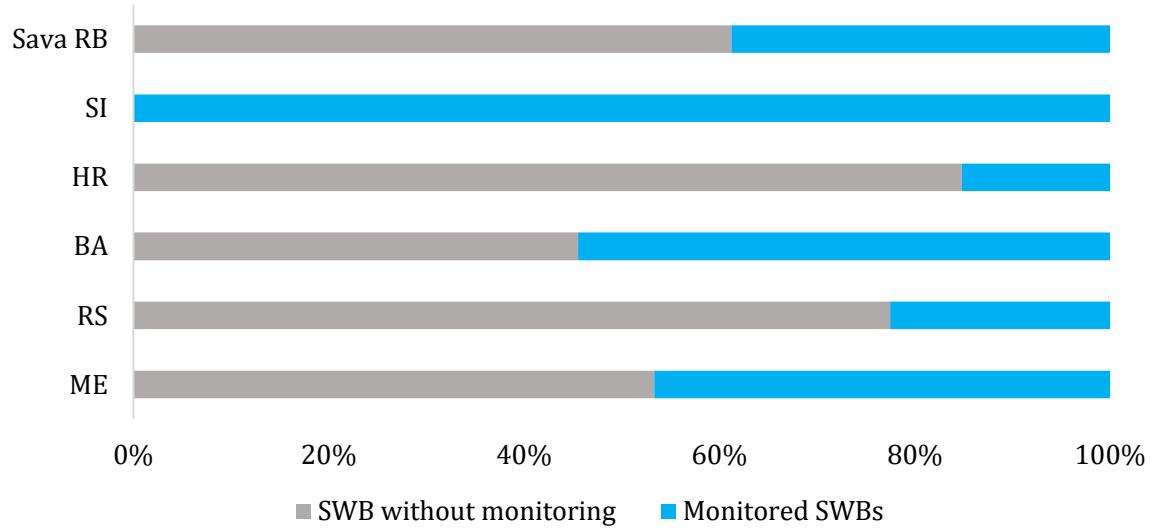


Figure 43: Monitoring of the SWBs (%) in the SRB

Total number of 127 monitoring sites in the Sava RB are located on 123 SWBs, 29 monitoring sites on the Sava River covering 27 SWBs, while 92 SWBs on the tributaries are covered with 98 monitoring sites. Of total number of SWBs in the basin 40 % of the designated SWBs are covered by some of the monitoring programmes (57% on the Sava River and 37% on tributaries). Coverage of the SWB on the Sava River and tributaries in comparison to total number of SWBs is presented on the Figure 43.

5.1.1.3 SWBs monitoring purposes

Monitoring purposes on the SWBs monitoring sites in Sava RB, in accordance with the available data from Croatia, Bosnia and Herzegovina and Serbia are the following:

- WFD operational monitoring
- WFD surveillance monitoring
- WFD investigative monitoring
- Reference monitoring
- Monitoring of a Protected Area designated for the protection of habitats or species depending on water (WFD Annex IV.1.(v))
- Marine Strategy Framework Directive monitoring
- International network of other international conventions
- Monitoring of a nutrient sensitive areas under Nitrates Directive (91/676/EEC) (WFD Annex IV.1.(iv))
- International network of a river convention
- Other purposes and/or networks not listed above.

Monitoring purposes are defined for 85 of 127 monitoring sites within the Sava RB (Map 18).

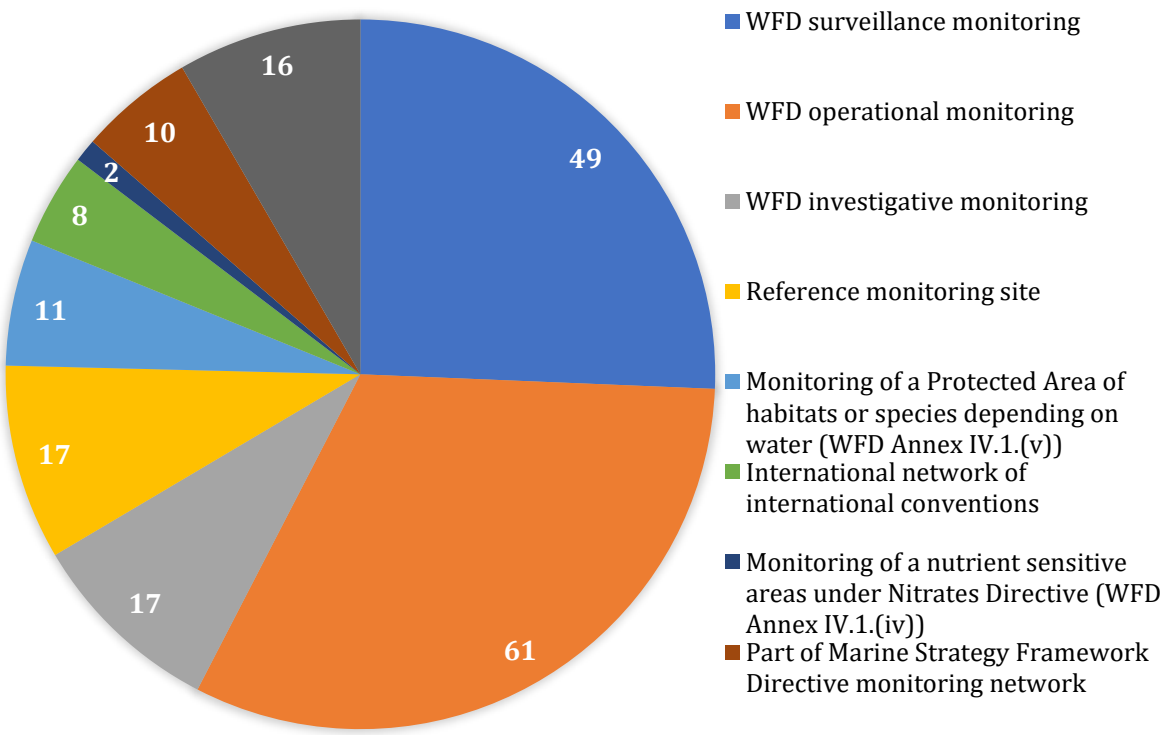


Figure 44: Representation of monitoring purposes on the monitoring sites on the Sava River and the tributaries of the basin wide importance

5.1.1.4 Danube TNMN

The operation of the Trans-National Monitoring Network (TNMN), functioning since 1996, is aimed to contribute to implementation of the DRPC. The TNMN builds on the national surface water monitoring networks. Following the provision of the DRPC the Parties to the FASRB cooperate in the field of monitoring and assessment of the SWBs aiming to:

- harmonize or make comparable their monitoring and assessment methods, in particular in the field of river water quality;
- develop concerted or joint monitoring systems applying stationary or mobile measurement devices, communication and data processing facilities;
- elaborate and implement joint programmes for monitoring the riverine conditions in the Danube catchment area concerning both, the water quantity and quality, sediments and riverine ecosystems, as a basis for the assessment of transboundary impacts.

Water quality data regularly gathered through the monitoring programme performed by the Danube/Sava countries, merged at Central Point at Slovak Hydrometeorological Institute, processed by using the agreed procedures and provided to the ICPDR information system, are available in TNMN Yearbooks [24].

[24] https://www.icpdr.org/main/activities-projects/tnmn-transnational-monitoring-network

Table 27: Basic data on the TNMN monitoring stations in the Sava RB

Country	River	Town/Location	TNMN Code	Distance (km)	Altitude (m)	Catchment (km²)	DEFF Code	Loc. Profile
SI	Sava	Jesenice	SI2	729	135	10,878	L1330	R
HR	Sava	Jesenice	HR6	729	135	10,834	L1220	LR
HR	Sava	Upstream Una Jasenovac	HR7	525	87	30,953	L1150	L
BA	Sava	Gradiška	BA5	457	86	39,150		M
HR	Sava	Račinovci**	HR8	254	85	62,890	L1060	LMR
HR	Sava	**	HR12	218	78	65,638		L
RS	Sava	Jamena	RS13	195	78	64,073	L2470	L
BA	Sava	Rača	BA11	190	80	64,125		M
RS	Sava	Sremska Mitrovica*	RS14	136	75	87,996	L2480	L
RS	Sava	Šabac	RS15	104	74	89,490	L2490	R
RS	Sava	Ostružnica	RS16	17	n.a	37,320	L2500	R
BA	Una	Kozarska Dubica	BA6	16	94	9,130		M
BA	Una	Novi Grad	BA12	70	137	4,573		M
BA	Vrbas	Razboj	BA7	12	100	6,023		M
BA	Bosna	Modriča	BA8	24	99	10,500		M
BA	Bosna	Usora	BA13	78	148	7,313		M
BA	Drina	Foča	BA9	234	442	3,884		M
BA	Drina	Pavlovića most	BA10	16	90	19,226		M
ME	Lim	Gradac/HS	ME 1					
ME	Ćehotina	Dobrakovo/HS	ME 2					

**The monitoring site Sremska Mitrovica is not in the TNMN since the year 2012*

*** Monitoring and assessment data are available for the monitoring site HR8 until 2016. For 2017 active monitoring site in HR12*

Comparability of monitoring results

Overall comparability throughout the basin is ensured by regular cooperation between the monitoring services (National Reference Laboratories) focusing on:

- Reference and optional analytical methods;
- Defining minimum concentrations to be measured and the required tolerance.

The TNMN laboratories have a free choice of standardized analytical method, providing they are able to demonstrate that the method in use meets the required performance criteria. To ensure the quality of collected data, a basin-wide Analytical Quality Control (AQC) programme is regularly organized by the ICPDR, for the national laboratories providing data for the TNMN.

5.2 Groundwater

The GWBs status assessment (in some cases risk assessment) is based on the results of established groundwater monitoring programs. In general, these programs are based on the existing national monitoring programs which, in most cases (Bosnia and Herzegovina, Serbia, Montenegro) are still being adapted to meet WFD requirements.

5.2.1 Overview of groundwater monitoring networks in the Sava RB

In **Slovenia,** the ground water chemical and quantitative monitoring network is established in accordance with WFD requirements and planned according to the hydrogeological characteristics of aquifers, the level of pollution, and designed based on the selection of representative measuring points' locations according to the conceptual hydrogeological models. The design of monitoring programme also considers the past observations' data sets homogeneity criteria, technical suitability of the monitoring facilities and the use of groundwater and the area.

The groundwater chemical monitoring program, covering all GWBs, is divided into surveillance and operational monitoring in accordance with the WFD. Surveillance monitoring is carried out once in each period of the water management plan. A wide range of pollutants is analysed in groundwater samples, several times a year, in order to ensure a coherent and comprehensive chemical status overview and to detect long-term trends in pollutant concentration level. Operational monitoring is carried out every year, except in the year when the surveillance monitoring is planned. The aim of operational monitoring is to determine the chemical status of those water bodies identified as endangered, to identify in a timely manner the long-term trend of increasing concentrations of pollutants and to follow the effectiveness of measures in endangered areas. The status of groundwater in all alluvial water bodies and in water bodies with high vulnerability, such as water bodies with karst and fissure porosity, is monitored annually.

Quantitative status monitoring, carried out by Slovenian Environment Agency, is established to meet the requirements of the WFD in the 2006, aiming to collect data on parameters of quantitative status assessment, as prescribed by the Decree on the status of groundwater ("*Official Gazette of the Republic of Slovenia", No. 25/09, 68/12 and 66/16*). As part of groundwater monitoring, measurements of basic hydrological and physico-chemical parameters are carried out on the established national measuring network in shallow aquifers. In aquifers with intergranular porosity, the depth is measured for the purposes of assessing the quantitative status, and in aquifers with karst, fissure and mixed porosity, the height of water or flow of springs and watercourses is monitored. Temperature and specific electrical conductivity of groundwater are measured as complementary parameters.

In the Sava RB, 124 measuring points were included in the state's groundwater monitoring, in 2019. At 101 measuring points, the status of alluvial aquifers was monitored through depth measurements at 23 monitoring sites, while the quantitative status of groundwater was monitored by water level or flow of springs and watercourses for aquifers with karst, fissure, and mixed porosity. In the quantitative status assessment for the national RBMP 2021-2027 in the Sava RB District, 51 monitoring sites were

included on the alluvial aquifers and 23 measuring points on the remaining aquifers, i.e. in total 74 measuring points.

In **Croatia,** groundwater monitoring in the Sava RB is conducted at around 280 monitoring sites. The majority of monitoring sites are located on the Zagreb aquifer. In general, the monitoring plan is characterized by uneven coverage of the major aquifers, in terms of depth. For alluvial and karst aquifers, the monitoring network is related to wells and captured springs at abstraction sites, which are used for drinking water purposes. Qualitative status assessment on all groundwater bodies' is based on existing 197 monitoring stations, whose include piezometers and wells for water supply system or karstic springs. The establishment of operational monitoring started in 2015. In the WISE system are entered reliable data from national monitoring, for qualitative status (stations with historical data) which counts 200 monitoring stations. The 2nd RBMP, anticipates the establishment of operational monitoring of groundwater quality in all groundwater bodies that are at risk. The inclusion of a total of 74 stations into operational monitoring is anticipated. Quantitative status assessment on all groundwater bodies is based on 80 monitoring stations, which include level measurements from piezometers and yields from wells used for water supply system. In the WISE system are entered reliable data from national monitoring for quantitative status (stations with historical data), thus it counts 80 monitoring stations. Only one groundwater body in Croatia – Una did not have any station.

In **Bosnia and Herzegovina,** no systematic monitoring of groundwater has been established. This means that very few springs and aquifers are regularly observed. Existing monitoring cannot be considered representative for a reliable assessment of the quantitative and chemical status of GWBs, in accordance with the requirements of the EU Directives. Currently, systematic monitoring of groundwater levels and temperatures is performed at 21 automatic stations in the Sava RB in the Federation of Bosnia and Herzegovina (on groups of GWBs: Posavina, Sarajevo-Zenica Field and Tuzla-Spreca Field), 8 of them, on the GWBs of the basin wide importance. In the Republika Srpska, the regular monitoring of water supply sources provides data on the parameters: dissolved oxygen, electrical conductivity, pH values, nitrates, nitrites, and as well colour, taste, odour, turbidity, consumption of KMnO4, ammonia, chlorides, iron and manganese.

In Serbia, ground water monitoring of major alluvial aquifers has been established. Water quality is monitored at water supply abstraction points and groundwater is occasionally tested as a part of various projects. The systematic monitoring of neogene and karstic aquifers has not yet been established. The monitoring of groundwater resources in the Sava RB is performed at several levels: at the national level (network of Hydrometeorological Service of Serbia), at the water supply source level (raw water networks) and at the level of other networks (e.g., in some of the riparian lands of the Sava River, which are part of the backwater zone of the Iron Gate Dam).

In **Montenegro,** ground water monitoring network is in initial phase of establishment in accordance with the WFD requirements. Current ground water monitoring network is consisted of 13 monitoring sites, covering 7 ground water bodies, with monitoring of qualitative parameters and4 assessing the quantitative and chemical parameters.

Table 28: The number of groundwater monitoring stations on GWBs of basin-wide importance

Country / Basin	NUMBER OF GROUND WATRE BODIES				
	Total	with monitoring			without monitoring
		Quantitative	Chemical	Quantitative and chemical	
SI	11	3	11	3	0
HR	14	8	11	8	3
BA	17	1	0	0	16
RS	5	3	3	3	2
ME	13	7	4	4	6
Sava RB	**60**	**22**	**29**	**18**	**27**

Of 60 GWBs in the Sava RB, 55% is covered with some monitoring programme. On the 33 GWBs, where monitoring is established, on the 54% (18 of 33 GWBs) both qualitative and chemical assessment are performed, while 12 GWBs have solely chemical and 4 GWBs quantitative monitoring.

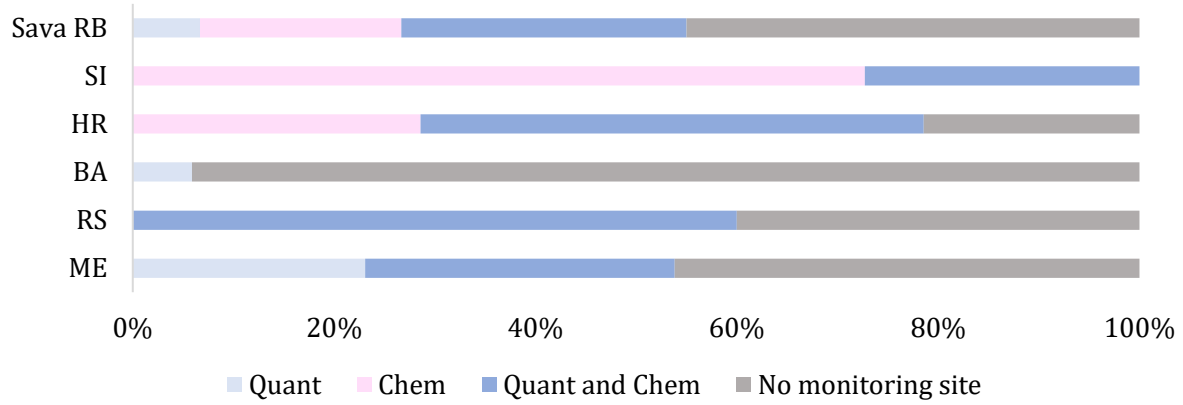


Figure 45: Ground water body (in %) coverage by monitoring type

The density of the groundwater monitoring network (area of GWB divided by the number of monitoring stations) is given to show differences in the development of monitoring networks throughout the basin. Lower values for monitoring density (expressed in km²/station) in general indicates better spatial coverage of GWBs by the monitoring network and the possibility for a more reliable status assessment.

Table 29: Number of monitoring stations and range of density of stations in the Sava River Basin

Country	Number of GWBs	Number of the monitoring stations on the GWB of interest in the Sava RB		Range of density (GWB km²/monitoring sites) of on the GWB of interest	
		Quantitative monitoring	Chemical monitoring	Quantitative monitoring	Chemical monitoring
SI	11	44	109	7-33	8-358
HR	14	80	200	27-5,186	6-1,372
BA	17	8	0	0-47	/
RS	5	6	6	254 -2,489	254-2,489
ME	13	13	6	69-526	203-703

6 Water status

The overall aim of the WFD implementation is to maintain and/or achieve good status for all water. Surface water status is a general expression determined for surface water by the poorer of its ecological status and its chemical status, and for groundwater by the poorer of its quantitative and its chemical status. Good ecological status and good chemical status must be achieved for natural SWBs, while good environmental potential and good chemical status are aim for heavily modified or artificial water bodies. For GWBs good quantitative and good chemical status should be ensured.

6.1 Surface water ecological/chemical status

6.1.1 Surface waters - ecological status/ecological potential and chemical status definitions

Ecological status, measuring the effects of human activities on water, is an expression of the quality of the structure, and functioning of an aquatic ecosystem. Ecological status of a surface water body is classified used biological, hydromorfological and physico-chemical quality elements, in accordance with Annex V of the WFD, in five categories as high, good, moderate, poor, or bad ecological status. For heavily modified and artificial water bodies, as high or maximum, moderate, poor, or bad ecological potential.

Chemical status of the surface water describes whether the concentrations of pollutants exceed environmental quality standards, defined in accordance with Directive 2013/39/EU (amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy). Good chemical status of the surface water is achieved if these standards are not exceeded.

6.1.1.1 Confidence in the status assessment system and comparabilty of the results

Methods for the assessment of ecological status vary between countries in the Sava RB. To ensure methods for the assessment and results of the of ecological status (water status class boundaries: high/good, good/moderate) comparability, WFD requires the national classifications of good ecological status to be harmonized through an intercalibration exercise. In the Sava RB, the intercalibration exercise is performed by the work of the Eastern Continental Geographical Intercalibration Group (EC GIG), in which Slovenia and Croatia are taking part. In the future, it will be necessary for all Sava countries to perform intercalibration thus to ensure full comparability of their classification systems.

Reference year/period used for the status assessment varies per countries, for Slovenia status assessment years are 2016-19, for Croatia 2012, for Bosnia and Herzegovina 2016, while in Serbia for the status assessment 2012-18 period has been used. Data related to ecological status assessment were not available for Montenegro.

Regarding to the above mentioned, full comparability of water status assessment results cannot be ensured within the Sava RB. Confidence level of the status assessment are evaluated in accordance with the countries' specific methodologies and is further elaborated bellow.

6.1.2 Ecological status/potential and chemical status

The ecological status/potential has been assessed for 235 water bodies (of a total of 296) in the Sava RB (46 on the Sava River and 189 on the tributaries). For 1 SWB on the Sava River, and 58 SWB on tributaries ecological status/potential is defined as unknown.

On the Sava River, no water body is in the high ecological status. The high ecological status has been attained by 4 SWBs on the tributaries, Kupa/Kolpa in Slovenia (with high confidence), Orljava (with medium confidence), Una (with low confidence) in Croatia and Uvac (with medium confidence) in Serbia.

On the Sava River, 19% (9 of 47) SWBs, are assessed as being in the good ecological status which make 153.1 km or 12% of the length of the Sava River's SWBs. Most of the water bodies on the Sava River (16 of 47 SWBs) are in the moderate status/potential (14 SWBs in the moderate status and 2 SWBs in the moderate potential) which comprise 568.3 km (45% of the Sava River's SWBs length). The poor status is defined on 9 of 47 SWBs (2 SWBs in the poor status and 7 SWBs in the poor potential) which make 263.2 km or 20 % of the length in the Sava River's SWBs length. In the bad status is 276.1 km or 22% of the length or 12 SWBs (4 SWBs in the bad status and 8 SWBs in the bad potential).

Data related to status assessment are available for 189 of 249 SWBs on the Sava River tributaries of the basin wide importance. Of total 189 SWBs, 167 have been assessed as natural and 22 as HMWBs. Of assessed natural water bodies 33% are in the good status (55 SWBs in length of 1,172.21 km), 36% are in the moderate status (61 SWBs in length of 1,404.8 km), in the poor status is 20 % (33 SWBs in length of 701.9 km) and 9% of the SWBs on the Sava River's tributaries are in the bad status (15 SWBs in length of 226.5 km). On the 22 SWBs on the Sava River's tributaries, ecological potential has been assessed. No water bodies are in maximum neither in good potential, while 9 SWBs (160.3km) are in poor and 8 SWBs (121.1km) in the bad ecological potential.

Data in the Table 30, the Figure 46 and on the Map 20, represent the results of the ecological status or potential assessment of the SWBs on the Sava River and its tributaries.

Table 30: Assessment of ecological status/potential for the Sava River and its tributaries

	The Sava River		Important tributaries		Total Sava RB	
	No. of WBs	Length (km)	No. of WBs	Length (km)	No. of WBs	Length (km)
High status/maximum potential	0	0.0	4	81.8	4	81.8
Good status	9	153.1	55	1,172.2	64	1,325.3
Moderate status/potential	16	568.3	65	1,438.0	81	2,006.3
Poor status/potential	9	263.2	42	862.2	51	1,125.4
Bad status/potential	12	276.1	23	347.7	35	623.8
No information	1	1.4	58	944.2	60	945.6

Note: The stated total length of the Sava River and its tributaries is different from the real length due to problems with the harmonization of trans-boundary water bodies (lengths of all delineated WBs counted in cases where different lengths of WBs on trans-boundary stretches were defined by the neighbouring countries).

In comparison with the 1st Sava RBMP, where majority of the SWBs were assessed with low confidence, the confidence level for the ecological status assessment significantly improved in this planning cycle.

On the Sava River the ecological status assessment has been done with high confidence level for 22 SWBs, with medium confidence for 21 SWBs, with low confidence for 1 water body and 3 SWBs are assessed with no information about the confidence level. Assessment of good ecological status with high confidence comprised 67%, with medium confidence 33% and with low confidence 0%; moderate ecological status (high confidence 33%, medium confidence 60%, low confidence 7%); poor ecological status (high confidence 78%, medium confidence 22%, low confidence 0%; bad ecological status (high confidence 36%, medium confidence 64% and low confidence 0%).

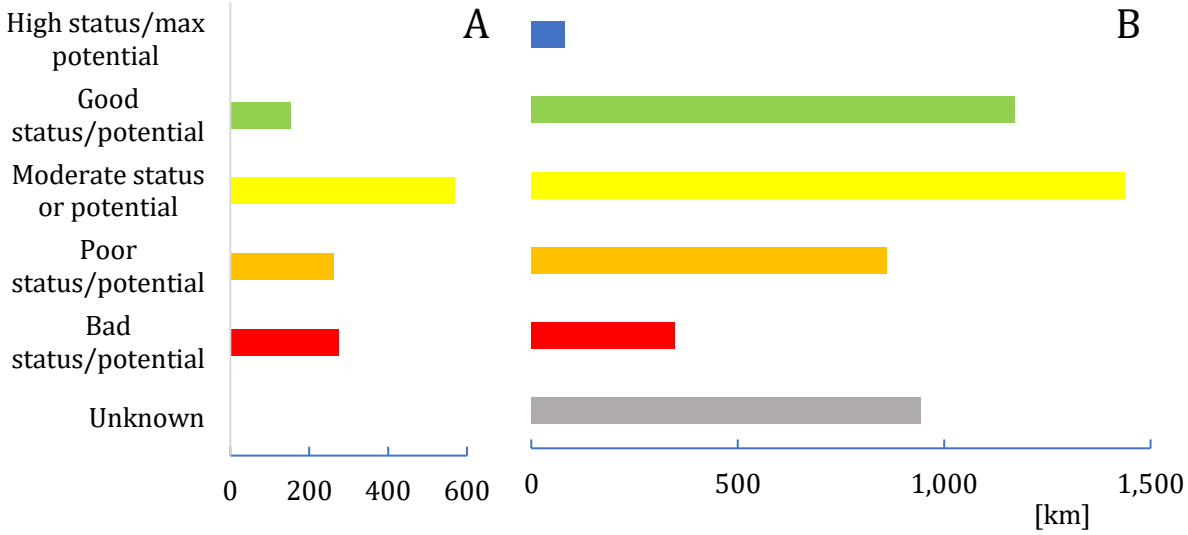


Figure 46: Ecological status/potential assessment of the SWBs on the Sava River (A) and on the tributaries (B);

Of the 189 assessed water bodies on the Sava River tributaries of the basin wide importance, ecological status/potential with the high confidence has been defined for 51 (27%) SWBs, with medium confidence for 91 (48%) water bodies and with a low confidence on 11 (6%) SWBs, while for the 36 (19%) SWBs no information about confidence level assessment were available. The high status is assessed in 50% of the cases with medium and in 50% with low confidence; good status (high confidence 34%, with medium confidence 59% and with low confidence 7%); moderate ecological status (high confidence 22%, medium confidence 71%, low confidence 7%); poor ecological status (high confidence 38%, medium confidence 56%, low confidence 6%; bad ecological status (high confidence 63%, medium confidence 37% and low confidence 0%).

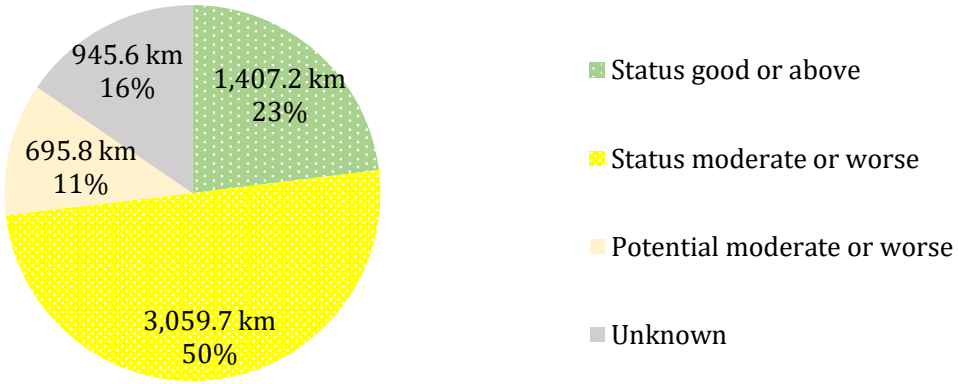


Figure 47: Ecological status and potential of the SWBs within the Sava RB with length indication;

In the Sava RB data regarding chemical status are available for 208 SWBs (40 on the Sava River and 168 on the tributaries) while chemical status on 77 (7 on the Sava River, 70 on the tributaries) SWBs has been defined as unknown.

Of total assessed SWBs, 75% (159 SWBs) achieved good chemical status (35 water bodies on the Sava River and 124 of water bodies on tributaries) and 24% (5 water bodies on the Sava River and 45 on the tributaries) failed to achieve good chemical status. Of the total extent of the SWBs in the Sava River basin 50% is in a good chemical status, 24% in failing to achieve the objective and 26% is not defined.

Data in the Table 31 shows the number and the length of water bodies which are at good or failing to achieve good chemical status. The chemical status of SWBs is shown in Map 21.

Table 31: Assessment of chemical status for the Sava River and its tributaries of the basin wide importance

	The Sava river		Important Tributaries		Total SRB	
	No.of WBs	Length (km)	No.of WBs	Length (km)	No.of WBs	Length (km)
Good chemical status	35	813.2	124	2,306.9	159	3,120.1
Failing to achieve good chemical status	5	220.7	45	1,235.4	50	1,456.1
Unknown	7	228.2	78	1,303.7	85	1,531.9

Note: The presented total length of the Sava River and its tributaries is different from the actual length due to problems with harmonization of trans-boundary water bodies (lengths of all delineated WBs counted where different lengths of WBs on trans-boundary stretches were defined by the neighbouring countries).

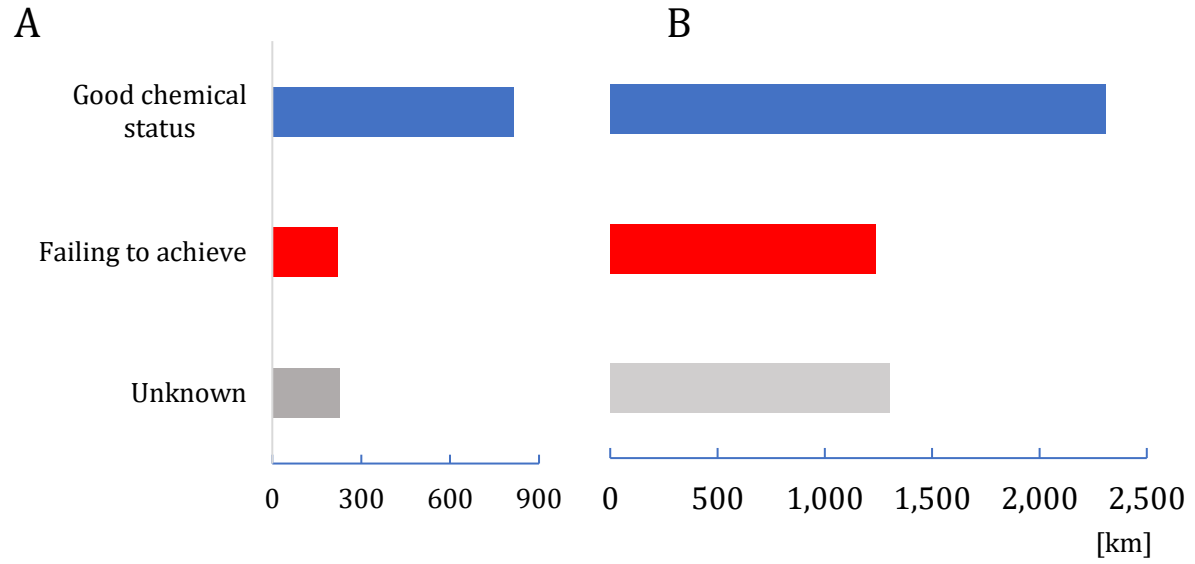


Figure 48: Assessment of chemical status in water bodies of the Sava River (A) and its tributaries (B) (length of water bodies – km)

Note: The presented total length of the Sava River and its tributaries is different from the actual length due to problems with harmonization of trans-boundary water bodies (lengths of all delineated WBs counted where different lengths of WBs on trans-boundary stretches were defined by the neighbouring countries).

Surface water bodies are defined as "at risk" if were not expected to preserve or reach good ecological status by the end of the planning cycle. Risk assessment of SWBs has been done according to the countries' specific methodologies. Results are compiled on a basin wide level and presented below. Due to possibility that good ecological status cannot be

reached by the end of the planning cycle, 25 SWBs on the Sava River and 71 SWBs on the tributaries are assessed as "at risk", which represent 32% of all SWBs in the Sava RB. The overall number of SWBs "at risk" is probably higher due to significant number of water bodies with no information about the risk and defined as "no relevant" for non- MS countries.

Table 32: Risk of failing to achieve good ecological status

	The Sava River		Important Tributaries		Total Sava RB	
	No.of WBs	Length (km)	No.of WBs	Length (km)	No.of WBs	Length (km)
At risk	25	655.8	71	1,096.1	96	1,751.9
Not at risk	3	45.2	50	879.8	53	925.0
Not relevant	19	561.2	111	2,527.5	130	3,088.7
No information			15	342.7	15	342.7

Furthermore, at risk of not achieve good chemical status, water bodies are if were not expected to preserve or reach good chemical status by the end of the planning cycle.

Table 33: Risk of failing to achieve good chemical status

	The Sava River		Important Tributaries		Total Sava RB	
	No.of WBs	Length (km)	No.of WBs	Length (km)	No.of WBs	Length (km)
At risk	1	27.1	2	38,0	3	65.1
Not at risk	23	569.8	98	1,603.1	121	2,172.9
Unknown	23	665.3	147	3,204.7	170	3,870.0

At risk of failing the WFD environmental objective, not reaching the good status due to failing to achieve good chemical status are 3 SWBs which represent 1% of total surface bodies in the Sava RB.

6.1.3 Gaps and uncertainties

Major gaps and uncertainties in surface water status assessment are the following:

- The data used for the status assessment of the SWBs in the Sava RB are compiled official national data originating from the different time periods (different planning cycle);
- Biological quality elements and methodologies used for the ecological status assessment differ per countries, the intercalibration exercise for achieving international harmonisation and comparability of status class boundaries has not yet been fully completed and this issue requires further cooperation;
- Still existing gaps in availability of reliable monitoring data;
- In some countries monitoring schemes are not in the full compliance with WFD requirements;
- Methods for assessment of the ecological potential are not developed in all Sava RB countries.
- No information if mixing zones are defined and used in the status assessment and how background concentrations are considered;

- Relevant river basin specific pollutants are not identified in all countries;
- The parameters used for the chemical status assessment requires further clarification;
- Lack of bioavailability and bioaccumulation analysis when chemical status is considered;
- The lack of the relation of the impairment of ecological and chemical status with the impact from different pressures;
- The issue related to transboundary cooperation in status assessment of transboundary SWBs remains significant;
- Data for surface water status assessment were not available for Montenegro.

6.2 Groundwater

Water framework directive, establishing the framework for the prevention of significant and further groundwater pollution and aiming to contribute to the provision of sufficient groundwater needed for sustainable, balance and equitable water use, requires the groundwater status assessment and achievement of good chemical and quantitative ground water status in accordance with its Annex V.

Good chemical status of the GWB is achieved when chemical composition of the GWB is such that the concentrations of pollutants do not exceed once prescribed by the Ground Water Directive (2006/118/EC)[25]. Furthermore, in addition to the requirements of good status, any significant and sustained upward trend in the concentration of any groundwater pollutant should be identified and reversed. Good groundwater quantitative status is an expression of the degree to which groundwater body is affected by direct and indirect abstraction.

6.2.1 Groundwater chemical status

The results of chemical status assessment of GWBs are defined by all riparian countries. Ground water bodies are classified as being in good status, failing to achieve good status or chemical status is unknown. Failing to achieve good chemical status is defined for those water bodies that did not meet the established criteria for good chemical status after applying nationally adopted status assessment methodologies. Risk assessment was done according to countries' specific methodologies and GWBs are defined as "at risk", "not at risk" and "no information".

The results of chemical status and risk assessment for the GWBs in the Sava RB are presented in the Table 34, Figure 49, Annex 4 and on the Map 22.

[25] Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration

Table 34: Results of chemical status and risk assessment for the GWBs

GW bodies			SI		HR		BA		RS		ME		Total Sava RB	
Number			11		14		17		5		13		60	
National (N) or Transboundary (T)			N	T	N	T	N	T	N	T	N	T	N	T
Number			5	6	5	9	15	2	5	0	2	11	32	28
Chemical	STATUS	Good status	5	6	5	9	11	1					21	16
		Poor status					4	1					4	1
		Unknown status							5		2	11	7	11
	RISK	Not at risk			5	9	11	1					16	10
		At risk					4	1					4	1
		Unknown	5	6					5		2	11	12	17

The results of status (risk) assessment as shown on and Map 22, concerning the chemical status of groundwater show that 5 GWBs are declared "at risk" or failing to achieve good status while 37 GWBs are in good status (or are not "at risk"). For the 30% (18 of 60) of the GWBs the chemical status and the related risk are unknown.

The confidence level of the chemical status assessment is given as high, medium, or low, reflecting the confidence and precision of the results provided by the chemical monitoring programs or expert judgement. In total 42 GWBs with defined chemical status, confidence level is defined for 31 GWBs' status assessment where 20 GWBs have been assessed with medium confidence, 9 GWBs with low confidence and 2 GWBs with high confidence. Good water status with high confidence have been assessed in 5% of the cases, in 40% with medium confidence and 24% with low confidence, and in 30% of the cases confidence level is defined as unknown. Failing to achieve good status has been assessed in 100% of the cases with medium confidence.

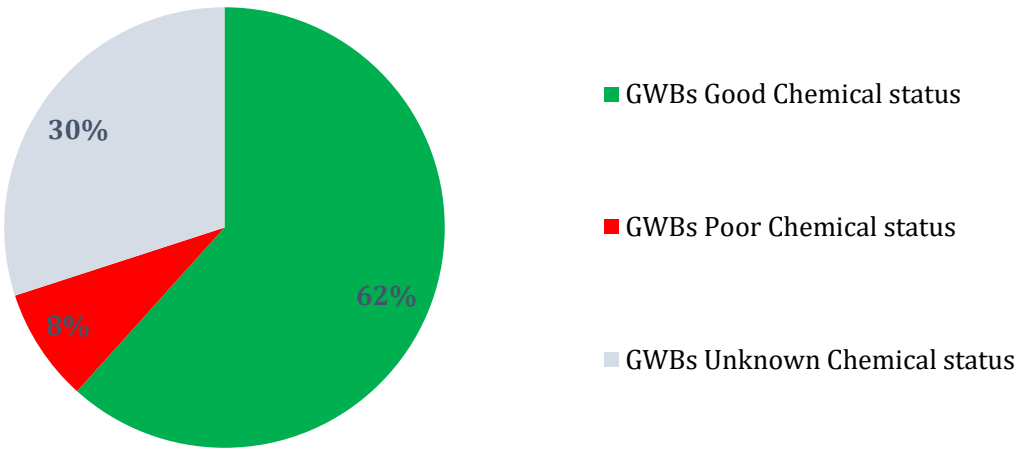


Figure 49: GWBs of the basin wide importance chemical status assessment

6.2.2 Groundwater quantitative status

Ground water quantitative status is an expression of the degree to which a groundwater bodies are affected by direct and indirect abstractions. Quantitative status of groundwater bodies may have an impact on the ecological quality of surface waters and terrestrial ecosystems associated with that groundwater body.

The results of the quantitative status (or risk) assessment are presented using two categories for the status assessment good or poor ground water status, and two risk categories: GWBs are "at risk" or "not at risk".

A GWB is classified as in the poor status or being at risk if criteria for good quantitative status or risk assessment are not met, after applying the nationally adopted status and risk assessment methodologies. Quantitative status and risk assessment data are developed according to countries specific methodologies and available results are compiled and presented below. (Table 35, Figure 50, Annex 4 and Map 23).

Table 35: Results of quantitative status and risk assessment for GWBs

GW bodies			SI		HR		BA		RS		ME		Total Sava RB	
Number			11		14		17		5		13		60	
National (N) or Transboundary (T)			N	T	N	T	N	T	N	T	N	T	N	T
Number			5	6	5	9	15	2	5	0	2	11	**32**	**28**
Quantitative	STATUS	Good status	4	6	5	9	13	1	2				**24**	**16**
		Poor status	1				2	1	3				**6**	**1**
		Unknown status									2	11	**2**	**11**
	RISK	Not at risk	5	6	5	9	13	1	2				**23**	**16**
		At risk					2	1	3				**5**	**1**

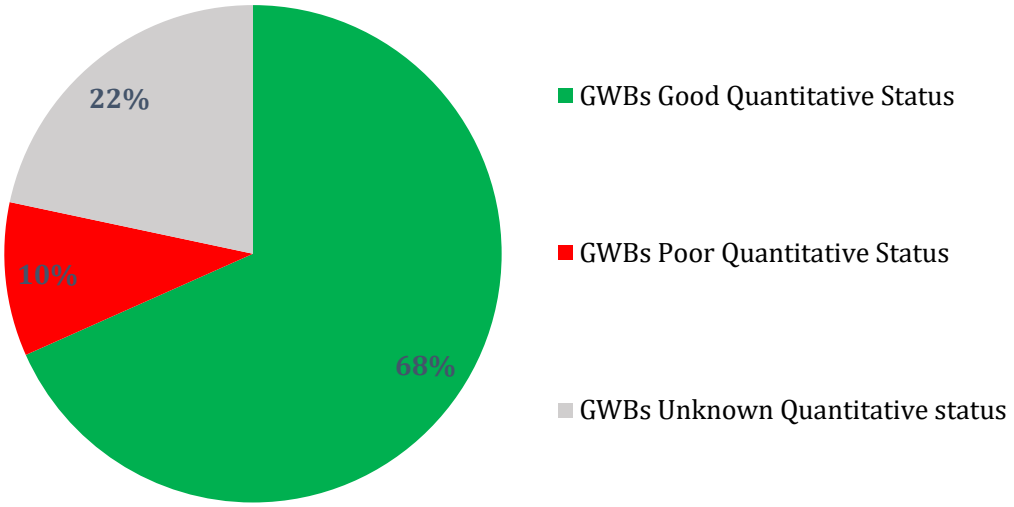


Figure 50: GWBs of the basin wide importance with quantitative status assessment

Quantitative status assessment showed that 7 GWBs are declared "at risk" or failing to achieve good status while 40 GWBs are in good status (or are not "at risk"). For the 22% (13 of 60) of the GWBs, the quantitative status and the related risk are unknown.

The confidence level of the quantitative status assessment is given as high, medium, or low, reflecting the confidence and precision of the results provided by the quantitative monitoring programs or expert judgement. In total 47 GWBs with defined quantitative status, confidence level is defined for 29 GWBs status assessment where15 GWBs have been assessed with medium confidence, 8 GWBs with low confidence and 6 GWBs with high confidence. Good water status with high confidence have been assessed in 15% of the cases, in 33% with medium confidence, 12% with low confidence, and in 40% of the cases confidence level is defined as unknown. Poor quantitative status has been assessed in 29% of the cases with medium confidence, in 43% with low confidence and in 28% confidence level was not defined.

Data related to confidence level are available for 44% of the GWBs (29 of 65). With high confidence are assessed 6 GWBs, 15 GWBs with medium and 8 GWBs with low confidence level. Good water status with high confidence level is assessed in 25 % of the cases (6 of 24 GWBs), with medium in 54% (13 of 24 GWBs) and in 5% of the cases with low confidence (5 of 24 GWBs). Poor status is assessed in 40% of the cases (2 of 5 GWBs) with medium confidence and in 60% with low level of confidence (3 of 5 GWBs).

6.2.3 Gaps and uncertainties

Major gaps and uncertainties in groundwater body status assessment are the following:

- The data used for the status assessment of the GWBs in the Sava RB are compiled national official data originating from the different time periods (different planning cycles);
- Still existing gaps in availability of reliable monitoring data for quantitative and chemical status assessment;
- The issue related to transboundary cooperation in status assessment of transboundary GWBs remains significant;
- The lack of the relation of the impairment of quantitative and chemical status with the impact from different pressures;
- WFD complied methodologies for the ground water bodies status assessment are not developed in all basin countries;
- The pollutants causing poor chemical status required further clarification;
- Information on background level of pollution, and data related to the trend analysis were not available;
- Ground water dependent ecosystems were not taking into consideration for status assessment in Serbia and Bosnia and Herzegovina;
- Data for ground water status assessment were not available for Montenegro and as well for the chemical status assessment for Serbia.

7 Environmental objectives and exemptions

7.1 WFD environmental objectives, visions and managements objectives for the Sava RB

The Water Framework Directive requires the implementation of the necessary measures to enable achievement and/or to prevent the deterioration of the status of all water bodies and establishes in Art.4 the following environmental objectives to be achieved:

- Good ecological/chemical status of SWBs;
- Good ecological potential and chemical status of HMWBs and AWBs;
- Good chemical/quantitative status of GWBs.

The 2nd Sava RBMP provides, where available, an overview of the status assessment for surface and ground water bodies which are defined as of interest for the basin wide planning, as explained in the Chapter 1.4. In order to ensure a complementary approach at the basin wide level, which is of use for national planning and implementation, visions and specific management objectives have been defined for all SWMIs. The defined visions and established management objectives from the 1st Sava RBMP remain to represent guidance for Sava countries with regard to attaining agreed goals of the basin wide importance and also assist to the achievement of the overall WFD environmental objectives.

The visions are based on common values and describe the principal objectives for the Sava RB. The respective management objectives describe the first steps towards the environmental objectives in the Sava RB in an explicit way. Basin wide management objectives:

- Have to be described in a quantitative, semi-quantitative or qualitative way. They can be achieved through implementation of measures that need to be taken to reduce/eliminate existing significant pressures for each SWMI and groundwater on a basin-wide basis.
- Help to bridge the gap between measures on the national level and their agreed coordination on the basin wide level to achieve the overall WFD environmental objectives. Measures at the national level can thus be complemented by the international level in such a way that they are effective in reducing and/or eliminating the existing impacts on the water status on the basin wide scale.
- Help to illustrate the measure's implementation success by comparing the current implementation status with the management objective.

Given the specific situation in non-EU countries, measures to achieve agreed management objectives will be implemented within a timeframe which is realistic and acceptable for all non-EU countries. In the EU MS countries Slovenia and Croatia, these measures are to be implemented according to the commitments and deadlines set down in the accession treaties with the EU.

7.1.1 Organic pollution - Vision and management objective

The vision for organic pollution is no emission of untreated wastewater into the waters of the Sava River Basin.

Management objective:

Phasing out all discharges of untreated wastewater from towns with >2,000 population equivalents and from all major industrial and agricultural installations.

7.1.2 Nutrient pollution - Vision and management objective

The vision for nutrient pollution is the reduction of nutrient emissions from point and diffuse sources in the Sava River Basin in order to avoid any negative impacts from eutrophication in the waters of the Sava River Basin.

Management objective:

Reduction of the nutrients loads entering the Sava River and its tributaries to levels consistent with the achievement of good ecological status/potential and good chemical status in the Sava River Basin.

7.1.3 Hazardous substance pollution - Vision and management objective

The vision for hazardous substance pollution is no risk or threat to human health or to the aquatic ecosystem of the waters of the Sava River Basin.

Management objective:

Elimination/reduction of the total amount of hazardous substances entering the Sava and its tributaries to levels consistent with good chemical status.

7.1.4 Hydromorphological alterations - Vision and management objectives

The vision for hydromorphological alterations is the balanced management of past, current and future structural changes of the riverine environment, so that the aquatic ecosystem of the Sava River Basin functions holistically and all native species are present.

Management objectives:

- Anthropogenic barriers and habitat deficits do not hinder fish migration and spawning;
- Floodplains/wetlands in the Sava RB are protected, conserved, and restored ensuring the development of self-sustaining aquatic populations, flood protection and pollution reduction in the Sava RB;
- Improvement of hydrological alterations does not affect the aquatic ecosystem with regard to its natural development and distribution;

- Future infrastructure projects are conducted in the Sava RB in a transparent way using best environmental practices and best available techniques – impacts on, or the deterioration of, good status and negative trans-boundary effects are fully prevented, mitigated, or compensated.

The following management objectives are proposed for each type of hydrological alteration:

- Impoundments: Impounded water bodies are designated as heavily modified and therefore a good ecological potential need to be achieved. Due to this fact, the management objective foresees measures at the national level to improve the hydromorphological situation in order to achieve and ensure this potential.
- Water abstractions: The management objective foresees the discharge of a minimum ecological flow, ensuring that the biological quality elements have a good ecological status or good ecological potential.
- Hydropeaking: Water bodies affected by hydropeaking are designated as heavily modified and a good ecological potential must be achieved. Therefore, the management objective foresees measures at the national level to improve the situation to achieve and ensure this potential.

7.1.5 Groundwater quality - Vision and management objectives

The vision for groundwater quality is that emissions of polluting substances do not cause any deterioration of groundwater quality in the Sava River Basin, also taking into consideration the potential impact of climate change in the future. Where groundwater is already polluted, restoration to good quality will be the goal.

Management objectives:

- Prevention of pollution in order to avoid a deterioration of groundwater quality and to attain a good chemical status in GWBs;
- Elimination/reduction of the amount of hazardous substances and nitrates entering groundwater bodies in the Sava RB to prevent the deterioration of groundwater quality and to prevent any significant and sustained increase in the concentrations of pollutants in groundwater;
- Reduction of pesticide/biocides emission into the Sava RB;
- Increase of wastewater treatment efficiency in order to avoid GW pollution from urban and industrial pollutions sources.

7.1.6 Groundwater quantity - Vision and management objective

The vision for groundwater quantity is that water use is appropriately balanced and does not exceed the available groundwater resources in the Sava River Basin, taking into consideration the potential impacts of future climate change.

Management objective:

Prevent over-abstraction from GWBs within the Sava RB by sound groundwater management.

7.1.7 Other water management issues

7.1.7.1 Invasive alien species - Vision and management objective

The vision for invasive alien species is to establish a coordinated basin-wide policy and management framework to minimize the risk of invasive alien species to the environment, economy and society. This will include a commitment to not knowingly introduce high-risk invasive alien species into the Sava River Basin.

Management objective:

Consider the problem of invasive alien species as a long-term issue in order to prevent the introduction of harmful alien organisms and eliminate or reduce their adverse effects to acceptable levels.

7.1.7.2 Quantity and quality of sediments

Management objectives:

- Based on an evaluation of sediment balance and sediment quality and quantity, to ensure the integrity of the water regime with regard to quality and quantity and to protect wetland, floodplains and retention areas;
- Prevention of the impacts and pollution of water or sediment;

7.2 Exemptions according to WFD Article 4

According to WFD, Programme of measures should be prepared, based on scientific, technical and economic analysis, to address water management issue and to enable achievement of objectives set in the Art.4. which are: no deterioration/achievement of the good ecological status/potential and good chemical status for surface and good chemical and quantitative status for ground water bodies, progressive reduction and phasing out of priority substances in surface water and prevention of pollutants input in ground water, reversal of any significant, upward trend of pollutants in ground water and achievement of standards and objectives set for identified protected areas. However, an integral part of the environmental objectives is the number of exemptions to the environmental objectives which may be applied if specific conditions are met and justified.
These exemptions range from small-scale temporary exemptions to mid- and long-term deviations, and include the following aspects:

- Article 4(4) allows an extension of the deadline for achieving good status beyond 2015; this extension is limited to 2027 (end of the third cycle), unless natural conditions prevent the WFD objectives from being reached within the time limits set.
- Article 4(5) allows less stringent objectives under certain conditions.

- Article 4(6) allows a temporary deterioration in the status of water bodies owing to natural causes or "force majeure".
- Article 4(7) sets out conditions in which deterioration of status or failure to achieve some of the WFD objectives may be permitted considering failure to achieve the objectives due to new modifications to the physical characteristics of SWBs or alterations in the level of groundwater, and failure to prevent deterioration from high to good status due to new sustainable human development activities.

In the transboundary context, in accordance with the Art.3.4 and Art.3.5 of the WFD, exemptions need to be coordinated on the basin wide level.

For the 2nd Sava RBMP exemptions are defined for water bodies in Slovenia, Croatia, and Montenegro according to their national RBMPs. Other Sava RB countries (Bosnia and Herzegovina and Serbia) have non-EU MS status and therefore currently have no legal obligation to report exemptions.

Within the Sava RB, the exemption in accordance with the Art. 4.4 WFD is applied on the 6 SWBs in Slovenia and 66 SWBs in Croatia due to reasons related to the technical feasibility of measures to achieve environmental objectives or to natural conditions.

Table 36: Exemptions according to WFD Article 4

Country	Number of the SWB under exemption 4.4			Length of the SWB under exemption 4.4 (km)		
	The Sava RB	The Sava River	Important Tributaries	The Sava RB	The Sava River	Important Tributaries
HR	66	18	48	1,227.9	462.8	765.1
SI	6	3	3	127.0	68.2	58.9
Sava RB	**72**	**21**	**51**	**1,354.9**	**531.0**	**824.0**

In Bosnia and Herzegovina Republika Srpska, the possible future application of Art 4 exemption, are related to exemptions 4.4 and 4.7. As the main reason for prolonging the deadlines for environmental objectives achievement (for the next 4 planning cycles (24 years), the lack of financial resources is defined. The estimated value, that would enable the appropriate dynamics of the program of measures implementation, is beyond the financial capacities of the Bosnia and Herzegovina Republika Srpska. Surface water bodies that were preliminary identified as HMWB for the purposes of the first RBMP, due to their long-term user importance and function can achieve significant improvements in terms of ecological status/potential over the next 6 years. The application of Art 4.7 is as well expected for the infrastructure projects, in the field of hydropower production and flood risk management, due their specific challenges that can adversely affect downstream SWBs.

For Serbia there is no available relevant information related to application the exemptions in accordance with the Art 4 WFD.

In Montenegro in the 1st national RBMP the assessment of the needs for exemption for surface and ground water was performed. In total 12 SWBs on the rivers Piva, Tara, Ćehotina and Lim were identified as candidates for exemption based on the need for extended deadlines to reach good status (Art 4.4). Hydropower production is indicated as the pressure's main driver, and it is expected that mitigation measures can ensure the achievement of the good status by 2033. Finally, one surface water body on the Piva River, is assessed to be unable to reach the good status by 2033, since the river is under pressure

from hydropeaking. In this case an exemption would be required. In Montenegro the exemptions are considered as well for GWBs. Of 13 GWBs, one GWB is assessed not to be able to meet its objective until 2033, due to point source pollution arising from the coal mine at Pljevlja and the TE Plant, which may be disproportionately expensive to remedy. However, in this case, the expenses will be borne by the industry in accordance with the "polluter pays" principle.

8 Economic analysis of water uses

8.1 Role of economics in the WFD

Surface and groundwater resources are used for a wide range of different economic activities, which may, by direct or indirect effects, cause significant damage to the water and its environment.

Development of economic sectors, changes in population and investment in public water services, are factors that may affect pressures on the aquatic environment and at the same time have an impact on determining the benefits of water protection and possible measures, to achieve good water status. As a result, socio-economic factors play an important role in implementation of the WFD.

According to Article 5 and Annex III of the WFD, an economic analysis of water uses had to be carried out (and has to be updated regularly) with the aim of assessing the importance of water use for the economy and assessing the socio-economic development of the river basin; this economic analysis is herewith updated at the Sava RB level.

The purpose of economic analysis is to review water use by activities and the impact of these activities on socio-economic indicators. Thus, the economic importance of the extent of water use for the development of the water dependent economic sectors can be determined.

8.2 Socio-economic characteristics

The demographic, social and macroeconomic characteristics of the countries in the Sava RB are analysed by the following data and indicators:

1) number of inhabitants in the countries and the parts of the Sava RB;
2) employment situation;
3) Gross Domestic Product (GDP);
4) GDP per capita in the region;
5) Gross Value Added (GVA).

The significance of the river basin to individual countries can be estimated by the share of the population which reside within. The population of the five countries of the region is over 17 million and almost half of this number resides in the Sava RB. In Bosnia and Herzegovina, 87% of the population lives in the Sava RB, whereas in Serbia this figure is 26%. In Slovenia and Croatia, approximately half the population lives in the Sava RB and in Montenegro around one-third of the population lives in the Sava RB. Detailed information is given in Annex 10, Table 1.

The unemployment rate does not show great divergence within each of the countries. The average employment rate (as a per cent of the population employed in total active population) in the river basin in 2016 was relatively 81%. In the 2016, EU27 employment rate was 70%. The highest figure was in Slovenia (92%), then Croatia (85%), Serbia (84%) and Montenegro (82%). Below average figure was recorded in Bosnia and Herzegovina (75%). The distribution of inhabitants is presented in Figure 51. Detailed information is given in Annex 10, Table 2.

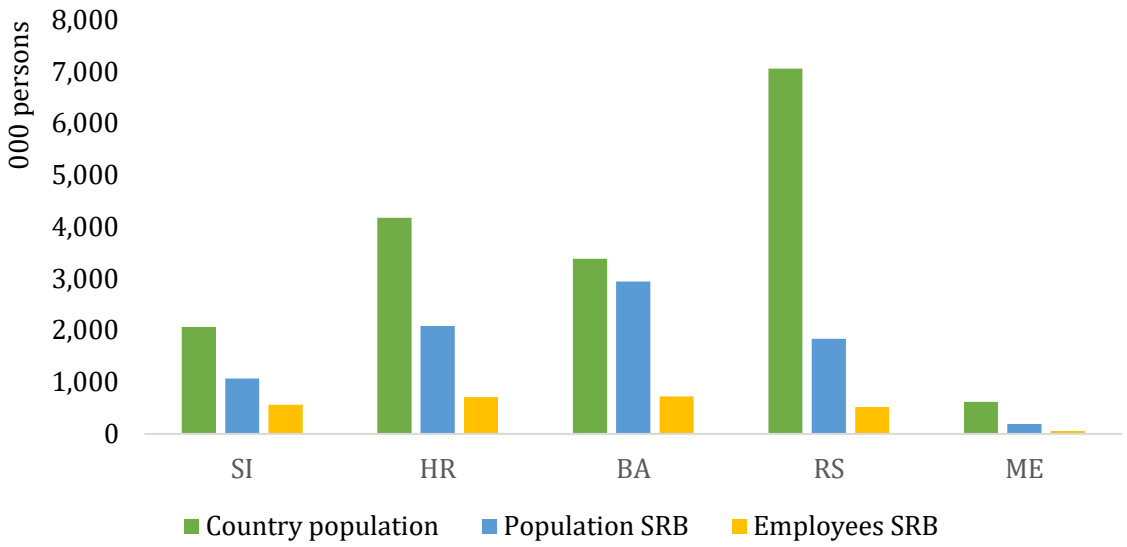


Figure 51: Population and employees in Sava RB countries (2016)

The socio-economic situation as measured by GDP per capita shows great extremes in the river basin. The difference in GDP per capita between the lowest (Bosnia and Herzegovina) and the highest (Slovenia) value is more than fourfold, while the difference between the highest and the second rank GDP per capita value (Slovenia and Croatia) is 1.7 times. On the other hand, the three lowest GDP per capita of the countries are below, and the two highest are above the average per capita indicator, i.e., 7,943 €/person. Economic conditions have changed slightly since 2005, when the 1st Sava RBMP was prepared and the economic gap between Sava RB countries was decreasing during the period 2005-2016. GDP per capita is presented graphically below in Figure 52. Detailed information is given in Annex 10, Table 3.

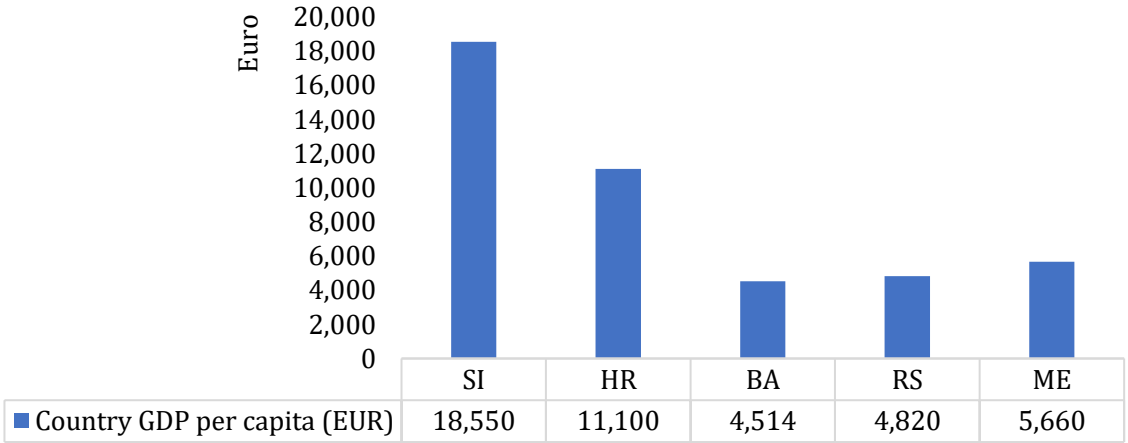


Figure 52: GDP per capita in the Sava RB countries (2016)

The distribution of employees between economic sectors is given in Figure 53 (Source: National statistical offices) below. In the Sava RB, 2.6 million persons are employed. The largest employer is the service sector (other activities), followed by the public sector and industry; nearly 90% of all employees work in these sectors. 11% are employed in agriculture and the energy sector provides work for 1% of the total workforce. Detailed information is presented in Annex 10, Table 4.

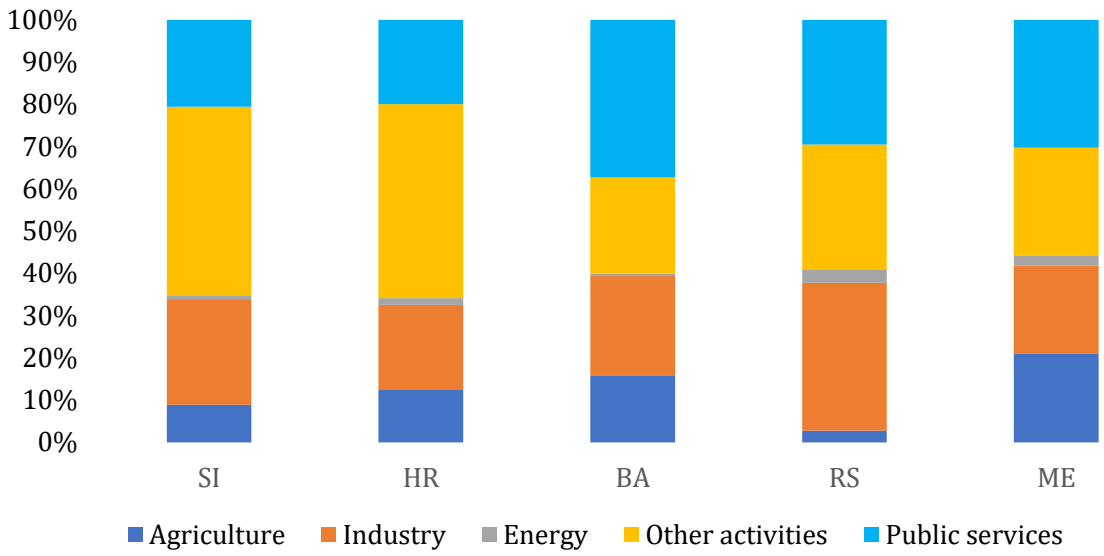


Figure 53: Distribution of employees between economic sectors in the Sava countries (2016)

The highest gross value added (GVA) is provided by the service sector (other activities), which represents more than half of the total GVA. The public sector and industry produce around 34% and the agriculture and energy sector create 9% of total GVA in the Sava RB. The distribution of the GVA by sectors is shown in Figure 54. Details of GVA by countries and economic sectors are outlined in Annex 10, Table 5.

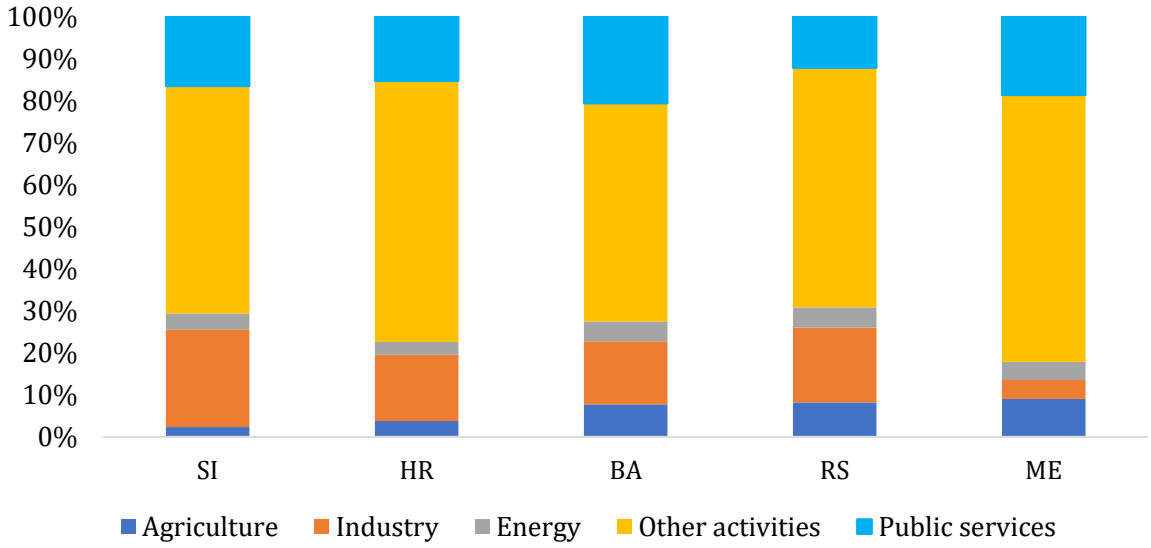


Figure 54: Gross value added by sectors in the Sava countries (2016)

Considering all previously mentioned characteristics of the Sava RB countries, careful coordination of the planned measures is therefore required. Low GDP per capita figures mean low household income in Serbia, Bosnia and Herzegovina, and Montenegro, which will necessitate a careful analysis of tariff affordability before implementing the cost recovery principle to water services in the short term.

8.3 Current water uses

Different water uses can cause qualitative, quantitative and hydromorphological pressures on the surface and ground water bodies In line with WFD guidance documents here are presented, economic aspects, and pressures on the water environment of the relevant water uses and services, which include domestic and industrial water supply, waste water disposal, power generation, agriculture, flood protection, fisheries and aquaculture, navigation, tourism and recreation and other uses.

As in 2016 the national statistical offices in the Sava RB countries are identified the following major water uses:

- Thermal and nuclear power plants;
- Public water supply;
- Agricultural water use
  - Irrigation
  - Fish farms
- Industry

The total water use in the Sava RB is 1.7 billion m^3 and approximately 61% of this is used by thermal and nuclear power plants (1.1 billion m^3). The public drinking water supply uses 379 million m^3 (22%). The agricultural water use, including irrigation, amounts to 24 million m^3 (1.5%). Water used for irrigation in the Sava countries has the lowest share of 18 million m^3 (1.1%) annually. Industrial water use is 185 million m^3 (10.7%). A percentage breakdown of major water uses is presented in Figure 55 (Source: National statistical offices). Detailed information is outlined in Annex 10, Tables 6a and 6b.

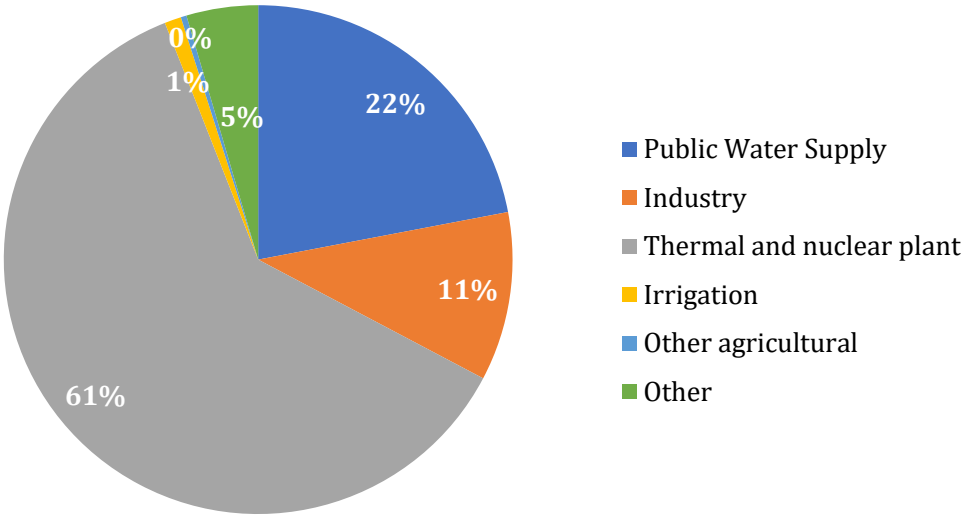


Figure 55: Major water uses in the Sava RB excluding hydropower (2016)

The average per capita water use in the Sava RB, calculated from the public water supply, is 128 l/person/day. It varies from 91 l/person/day (Bosnia and Herzegovina) to 211 l/person/day (Montenegro) per country. Public water use includes drinking water for households, industrial and institutional water use, without losses of the service provider.

Public water use includes drinking water for households, industrial and institutional water use, without losses of the service provider.

Water losses in the distribution networks account for a significant proportion of the total volume of water abstracted. According to data from the national statistical offices, the average water losses were about 41%. Detailed information is outlined in Annex 10, Table 6.

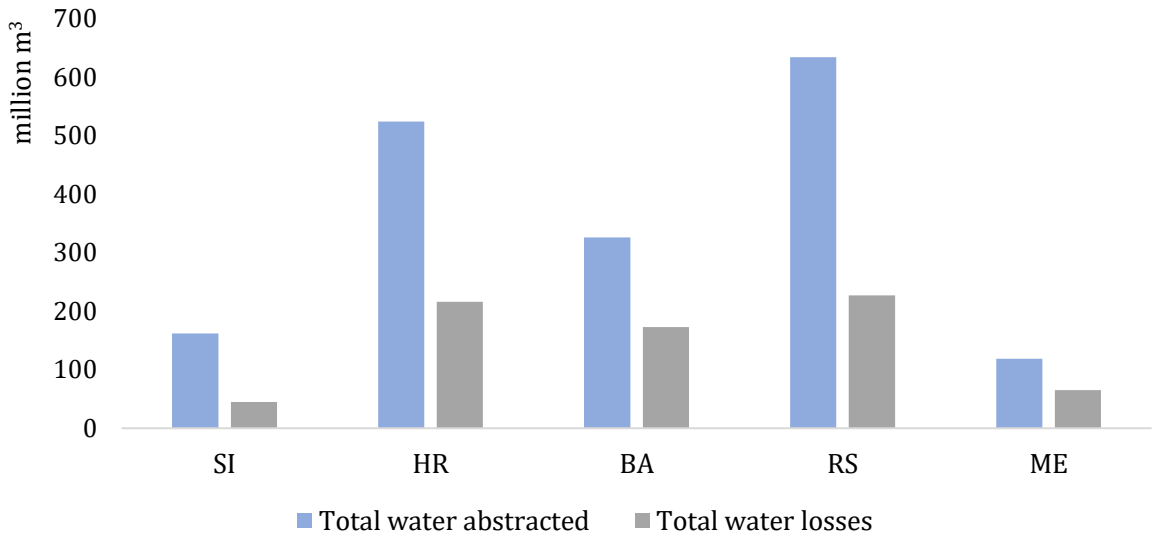
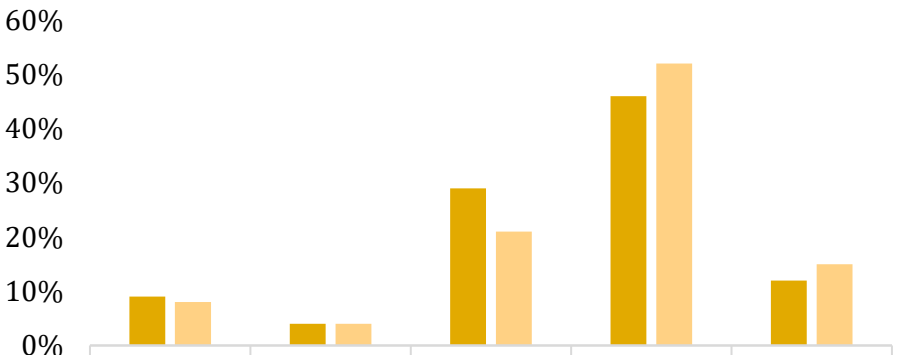


Figure 56: Water abstraction and losses in the Sava countries (2016) Source: National statistical offices

Industrial activity includes both, mining, and manufacturing. In 2016, 185 million m³ was used for industrial activities.

Another important water use in the Sava RB is by hydropower plants. The capacity of the 20 existing hydropower plants with a capacity above 10 MW is approx. 2,400 MW. They produce 6,400 GWh of electricity annually on average. There is a large number of hydropower plants less than 10 MW in Slovenia. A percentage breakdown of capacity and of total average annual energy production (Sava RB; 100%) by country is presented in Figure 57. Detailed information is outlined in Annex 10, Table 7.



	SI	HR	BA	RS	ME
Average total production	9%	4%	29%	46%	12%
Installed capacity	8%	4%	21%	52%	15%

Figure 57: Installed capacity and energy production of hydropower plants >10 MW in the Sava countries (2016, percentage of total per country)

In 2016 the largest share of water use in the Sava RB was taken by the energy sector. Due to economic difficulties, in most of the countries water use by important production sectors such as agriculture and industry represented a small part of overall water use.

8.4 Projection trends in water use, key economic indicators, and drivers up to 2027

Future development of water uses in Sava RB could change the type and significance of pressures on water bodies. Trends in the main water uses that cause significant pressures on water bodies are presented. Depending on the data available, these assessments are either expert judgements, extrapolations of past trends or projections based on statistical methods. This chapter also describes the driving forces for the use of water in the Sava RB and trends in the key sectors of water use and their pressures on water bodies. Furthermore, baseline scenario for the quantitative and qualitative water uses and the resulting pressures on water bodies is presented.

The socio-economic variables are key factors influencing the development of water use. These factors are referred to as exogenous drivers (driving forces) for water use because they represent developments over which water policy has no direct influence. The demographic and macroeconomic trends (as base for water demand projections) are presented in the Table 37.

Table 37: Water demand projection assumptions (until 2027)

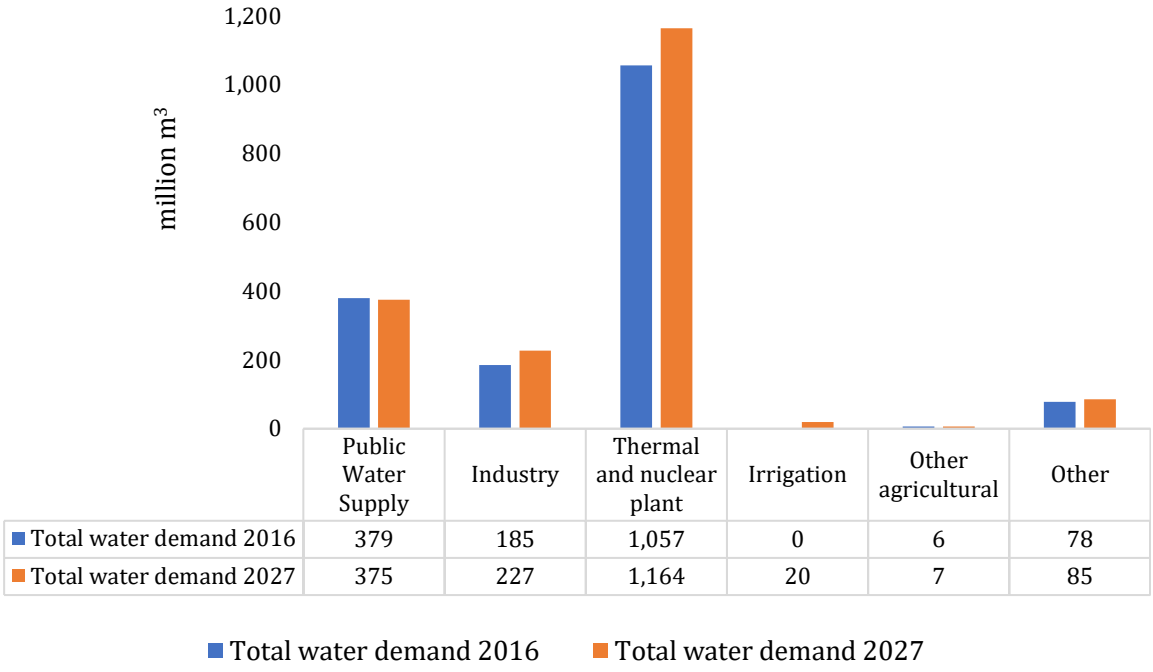
	Population growth rate until 2027 (% AAGR)	Economic growth until 2027 (% per year - AAGR)					
		General (GDP)	Public water supply	Agriculture	Industry	Energy production	Other
SI	0.01%	3.1%	0.01%	0.88%	1.30%	0.80%	0.88%
HR	-0.12%	2.8%	-0.12%	0.70%	1.70%	0.80%	0.69%
BA	-0.26%	2.4%	-0.26%	0.61%	1.60%	1.89%	0.61%
RS	-0.22%	3.7%	-0.22%	0.82%	3.30%	0.94%	0.82%
ME	1.11%	3.3%	1.11%	0.00%	3.30%	0.94%	0.82%

Source: International Monetary Fund. 2021. World Economic Outlook: Managing Divergent Recoveries. Washington, DC, April; ICPDR – Draft ANNEX 1 as of 27 March 2021, DRBMP Update 2021

The demand projection relies on the fundamental scenario assumption that a positive socio-economic development in the Sava RB countries is achieved, driven by a further economic recovery with sustained growth rates. As a result, current national development plans in water use sectors are being funded and implemented.

The projection of water demands up to 2027 has the same structure as the analysis of existing water uses. The trends are presented by economic sectors and by country. The overall volume of water use is expected to increase by 2027 in the Sava RB (approximately 9% overall growth is planned). The total water demand is expected to reach 1.876 billion m^3. Higher demand is predicted in all sectors in 2027 than for 2016 except in the domestic sector (households).

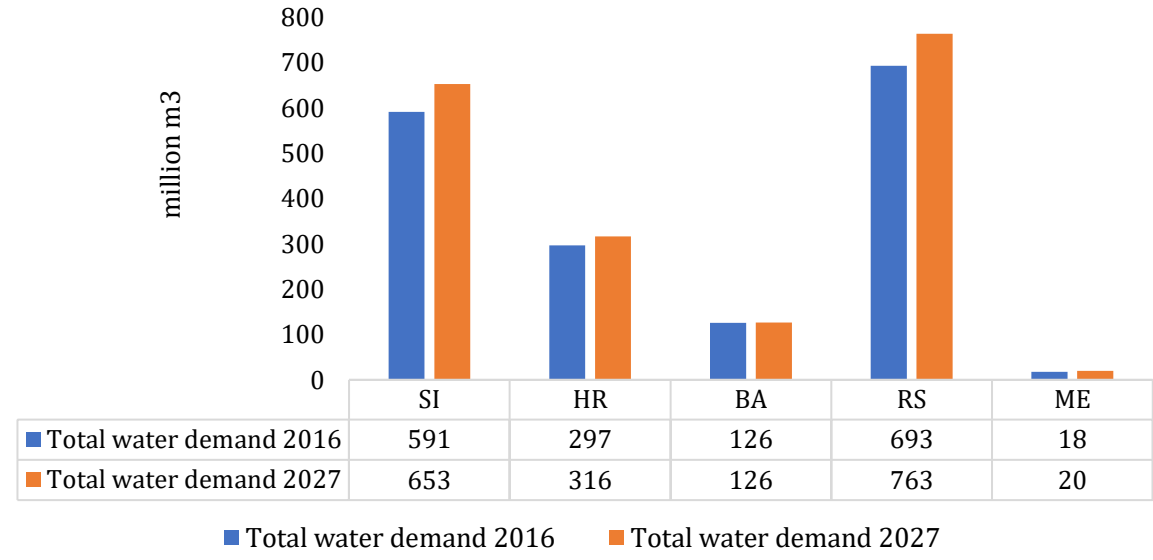
The distribution of water uses by the economic sector in 2016 and the projected water demand in 2027 is presented in



	Public Water Supply	Industry	Thermal and nuclear plant	Irrigation	Other agricultural	Other
Total water demand 2016	379	185	1,057	0	6	78
Total water demand 2027	375	227	1,164	20	7	85

Figure 58: Water demand by economic sector (2016-2027) (excluding hydropower)

The share of individual sectors of total water use is projected to change slightly: a growing proportion of use by the industry and irrigation and decline in domestic use are expected. Detailed information is presented in Annex 10, Table 8. Total water uses and water demand by country are presented in Figure 59. A minor increase of 0.16% is predicted in Bosnia and Herzegovina, while in Slovenia, Croatia, Serbia, and Montenegro moderate growth of 10.4%, 6.7%, 10.1% and 13.4%, respectively, in water demand compared to the reference year is predicted.



	SI	HR	BA	RS	ME
Total water demand 2016	591	297	126	693	18
Total water demand 2027	653	316	126	763	20

Figure 59: Water demand by country (2016–2027) (without hydropower)

Dynamic projection of water demand is presented in Figure 60.

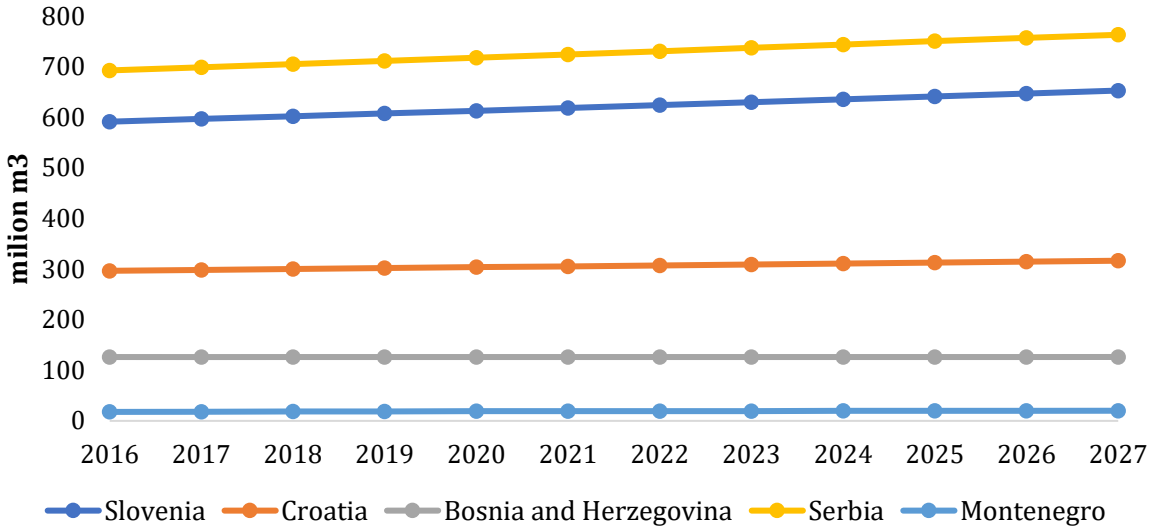


Figure 60: Water demand projection (2016-2027, million m³)

8.5 Compilation of quantitative water uses

When compiling the quantitative pressures on waters, a distinction is made between (gross) water abstraction and (net) water consumption ("abstraction minus return"). This distinction is also made in the WFD (Annex II – pressure identification). The reason for this is that only an imbalance between the available water resources and the consumptive share of used water reflects the actual pressures on the water balance and the water dependent ecosystems. Water that is taken from surface waters and returned more or less immediately, such as water used for cooling and hydropower generation, is therefore not included in the balance of water supply and demand

Table 38: Water demand by 2027 in million m³ water per year (total national level)

Effects on of			TRENDS IN QUANTITATIVE PRESSURES ON WATER BODIES								
			2016			PROJECTIONS FOR 2027					
			1 Total abstraction	2 Total use	3 Total loss	1 Total abstraction	Increase in %	2 Total use	Increase in %	3 Total loss	Increase in %
QUANTITATIVE USE OF WATER	CONSUMPTIVE USE	SI	1,078	1,033	45	1,189	10.28%	1,139	10.28%	50	10.28%
		HR	843	627	216	902	7.04%	671	7.04%	231	7.04%
		BA	323	150	173	325	0.52%	151	0.52%	174	0.52%
		RS	4,117	3,890	227	4,557	10.68%	4,306	10.68%	251	10.68%
		ME	119	54	65	135	13.29%	61	13.21%	74	13.35%
		TOTAL	6,480	5,754	726	7,107	9.68%	6,328	9.97%	780	7.39%

8.6 Compilation of qualitative pressures on waters

The projections of qualitative pressures are captured as trends in the Table 39 and are described by three possible trend directions: increasing, decreasing or constant.

Table 39: Trends of qualitative pressures on waters

Effects on / Of		TRENDS IN QUALITATIVE PRESSURES ON WATER BODIES					
		1 Organic pollution	2 Nutrients pollution	3 Hazardous sub. pollution	4 Groundwater pollution	5 Morphological alterations	6 Hydrological alterations
USES OF WATER	Urban wastewater	↑	↑	X	X	X	X
	Industrial wastewater	↑	↑	↑	X	X	X
	Agricultural pollutants	↑	↑	↑	↑	X	X
	Fish farms	↑	↑	↑	X	↑	X
	Hydro-power	X	X	X	X	↑	↑
	Flood control	X	X	X	X	↑	X
	Sediment exploitation	X	X	X	X	↑	X
	Navigation	X	X	↑	X	↑	↑

Legend: Increasing pressure ↑; decreasing pressure ↓ ; constant pressure →; no effect: X

8.7 Recovery of costs of water services

Economic instruments of the WFD is a pricing policy for water services, which should provide adequate incentives for the efficient use of water resources and thus contribute to the environmental objectives.

The main principle to achieve this objective is cost recovery of water services, including environmental and resource costs. In addition, the application of the polluter pays principle should ensure that the various water uses make an appropriate contribution to the recovery of costs.

In this context, costs are to be understood as economic costs. These are the costs to society as a whole, not just the costs incurred by the operators of water services. In Article 9 WFD, economic costs consist of three components: financial costs, environmental costs and resource costs.

8.7.1 Water services - definition and scoping

The WFD defines water services as a subset of water uses. The concept of water services is essentially aimed at public services for water supply and for wastewater disposal (collection and treatment) regardless of whether they are operated by the public or private sector. The EU Commission advocates a more comprehensive interpretation of water services, which also includes private self-supply with water and private wastewater disposal (so-called self-services) as well as any impounding and storage of water for the

purpose of water supply, hydropower generation, navigation, and flood control. However, according to a ruling by the European Court of Justice from 2014, it is within the planning scope of the Member States to which of the water-use activities will be applied the principle of cost recovery in accordance with the Article 9 WFD, as long as this does not compromise the purposes and the achievement of the objectives of the Directive.

In the 1st Sava RBMP, the scope of cost recovery under Article 9 WFD was limited to public water supply. In the 2nd Sava RBMP, public water supply and public wastewater disposal will be both considered together as a single water service for 'drinking water supply and wastewater disposal' as most Public Utility Companies (PUCs) provide both together as a common service in technical, organizational, and economic unity.

The main means of controlling water use in Sava RB countries are currently legal instruments such as laws, regulations, and licensing procedures. The economic principles according to Article 9 WFD are to be applied in a supportive manner, as far as they are practicable and effective. However, this requires that the technical, organizational and informational prerequisites for a pricing policy are in place, e.g. water metering and a system for billing and collecting user charges. This is only partially the case.

The area of application for the WFD pricing principles with the greatest potential in Sava RB countries is public drinking water supply and wastewater disposal and treatment. This is because vast majority of the investments for the implementation of WFD is required to take the basic measures for the two EU directives on public water supply and wastewater disposal and treatment. For the Sava RB the application of pricing principles focuses on this sector.

As for other water uses, the costs of impounding or storing water for navigation and flood control, as well as the costs for public irrigation systems should continue to be largely borne by public budgets in Sava RB countries, as these are public infrastructures of general interest. Private operators have to bear the financial costs of their water uses for water supply and wastewater disposal, as well as for hydropower generation and irrigation.

In order to consider not only the financial costs but also the environmental and resource costs of water use within the meaning of Article 9 of the WFD, the Sava RB countries have already legally introduced the environmental fees, described in detail in the *Economic Analysis of Water Use and Water Services for the 2nd Sava RBMP*- Ekonsating (2022)- Background document.

When applying Article 9 WFD to public water services for water supply in the Sava RB it must be considered that the losses of the water supply system amount to more than 40% of the abstracted water. In these circumstances, the most important and effective way to achieve the central objective of Article 9 WFD, the efficient use of water resources, is to take the following technical measure: reducing water losses in water supply. In this context, water pricing policy under Article 9 WFD is a supportive instrument that should be used in a socially responsible manner.

8.7.2 Cost-recovery of water services

In order to analyse the implementation of the cost-recovery principle in Sava RB countries, the questionnaire has been created for collection of financial and economic information from different public service providers to the 2nd Sava RBMP. The questionnaires were sent to three public utility companies (in Slovenia as EU member s

and in Serbia and Bosnia and Herzegovina as non-EU countries). The public utility companies answer to the questionnaire are: "Vodovod – kanalizacija", javno podjetje d.o.o., Celje (Slovenia), JKP "Vodovod" Sremska Mitrovica (Serbia) and JP "Vodovod i kanalizacija" d.o.o. Gračanica (Bosnia and Herzegovina).

The questionnaire is divided into the following sections: General information on service provider; Current financial viability of services, tariffs, and unpaid bills; Ownership of assets and technical condition of operational assets; Calculation of need for re-investments and reconstructions. The full methodology, questionnaire, results, and analysis are given in the Background document.

The main characteristics of all PUCs analysed is that revenues are planned and recorded mostly by user groups as households and industry, as well as drinking water division and wastewater division, but the annual costs are not divided by these cost centers. Only Slovenian public service provider prepares cost-calculations and financial reporting separately for divisions of drinking water and sanitation. Operational, maintenance and other costs are mostly covered by revenues in all three cases.

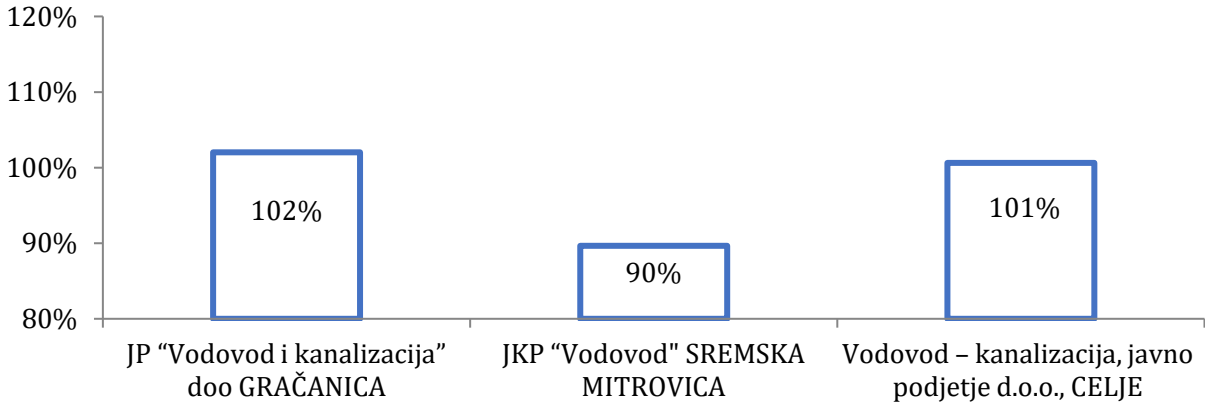


Figure 61: Cost recovery ratio for water supply and sanitation.

The price setting authority is the municipality, price proposal is prepared annually. The tariffs for drinking water supply and wastewater treatment are both of one-component fees, which depends exclusively on the volume of the provided water service. There is also distinction between customers (mostly households and industry). Price approval is mostly characterized by foreseen expenditures that are calculated from approved fees. Slovenian case is a bit different, defined fee covers total operational expenditures. In Bosnia and Herzegovina case, prices are not adjusted to market conditions because they are determined for a longer period (e.g., the price has not changed for many years).

All public service providers did not observe price affordability problems at households and other customers. Regarding unpaid bills, all of them took measures for collection of outstanding bills using mostly warnings and some cases also lawsuits. Some of them have also support (subsidy) system for low-income customers.

In spite of legal instruments, which ensure the cost-recovery for water services, it was established, that 100% cost-recovery is not completely achieved. Some acters performing activities that have impact on water status are not obliged to pay for the environmental and resource costs they are causing. To assess actual environmental and resource costs for all activities that are responsible for these costs further research activities and changes of legislation are foreseen.

There are different ways how public service providers could tackle with this important issue, while some of them could also be transformed to wider level (e.g. national level): (a)one of the necessary steps is to increase the prices of the service, which has not been changed for a while and are economically unjustified; (b) full depreciation must be put into the reconstruction investments; (c) flexibility of investment plans should enable to transfer available funds between individual planned investments and between planning years; (d) public service providers must be included in the decision making; (e) public service providers should participate in projects that provide possible grant funds or loans under favourable conditions for the development of communal infrastructure; (f) expanding the range of services of the public service providers (additional revenue).

8.7.3 Organisation and Infrastructure

The total number of service providers in the Sava RB countries is 583 formal water service providers which are reported to serve close to 13.7 million people. At the Sava RB level it means that 6.6 million people is served by formal water companies. Montenegro, Serbia, and Bosnia and Herzegovina tend to have as many utilities as municipalities.

Different models of economic regulation coexist for water and sanitation services (WSS) in the Sava RB area, but there is a continued trend toward increased central level regulation, with Montenegro recently adding (in 2016) water sector competencies to their national energy regulatory agencies. Slovenia and Bosnia and Herzegovina continue to rely on self-regulation at local level. In Serbia, there is no economic regulation in place, whereas Croatia has set up a national regulatory agency. In Montenegro, the agency also regulates the energy sector.

Table 40: Organization of services (country level)

Indicator	SI	HR	BA	RS	ME
Number of formal water service providers	102	156	119	184	22
Average population served *[inhabitants]*	20,060	22,215	14,146	32,363	25,748
Dominant service provider type	Local / municipal utility companies	Local / municipal utility companies	Municipal	Local / municipal utility companies	Local / municipal utility companies
Service scope	Water and sanitation	Water and/or sanitation	Water and sanitation	Water and sanitation	Water and sanitation
Ownership	Municipality	Local governments	Local government units	State	Municipal
Geographic scope	One to a few municipalities	One to a few cities	One to a few cities	One to a few municipalities	One to a few cities

Source: WB, Water Danube Programe, State of the Sector Report 2018 Update, June 2019

In the Background document the main characteristics of water services sector regulation in the Sava RB area are presented in the details. One of the arguments in favour of a multisector regulator instead of a dedicated one is to allow the transfer of regulatory knowledge and expertise from one sector to another. Furthermore, a multisector model, at least theoretically, would increase independence of the regulator by not allowing a

single sector to dominate the agenda and make the agency financially dependent on any sector or large utility. Yet, this may not be the case in practice.

All regulatory authorities in the region oversee tariff regulation either through formal tariff setting or through tariff review and clearance.

The regulators have a direct responsibility for determining tariffs, either by formally setting them or by reviewing and clearing proposed tariffs, often after they have been previously approved by local government councils. In countries that have no dedicated economic regulator, regulatory functions such as tariff setting and service quality monitoring are generally performed by local governments, sometimes with the involvement of a national government control mechanism (Serbia).

8.7.4 Financing water sector

In all of the Sava RB countries, taxes and transfers are still financing investments. In most EU member countries and some candidate countries, EU-related funding (cohesion funds, regional policy funds, and Instrument for Pre-Accession [IPA] funds) represent the largest share of external financing to the sector, whereas in non-EU countries, International Financing Institution (IFI) and bilateral donors continue to play the main role. In addition, Croatia and Slovenia have set up dedicated funds to finance the water sector investments, thus avoiding potential national budget appropriation and allowing securing predictable funding.

In Slovenia investment in water in the past has been funded mostly by EU funding. Sources of public funding include (OECD Country Report, 2019):

- The wastewater tax, introduced in 1996, which is levied on industrial and communal wastewater per unit of pollution;
- A Water Fund, managed by the Ministry of Environment, which receives its funds from water resources rights. This fund can be used to finance investments in water infrastructure; construction of public and local infrastructure to meet water infrastructure requirements; and for intermunicipal and regional projects for the purpose of constructing facilities for the pumping, filtering, and capturing of water for construction of movable water distribution systems for drinking water supply;
- Revenues from tariffs which are mostly managed at municipality level and are not earmarked for water expenditures, therefore spent for projects, which are priority for the municipality.

In Croatia water extraction rights and wastewater discharge fees are managed by the national water agency. However, even in countries with such schemes, the decisions on the use of funds are often somewhat arbitrary and are not necessarily directly linked with the sector's policies and strategies.

A great diversity of funds allocation methods can be observed across the Sava RB: Serbia and Croatia allocate investment funds on a needs basis, Slovenia on an ad-hoc basis, Bosnia and Herzegovina on a strategy and policy development per entity basis, and Montenegro on a multi-criteria analysis for project ranking basis.

Table 41: Financing services – sources of financing

Indicator	SI	HR	BA	RS	ME
Overall sector financing *[€/capita/year]*	210	106	29	22	98
Overall sector financing *[share of GDP] [%]*	0.53	0.86	0.60	0.44	0.40
Percentage of service cost financed from tariffs	55	65	63	100	35
Percentage of service cost financed from taxes	0	32	30	0	42
Percentage of service cost financed from transfers	45	3	7	0	23

Source: WB, Water Danube Programe, State of the Sector Report 2018 Update, June 2019

Few countries have developed a dedicated water sector financing mechanism providing predictable funding. In most countries, investments are financed from external transfers or ad-hoc IFI-supported loans repaid by state or local government budgets. While many countries partly finance the sector's investments from their national budget, Bosnia and Herzegovina and Croatia have a dedicated mechanism to finance investments, guaranteeing more predictable funding.

Table 42: Financing services – service expenditure

Indicator	SI	HR	BA	RS	ME
Average annual investment [share of overall sector financing] [%]	45	41	50	23	33
Average annual investment *[€/capita/year]*	94	41	14	5	32
Estimated investment needed to achieve targets *[€/capita/year]* 2011-2035	114	93	40	32	54
Of which, share of wastewater management *[%]*	72	73	62	72	69

Source: WB, Water Danube Programe, State of the Sector Report 2018 Update, June 2019

8.7.5 Level of cost recovery for water services

Cost recovery level for water services should be calculated as:

COST RECOVERY LEVEL = (TR – SUBSIDY) / TC * 100%

where:

- TR: total revenues (fixed or variable charges in €/year),
- SUBSIDY: total amount of subsidies paid to the water service
- TC: total costs (€/year) of the water service provided.

The calculation in Table 43 is based on OM costs presented in WB, Water Danube Programe, State of the Sector Report 2018 Update, June 2019 and the IBNet Database (https://www.ib-net.org/). These costs include current operation, maintenance, and depreciation costs (depreciation costs are for most of the PUCs equal to 0 because the existing assets are very old). These costs don't include any financial costs related to existing loan repayments. The existing maintenance costs are for sure below the necessary level.

Table 43: Cost recovery (2017)

Indicator	SI	HR	BA	RS	ME
Average residential tariff [incl. water and wastewater] [€/m³]	3.03	2.06	0.43	0.53	0.65
Operation and maintenance unit cost *[€/m³]*	1.69	1.43	0.46	0.42	0.55
Operating cost coverage [billed revenue/operating expense]	1.00	1.11	1.27	1.28	0.43

Source: WB, Water Danube Programe, State of the Sector Report 2018 Update, June 2019

The costs of providing services vary widely from country to country but have grown significantly over the last 20 years, leading to parallel tariff increases. The necessary investments, in particular for the extension of wastewater collection and treatment, have been matched by significant increases in overall operating expenses. Both OM costs and residential tariffs generally follow the level of economic development of countries, with costs and tariffs highest in EU member countries. Most of the countries apply volume-based fees. The price-setting authorities in most of the countries are municipalities; they approve regular fee increases, which are usually below the inflation rate. In most countries, payment discipline has to be improved.

Full cost recovery from tariffs does not appear to be a priority in any country, and many utilities in the region do not even cover their operating costs from billed revenues. To maintain service quality in the long run, utilities should be able to recover their operating and regular maintenance costs, as well as those necessary for asset management and renewal, from their own revenues. Table 43 shows the average operating cost coverage of utilities in the Sava RB area, measured as the net billed sales over operating expenses, including depreciation; utilities should have an operating cost coverage above 1 to be financially self-sufficient in terms of OM. In Montenegro utilities don't recover all of their operating expenses from own revenues. The overall situation is positive, considering that utilities in all Sava RB countries except Montenegro manage to collect a significant share of billed revenues, and therefore the actual ability of utilities to finance themselves is good.

8.7.6 Environmental and resource costs

Environmental and resource costs are generally difficult to identify, monetize and allocate to users of water services. A calculation often cannot be carried out with reasonable effort and appropriate accuracy. The Directive takes this into account and leaves open how to proceed methodically or instrumentally: "take account" does not necessarily mean "calculate".

External environmental and resource costs can be taken into account through complementary pricing instruments in the form of environmental fees or taxes. These are economic instruments that have proven effective in practice. Environmental fees and taxes are generally not intended to emulate the amount of external costs, but rather to create an economic incentive, as is the aim of Article 9 WFD.

The Background document provides a detailed comparative overview of various water fees charged and the total amount of public revenues collected per year in each country. This data can provide the approximative value of the external environmental and resource costs in the Sava RB countries.

8.7.7 Social considerations – affordability

When applying the cost recovery principle according to Article 9 WFD, social, ecological and economic effects, as well as the geographic and climatic conditions of the region concerned, can be taken into account. The pricing of public water supply and sanitation

services must take particular account of social impacts, as they are public services of general interest.[26]

A common indicator of the affordability of water services is the share of their price in the average household disposable income. The current price level for water services (water supply and wastewater disposal) in Serbia was recently calculated at 1.93% of average net household income. The analysis in the documents assumes that water services can be considered affordable as long as the average household does not have to spend more than 3% of the available household net income.

This 3%-threshold value is also stated in an EU guide to cost-benefit analysis. A figure of 3% for an average household means that a low-income household would have to provide a much higher proportion of its income.

Table 44: Affordability ratio for water services

Indicator	SI	HR	BA	RS	ME
Current affordability of water and wastewater tariffs (2015)	0.8	2.3	n.a.	2.2	2.3
Potential affordability ratio for the average incomes [%]	1.5	1.4	0.8	0.9	0.5
Potential affordability ratio for the bottom 40% income [%]	2.5	2.8	1.6	2.4	1.0
Households with the share of potential water expenditures above 5% of average income [%]	0.3	19.4	n.a.	0.3	1.0

Source: WB, Water Danube Programe, State of the Sector Report 2018 Update, June 2019

Only Croatia and Slovenia have formal subsidy schemes to ensure affordability for low-income earners. In Croatia, cross-subsidies among different consumer groups is commonly applied, combined with the identification of low-income households that are entitled to a lower tariff on the first block of an increasing block tariff to ensure minimum consumption. Minimum consumption at subsidized rates is also enabled for low-income groups in Slovenia and is administered at the municipal level, but they are rarely applied. In practice, governments in most SRB countries subsidize their local water and sanitation services from a combination of taxes and transfers, if needed, even if such arrangements are not formalized or targeted.

8.8 Economic assessment of measures

The identification and selection of a cost-effective programme of measures aimed at reaching good water status for all water bodies is one of the crucial steps in river basin management and planning cycles.

Due to lack of data on costs, effects and benefits of measures received from Sava RB countries and their RBM plans, which are basis for further economic analyses, a brief overview of basic methods for cost-effectiveness assessment has been made with two case studies in the Background document. Those case studies are an example how to tackle with cost-effectiveness assessment on different levels (e.g., river basin level, water body level). Both case study areas are part of the Drava River Basin, which is like Sava RB, tributary of the Danube.

[26] In line with the UN Agenda 2030, Sustainable Development Goal 6, target 6.1: *'achieve universal and equitable access to safe and affordable drinking water for all'*.

In this manner, results, outcomes, and conclusions could be useful and helpful for all Sava RB countries and their river basin management planning process. These practical cases provide further steps for Sava RB countries in the process of data collection and preparation for economic assessment of water measures.

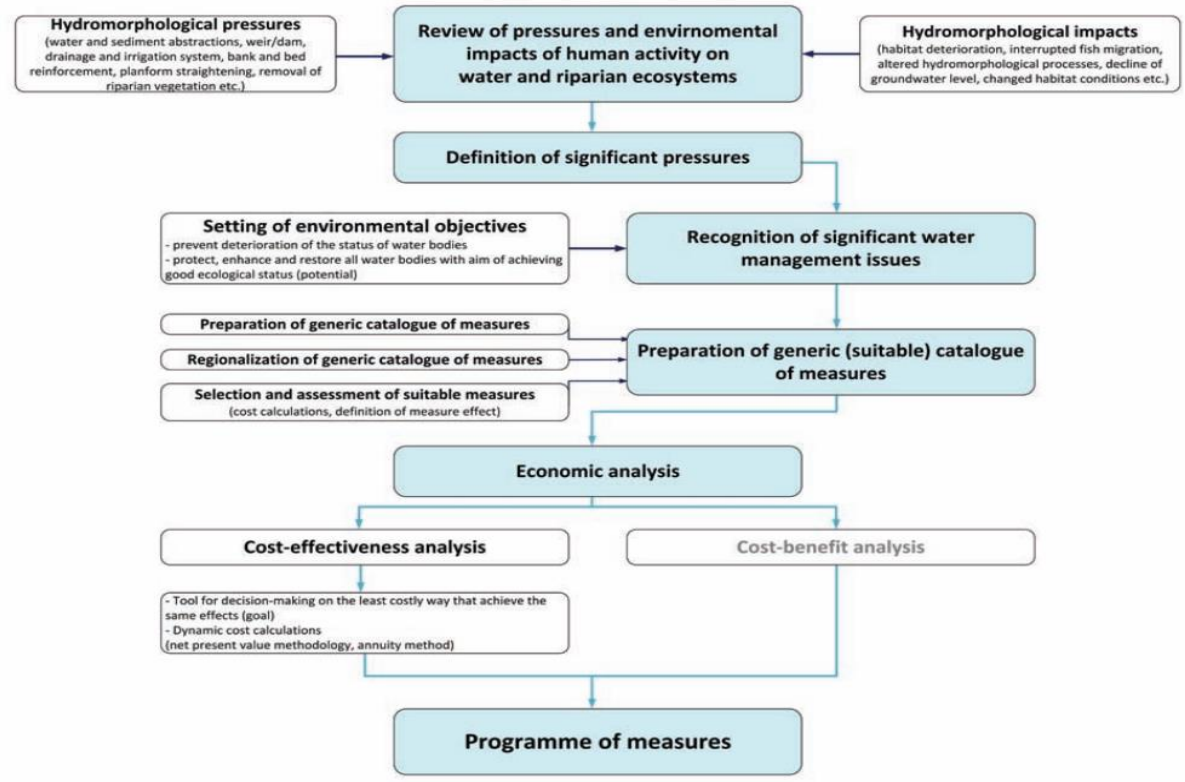


Figure 62: Example of applying CEA and CBA for hydromorphological measures

8.8.1 Cost-effectiveness analysis

Cost-effectiveness analysis (CEA) is an appraisal technique that provides a ranking of alternative measures based on their costs and effectiveness, where the most cost-effective one has the highest ranking (CIS Guidance document no. 1)[27]. CEA seeks to identify the most cost-effective way of meeting a pre-determined objective from a range of options. This objective is usually set outside the CEA process by legal constraints or a policy commitment.

CEA can be a support to decision making regarding the selection of the most cost-effective combinations of measures for inclusion in the Programme of Measures as described in Article 11 of the WFD. However, Article 5 and Annex III WFD do not stipulate CEA as a method for cost-effectiveness assessment. Conducting a full CEA, however, faces significant challenges, most of them linked to data requirements and availability, e.g., on the costs of measures, or on the quantified effects in terms of reaching WFD objectives. These challenges apply to both the national (and sub-national), as well as the transboundary levels.

[27] Common Implementation Strategy for the Water Framework Directive, Guidance Document No.1- Economics and Environment, The Implementation Challenge of the WFD, 2003

8.8.2 Cost-benefit analysis

Cost-benefit analysis (CBA), by contrast, can be used to identify the best way of meeting a number of pre-determined objectives or to help set objectives in the first place. For each objective, it weighs up all the costs and benefits to society and assesses which is in the public interest based on economic welfare. CBA is appropriate particularly where the pre-set objectives appear to conflict with each other (where they are complementary a CEA approach may still apply) or where there are no constraining objectives.

As types of benefits for a cost-benefit analysis in the context of the WFD were considered:

- environmental benefits and
- scarcity rent.

Environmental benefits refer to welfare gains and avoided costs for citizens, administrations and companies (e.g., public service companies) due to a better provision of goods (e.g., supply with drinking water) and services, as a result of an improved ecological status of the water bodies within a river basin or country. Scarcity rents measure the value of a scarce resource over and above its opportunity cost. They are a measure of economic benefits resulting from more efficient use of water resources. One of the objectives of the WFD is to ensure resource efficiency, which is a vital concept of sustainable development.

The legal obligation of the WFD is to achieve "good status" and to avoid the deterioration of water status, with the possibility to apply for exemptions in exceptional cases. The tool of CBA is of specific relevance for assessing the disproportionality of costs compared to benefits in the context of WFD Art. 4 exemptions, which is an issue dealt with at the national level. WFD doesn't stipulate the use of CBA for the assessment of disproportionate costs. However, proportionate selection of different analytical approaches (cost-benefit analysis, benefits assessment, assessment of the consequences of non-action, distribution of costs, social and sectoral impacts, affordability, cost-effectiveness etc.) can be useful to inform decision making.

8.8.3 Payments for ecosystem services

Payments for Ecosystem Services (PES) describes a variety of innovative, market-based incentive schemes that reward land managers for maintaining and enhancing environmental benefits ("ecosystem services") such as water quality, flood regulation, climate regulation and certain provisioning and cultural ecosystem services (such as biomass and recreational access). While PES represents a useful and innovative approach to conservation of nature, it should be considered just one approach that may complement rather than replace other approaches, including different forms of regulation and awareness-raising.

PES schemes involve a willing 'buyer', or beneficiary, of an ecosystem service, voluntarily paying a 'seller' (typically a landowner) who is willing to adopt measures to provide a particular ecosystem service or services. Intermediaries (organisations who act as brokers to coordinate buyers and sellers) and knowledge providers are also important actors in the functioning of PES schemes.

PES schemes should be voluntary and should demonstrate "additionality" (i.e. outcomes that are above and beyond what would normally be expected or mandated) and

conditionality (i.e. payments depend on verified environmental improvements). Key PES principles are set out in the Table 45.

Table 45: Key PES Principles (DEFRA, 2016)

Voluntary	Stakeholders enter into PES agreements voluntarily.
Beneficiary pays	Payments are made by the beneficiaries of ecosystem services (individuals, communities and businesses or governments acting on behalf of various parties).
Direct	Payments are made directly to ecosystem service providers (in practice, often via an intermediary or broker).
Additionality	Payments are made for actions over-and-above those usually required from land managers and others (i.e. providers should not be compensated for satisfying regulatory obligations such as meeting 'polluter pays' requirements).
Conditionality	Payments are conditional on the delivery of ecosystem service benefits (in practice, often for actions agreed likely to deliver the desired ecosystem services).
Ensuring permanence	Management interventions should not be readily reversible.
Avoiding leakage	PES schemes should be set up to avoid leakage, whereby securing an ecosystem service in one location simply leads to the loss or degradation of ecosystem services elsewhere.

In practice, such characteristics are seldom entirely observed, and many schemes are referred to as "PES-like" to acknowledge deviation from the ideal set of criteria. For example, payment is often linked to actions rather than being conditional on service delivery.

Recognized as an important implementation tool, the role of PES schemes has been promoted in the EU Biodiversity Strategy to 2020[28], and their potential is further highlighted in the Roadmap for a Resource Efficient Europe[29] (COM(2011)57). Regarding Parties' commitment under the Convention for Biological Diversity to substantially increase financial resources from all sources, the Strategy recognizes the need for increases in public funding, but also the potential of innovative financial mechanisms, including PES.

There are ongoing reforms within the EU where PES can play an important role, in particular, agri-environmental schemes in the CAP (Common Agricultural Policy) reform and similar support payments in the proposed European Maritime and Fisheries Fund. In the context of water, PES can be used to persuade users of land or other natural resources to modify their behaviour to protect and enhance water resources (e.g., shifting to organic farming, converting arable land to pasture, planting trees). PES may compensate them for the extra effort and/or financial cost involved in changing their behaviour. The establishment of Green Infrastructure is another area where PES could potentially play a role.

There are many ways to organize ecosystem services, and categories may need to be refined for specific projects. For the Sava RB one of them, as a starting point, could be The Millennium Ecosystem Assessment approach (Brauman, 2014), which has divided ecosystem services into four main categories: provisioning, regulating, cultural, and supporting. River systems within the basin provide diverse ecosystem services, such as flood regulation (regulating), fresh water (provisioning), nutrient cycling (supporting), and recreation (cultural), among others.

[28] http://ec.europa.eu/environment/nature/biodiversity/comm2006/2020.htm
[29] http://ec.europa.eu/environment/resource_efficiency/index_en.htm

9 Programme of Measures

The Programme of Measures responds to all the significant pressures in order to achieve the agreed environmental objectives (WFD Article 4) and visions on a basin-wide scale (Chapter 7). It builds upon the results of the pressure analysis (Chapter 3), the water status assessment (Chapter 6) and includes the measures of the basin-wide importance.

Priorities for the effective implementation of national measures on a basin-wide scale are highlighted and are the basis of further international coordination. The Programme of Measures is structured according to the Significant Water Management Issues in the Sava River Basin- Interim Overview adopted by the Sava Commission 2017.

9.1 Surface water

The Programme of measures aiming at achievement of the environmental objectives according to the WFD, visions and management objectives developed for the Sava RB is built on the national measures that are already in place and outlines the actions to be taken in the forthcoming river basin management cycles to achieve good water status.

9.1.1 Organic pollution measures

Many agglomerations in the Sava RB have no, or insufficient, wastewater treatment and are therefore key contributors of organic pollution. Industrial wastewater is frequently insufficiently treated or is not treated at all before being discharged into surface water (direct emission) or public sewer systems (indirect emission).

The management objectives for organic pollution will be reached with the implementation of the following steps:

- In EU MS (Slovenia and Croatia)
  - Implementation of the UWWT Directive (91/271/EEC);
  - Implementation of the Sewage Sludge Directive (86/278/EEC)[30];
  - Implementation of the Industrial Emission Directives-IED (2010/75/EU);
  - Increase of the efficiency and level of treatment when necessary.
- In non-EU countries (Bosnia and Herzegovina, Serbia, and Montenegro),
  - Specification of number of wastewaters collecting systems (connected to respective WWTPs);
  - Specification of number of municipal and industrial wastewater treatment plants which are planned to be constructed by 2027 including:
    - Specification of treatment level (secondary or tertiary treatment);
    - Specification of emission reduction targets.

In **Slovenia**, the Decree of discharge and treatment of urban wastewater ("*Official Gazette*", *no. 98/15, 76/17, 81/19 and 194/21)* defines the standards and requirements related to discharge and treatment of urban wastewater from agglomerations, as well as the mandatory municipal utilities for discharge and treatment of urban wastewater and rainwater in these agglomerations. For householders in such agglomeration the connection to the sewerage system and treatment plants is obligatory. The householders

[30] Council Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture

outside of the agglomerations should ensure the individual treatment in individual treatment plant or septic tank without discharge.

In accordance with the requirements of applicable regulations, municipalities will have to ensure adequate discharge and treatment of municipal wastewater generated in facilities in agglomerations, by building a public sewerage network or by reconstructing an existing public sewerage network, in order to meet the prescribed requirements regarding municipal wastewater discharge and treatment, and construction of municipal wastewater treatment plants with an appropriate level of treatment or reconstruction of existing municipal wastewater treatment plants that complete the public sewerage network and are intended for the implementation of the public service of municipal wastewater treatment in the future.

In agglomerations with a total load equal to or bigger than 2,000 PE, an appropriate method of urban wastewater disposal should be provided for approximately 9.5% of the total load (91,672 PE). In accordance with the prescribed requirements, municipal wastewater treatment will have to be provided for approximately 10.1% of the total load (97,461 PE) generated in agglomerations with a total load equal to or greater than 2,000 PE, of which 5,789 PE is already provided for municipal wastewater, but treatment is not yet guaranteed. Analyses show that, according to the data on 31 December 2018, 2 municipal or joint treatment plants (Brod and Ljubljana) do not meet the requirements regarding the appropriate level of treatment. These two will require an upgrade of the current municipal wastewater treatment level from the secondary treatment level to the tertiary treatment level.

Regarding the sludge treatment, it is forbidden to discharge sludge from municipal sewage treatment plants into the public sewer or directly or indirectly into the water. Untreated sludge is collected by a public service provider who is the operator of a municipal sewage treatment plant equipped for sludge treatment. For the sludge, the treatment should be provided which achieves: - compliance with the requirements for use as fertilizer in agriculture in accordance with the regulation governing the use of sludge from municipal sewage treatment plants in agriculture, if the treated sludge is used as fertilizer in agriculture, or - requirements for sludge recovery or disposal operations in accordance with waste regulations.

Regarding the implementation of the UWWT Directive (271/91/EEC) in **Croatia** the following activities take place:

- Construction of municipal wastewater collection and treatment systems on agglomerations above 2,000 PE is ongoing:
- An updated review of the situation (31 December 2018) indicates that the total collected load increased to 70%, that the collected load from agglomerations above 15,000 PE reached almost 80% of the total load from these agglomerations. According to the latest report on the implementation of measures to meet the obligations of the UWWT Directive (271/91/EC) (submitted to the European Commission in summer 2018), the Republic of Croatia presented an extension of deadlines to 2025. It is planned that until 2023 the wastewater from 91 agglomerations with the population of 1,709,874 and total load of 2,012,057 PE will be collected and treated.

Regarding the Implementation of the Sewage Sludge Directive (86/278/EEC) and the Industrial Emission Directives-IED (2010/75/EU), the Waste Management Plan of the Republic of Croatia for the period 2017-2022 ("*Official Gazette", no. 3/17*) sets out the

waste management objectives that need to be achieved by 2022, in relation to the initial situation from 2015. The Waste Management Plan states that it is necessary to improve the management system for special categories of waste, and one of the tasks relates to the establishment of a system for managing waste sludge from wastewater treatment plants through the development of an Action Plan for the use of sludge from WWTPs on the suitable surfaces. The Waste Management Plan emphasizes that, when establishing a waste sludge management system, the priority order of waste management should be considered, because of which the material recovery and application on areas suitable for sludge application should be taken into consideration too.

Regarding the implementation of the measures for the reduction of organic pollution, in **Bosna and Herzegovina** in the last planning cycle, 5 WWTPs are completed in settlements Odžak, Živinice, Sarajevo, Bihać and Bijeljina. In the next planning cycle 4 WWTPs have been foreseen to be built in Bosnia and Herzegovina until 2027.

In **Serbia** in the last planning cycle, extension of the sewage network and construction of the tertiary level treatment WWTP with the capacity of 84,000 PE has been implemented in Šabac, while 5 WWTPs with secondary/tertiary treatment of joint capacity around 264,000 PE (Valjevo, Lazarevac, Loznica, Obrenovac and Sremska Mitrovica) together with the extension of the sewage networks are foreseen for the period 2021-27 and expected to be finalized in the next planning cycle.

In **Montenegro** as measures were implemented: different phases of the construction of the municipal WWTPs for municipalities Kolašin (Feasibility Study/Detailed Design preparation), Plav/Gusinje (Feasibility Study (revision proposed), Andrijevica (Desktop Study), Berane (Construction Design/Construction Supervision), construction of the WWTPs and waste water collection network in municipalities for Bijelo Polje (Tendering Design), and Pljevlja (Construction Supervision) and sewer network for Mojkovac municipality (Desktop Study).
It is foreseen that the following additional measures will be implemented in the future:

- Improvement of aquaculture in order to reduce nutrient and organic matter loads in region of Opasanica / Verušica;
- Reduction of nutrient and organic matter load in fish farms of Bistrica (L).

9.1.2 Nutrient pollution - measures

The management objectives for nutrient pollution will be achieved in EU MS by the implementation of the following basic measures:

- Implementation of the UWWT Directive (91/271/EEC);
- Implementation of the Nitrates Directive (91/676/EEC).

Regarding the implementation of the UWWT Directive (271/91/EC) in **Slovenia** and **Croatia** the measures are described in the previous chapter on Organic pollution.

The status of implementation of Nitrates Directive (91/676/EEC) is as follows:

- In **Slovenia** the protection of waters against nitrate pollution from agricultural sources is regulated by the Decree on the protection of waters against nitrate pollution from agricultural sources and its amendments *("Official Gazette of the Republic of Slovenia", no. 113/09, 5/13 and 22/15)* which is considered as a measure to reduce nitrogen input to and from the soil in order to protect water from nitrate pollution from agricultural sources, and sets for all types of soil in the territory of the Republic of Slovenia, the limit values of 170 kgN/ha at the level of

the agricultural holding, for the annual input of fertilizers into the soil. As Slovenia defined its entire area as a vulnerable zone in 2001, it has been decided that the program of measures to reduce water pollution with nitrates from agricultural sources would be implemented on the entire country's territory. This means that the farmers who carry out fertilization, or those where livestock manure is produced during their activities, should comply with restrictions or prohibitions on the introduction of nitrogen into the soil.

- On a day of the accession of the **Republic of Croatia** to the European Union, the Ordinance on good agricultural practice in the use of fertilizers *(Official Gazette, No. 56/08)* entered into force, which determined general principles of good agricultural practice in the use of fertilizers and soil improvers especially the use of nitrogen fertilizers. The application of the Ordinance was mandatory in vulnerable areas and was subsequently integrated into the Action Program of Measures. In other areas, the provisions of the Ordinance were considered a recommendation.
  The Ministry responsible for agriculture adopted:
  - Ordinance on the content of the Action Program for the Protection of Waters against Nitrate Pollution of Agricultural Origin ("*Official Gazette" 7/13*) and
    - I Action program for the protection of waters against pollution caused by nitrates of agricultural origin *("Official Gazette", no. 15/13)*
    - II Action program for the protection of waters against pollution caused by nitrates of agricultural origin ("*Official Gazette", no. 60/17*).

  The prescribed measures from the Action Program are mandatory in vulnerable zones, while in other areas they are considered as a recommendation, and mainly relate to the conditions and manner of fertilizer application, general principles of fertilizer use, as well as storage measures, tank size and manure disposal methods. case of insufficient agricultural land for its disposal.

  The Decision on Designation of Vulnerable Areas *(Official Gazette, no. 130/12)* defines vulnerable zones that cover an area of 9% of the territory of the Republic of Croatia. Monitoring results, especially of the surface water, indicate the need for the revision of the vulnerable areas.

  The obligation of regular reporting to Croatian Waters is prescribed on the types and quantities of mineral fertilizers and plant protection products produced, imported and/or placed on the market in the Republic of Croatia.

Given the specific situation in non-EU countries, the following measures are to be implemented:

- Introduction of a maximum limit of 0.2 to 0.5% P weight/weight for the content of total phosphorus in laundry detergents for consumer use;
- Working towards a market launch of polyphosphate-free dishwasher detergents for consumer use;
- Definition of the basin-wide and/or national quantitative reduction targets (for point and diffuse sources) taking the respective preconditions and requirements of the Sava countries into account;
- Specification of number of wastewater collecting systems (connected to respective WWTPs), which are planned to be constructed by 2027;

- Creation of baseline scenarios for nutrient input taking the respective preconditions and requirements of the Sava countries into account;
- Implementation of the Best Available Techniques and Best Environmental Practices regarding agricultural practices (for EU Member States linked to EU Common Agricultural Policy – CAP).

In **Bosnia and Herzegovina,** the nutrient pollution measures have been focused to adoption of regulations i.e., Regulation on the conditions for discharging wastewater into the environment and public sewerage systems was published ("*Official Gazette of the Federation of Bosnia and Herzegovina", no. 26/20*), dated 24 April 2020 (adopted in Federation of Bosnia and Herzegovina). In Republika Srpska an Ordinance on detergents (*Official Gazette of the Republika Srpska", no. 14/19 and 32/19*), a Rulebook on the conditions for discharging wastewater into surface waters ("*Official Gazette of the Republika Srpska*", no. 44/01) and a Rulebook on the conditions for discharging wastewater into the public sewer ("*Official Gazette of the Republika Srpska*", *no. 44/01*) are in force. In the Federation of Bosnia and Herzegovina, the Study for determination of areas suspectable to eutrophication and areas vulnerable to nitrates and in Republika Srpska a Study on zones sensitive and less sensitive to eutrophication, have been prepared. In the future, it is necessary to ensure consistent application of regulations for prohibition and restriction of the phosphorus-containing detergents use, as a measure to protect water in areas subject to eutrophication, to develop a study for collection and treatment of wastewater from urban areas and industry and the study for assessment of measures to reduce diffuse pollution from farms and forestry and a study for implementation of BAT in the agriculture, as well as to adopt regulation on the rules of good agricultural practices.

In **Serbia,** P free detergents are in use in accordance with the Rulebook on detergents, ("*Official Gazzette Republika Srpska", no. 25/ 2015*). The dishwasher detergents shall not be placed on the market since 1st of January 2018, if the total content of phosphorus in detergent is equal to or greater than 0,3 grams in the standard dosage as defined in Part 1 B of Annex 2, (*Rulebook on detergents, 2015*). The nutrient pollution will be minimized by construction of new sewerage systems and WWTP as described in the previous chapter. For the implementation of the BAT in agriculture the research studies to improve the knowledge base will be prepared which will provide an overview of the pesticides's impact on the SWBs and GWBs.

In Montenegro set of measures for nutrient pollution is the same as for organic pollution.

9.1.3 Hazardous substances pollution measures

The management objectives for hazardous pollution will be achieved by the implementation of the following basic measures:

- Implementation of the Industrial Emission Directive- IED (2010/75/EC) which also relates to the Directive 2008/105/EC and Directive 2013/39/EC.

To reduce the environmental pollution form activities and devices which could cause the hazardous substances pollution **Slovenia** has adopted the Environmental Protection Act ("Official Gazette Republic of Slovenia", *no. 39/06 – uradno prečiščeno besedilo, 49/06 – ZMetD, 66/06 – odl. US, 33/07 – ZPNačrt, 57/08 – ZFO-1A, 70/08, 108/09, 108/09 – ZPNačrt-A, 48/12, 57/12, 92/13, 56/15, 102/15, 30/16, 61/17 – GZ, 21/18 – ZNOrg, 84/18 – ZIURKOE in 158/20)* according to which the operators of installations in which an

activity that may cause large-scale environmental pollution is or will be carried out must obtain an environmental permit. The principle of integrity (Art. 5 of the Environmental Protection Act) and the principle of prevention (Art. 7 of the Environmental Protection Act) apply to the issuance of these permits. The principle of integrity is reflected in a comprehensive approach to pollution prevention and control (including emissions of substances into soil, water and air, waste management rules and other environmental protection measures) and in combining procedures and similar devices of the same operator at the same location. On the other hand, the principle of prevention says that any intervention in the environment must be planned and carried out in such a way as to cause the least possible burden on the environment. Emission limit values, environmental quality standards, codes of conduct and other environmental protection measures are achieved using best available techniques (BAT) available on the market.

In **Croatia** it has been recognized that the complete control on hazardous substances should be establish. This will be achieved by establishment for monitoring of the condition of agricultural land, operationalization of the obligation to test and continuously monitor pollution status of agricultural land according to the prescribed methodology. It is necessary to intensify work on development Cadastre of water protection according to the recommendations of WFD CIS Guidance Document No. 28[31] by considering each component registry. During this work it will be considered the compliance requirements of environmental permits with the BAT Conclusions. The BAT conclusions are binding, because the Croatia as an EU MS is obliged to consider compliance with permit conditions within 4 years from the date of publication BAT Conclusions at the official EU website.

Given the specific situation in the non-EU countries, the following measures are to be implemented according to a realistic and acceptable timeframe which is to all non-EU countries:

- Implementation of Best Available Techniques and Best Environmental Practices including the further improvement of treatment efficiency, treatment level and/or substitution.
- Exploring the possibility to set down quantitative reduction objectives for pesticide emission in the Sava RB.

In **Bosnia and Herzegovina,** in Federation of Bosnia and Herzegovina the-law has been prepared prescribing specific parameters for certain industrial activities within which hazardous and harmful substances are produced and a new Regulation was published, *("Official Gazette of the Federation of Bosnia and Herzegovina", no. 26/20)*.

In the future the study on the gradual introduction of the latest EU technologies in large industrial and agro-industrial companies, and especially in the food industry, malt production, fish processing and leather processing will be prepared. It is also foreseen that implementation of the directives regarding priority substances (Directive 2013/39/EC) and the concerning the placing of plant protection products on the market (Regulation EU 1107/2009)[32] will be continued. For the second planning cycle, in

[31] Common Implementation Strategy for the Water Framework Directive (2000/60/EC) Guidance Document No. 28 Technical Guidance on the Preparation of an Inventory of Emissions, Discharges and Losses of Priority and Priority Hazardous Substances (2012)

[32] Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC-*Plant protection directive*

Republika Srpska supplementing/updating the existing legislation and drafting new ones are envisaged, as well as drafting certain studies, action plans and other documents that address this and other areas listed in this Program of Measures. Also, the transposition of EU legislation into Republika Srpska water sector legislation is envisaged.

In **Serbia,** the initial activities towards the full transposition and implementation of IED (2010/75/EU) has started by the first revision of the Directive Specific Implementation Plan for IED (2010/75/EU) prepared through IPA Project "Law Enforcement in the Field of Industrial Pollution Control, Chemical Accident Prevention and Establishment of EMAS, Europe Aid / 131555 / C / SER / RS"), whose second revision has been prepared through Swedish Project "Implementation of Industrial Emission Directive - IED Serbia", while the third revision is planned. In scope of the project Implementation of Best Available Techniques and Best Environmental Practices the industrial facilities subjected to the issuance of the integrated environmental permit have been identified. In accordance with the Law on integrated prevention and control of environmental pollution *("Official Gazette Republic of Serbia", no. 135/2004 and 25/2015)*. The new Law on integrated prevention and control of environmental pollution is in preparation phase, which is in accordance with IED (2010/75/EU). The integrated permit contains conditions related to the application of the BATs or other technical conditions and measures which the operator of the new or existing facility applies or plans to apply in order to prevent or reduce pollution. Within the Sava RB, 3 facilities satisfied the criteria and obtained the integrated permit. HBIS Serbia – Šabac, Beli limovi (2014), Elixir Zorka mineralna Đubriva, Šabac (2018) and Zorka Keramika, Šabac (2018).

In Montenegro are ongoing implementation of technical measures for irrigation, industry, energy and households water sharing in Bistrica WB (Construction Design / Operation and Maintenance). In the future as measures are planned: preparation of the Study/research for upgrade or improvement of industrial wastewater treatment plants (including farms) in municipalities Mojkovac, Berane, Bijelo Polje and for Thermoplant Pljevlja and "Šuplja Stijena" Mine, upgrades or improvements of wastewater treatment (including farms) in municipalities Plav, Andrijevica, and Pljevlja. Furthermore. measures are planned to prevent or control the input of pollution from urban areas, transport and built infrastructure in region of Opasanica / Verušica WB, and for the phasing-out of emissions, discharges and losses of priority hazardous substances or for the reduction of emissions, discharges and losses of priority substances in Ćehotina_4 WB. As well planned are remediation of contaminated sites within Bijelo Polje municipality, Ćehotina_4 WB and Ćehotina_6 WB (Jalovište Gradac).

At the **transboundary level** a trans-boundary system for accident prevention and control (Accident Emergency Warning System- AEWS) has been established and is maintained by the ICPDR. The main purpose of the AEWS is to increase public safety and to protect the environment in case of accidental pollution by providing early information for affected riparian countries.

All Sava countries, with exemption of Montenegro have established Principal International Alert Centers (PIACs) as a central point for communication in case of emergency situations which have or may have a trans-boundary impact on water and aquatic eco-systems.

The PIACs are operational 24/7 in Slovenia and Croatia only, where the PIACs are included into the national alert system 112. In Bosnia and Herzegovina and Serbia the legislative basis (e.g., water laws, civil protection laws, protection and rescue laws) has

already been created to include the PIACs into a joint national civil protection structure, while the responsible authorities at the national level have not yet been nominated officially.

Taking into consideration international conventions[33], WFD and the Directive Seveso-III-(Directive 2012/18/EU), the Sava Commission proposed a Protocol on Emergency Situations to the Framework Agreement on the Sava River Basin, which establishes a basis for:

- Cooperation for the undertaking of measures to prevent or limit hazards, and reduce and eliminate adverse consequences, including those from incidents involving substances hazardous for water;
- Establishing a coordinated or joint system of measures, activities, warnings, and alarms in the Sava RB for extraordinary impacts to the water regime, such as sudden and accidental pollution;
- Operation of an Accident Emergency Warning System.

The final harmonization of the Protocol is foreseen to take place upon the readiness of the Parties.

To implement the two protocols in force, Protocol on Prevention of Pollution Caused by Navigation and Protocol on Flood Protection as well as the draft Protocol on Emergency Situations, the improved operational response in emergency situations, including closer interaction and cooperation between river basin management authorities and civil protection sector, have been identified as a necessity. For that purpose, the project Water Contingency Management in the Sava River Basin-WACOM is going to be implemented at the transboundary level. The main objective of the project is the reduction of environmental risks related to accidental pollution and floods, especially with potential transboundary impact by improved cooperation of key actors and jointly developed common operational system for activating the accident management protocols within the Sava RB. Beside the reduction of risks, project will also bring overall improved transnational cooperation on the Sava RB which requires specific attention, developing improved ties among people, institutions, and countries. This will result in the significant optimization of the resources applied. The project will be finalized in December 2022.

9.1.4 Hydromorphological alterations measures

The management objectives for hydromorphological alterations will be achieved by the implementation of measures focusing on:

- Interruptions of river and habitat continuity;
- Hydrological alterations;
- Morphological alterations.

9.1.4.1 Interruptions of river and habitat continuity measures

The following measures are to be implemented according to a timeframe which is realistic and acceptable to all Sava RB countries:

[33] UNECE Convention on the Trans-boundary Effects of Industrial Accidents, Helsinki 1992; The Convention on the protection and Land Use of Trans-boundary Water courses and Internationally Lakes Helsinki 1992; the Code of Conduct on Accidental Pollution of Trans-boundary inland Waters – UN 1990.

- Specification of number and location, funding needs and funding sources for building of fish migration aids and other measures to achieve/improve river continuity which are intended to be implemented by 2021/2027 by the Sava countries (the 2015 deadline applies to Slovenia as an EU MS);
- Specification of locations, extent and measures type, funding needs and funding sources for restoration, conservation and improvements of habitats which are intended to be implemented by 2021/2027 by the Sava countries (the 2015 deadline applies to Slovenia as an EU MS)[34].
- Construction of fish migration aids and/or other measures to achieve/improve river continuity in the Sava River and its tributaries to safeguard reproduction and the self-sustaining of migratory species;
- Restoration, conservation and improvements of habitats and their continuity for migratory species in the Sava River and its tributaries.

In **Slovenia,** the measure refers to the implementation of the Freshwater Fisheries Act ("*Official Gazette of the Republic of Slovenia", no. 61/06*). Fish management includes, among other things, tasks related to maintaining the favourable status of fish and achieving good ecological status of waters. Any intervention in the fishing environment is planned and carried out in a way to ensure, as far as possible, the conservation of the fish, their species diversity, age structure and abundance. The construction of facilities that are carried out in accordance with the regulations on the construction of facilities may be carried out after obtaining the prior consent of the Fisheries Institute of Republic of Slovenia. Due to the passage of fish over the structures built in the water, the investor should ensure an appropriate passage for the fish. The functionality of the passage is provided by the owner or tenant of the building. The Fisheries Institute, in cooperation with the fisheries management provider, issues an opinion on the impact of the intervention on the condition of fish in the procedure of issuing water rights under water regulations.

In **Croatia,** the implementation of measures is foreseen on the water bodies where unsatisfactory hydromorphological condition are assessed, and will intensify, especially in cases of significant hydromorphological pressure on the fish population, including measures to ensure continuity of the water flow and the environmentally acceptable flow.

In **Bosnia and Herzegovina,** several studies on hydromorphological pressures and their impacts and improvement of hydromorphological characteristics and flow regime for watercourses over 10 km^2 have already been finalized and are planned to be updated.

In **Serbia,** the legislative measures to improve the legal regulations and technical guidelines for fish passes and preparation of a methodology for setting the priorities for the fish passes' construction on dams are foreseen.

For **Montenegro,** data and information regarding the measures for river continuity interruptions were not available.

[34] Until 2015 it is possible to prepare projects for immediate implementation. Assessing funding needs for the implementation of measures and identifying funding sources are crucial steps. If countries commit themselves to this, it will also help create pressure on the European Commission and the Council to allocate sufficient funds to these measures in future funding programmes for the EU and Accession countries in particular in Cohesion Policy and IPA programmes.

9.1.4.2 Hydrological alterations – water abstraction measures

The management objectives regarding the water abstraction should be focused to ensure sufficient residual flow downstream of a water abstraction, meeting ecological flow requirements (i.e., for ensuring habitat conditions or for meeting good status in the section influenced by the water abstraction).

In **Slovenia** the measures are defined in the following groups:

- Measures related to the achievement of good ecological potential in the electricity production in large hydropower plants: The measures taken by operators and holders of concessions for specific water use in connection with the water regime and water use are to ensure flood safety, to prevent harmful deposition of gravel and sediments, and to exercise existing and future water rights. Operators and holders of concessions for special water use must also implement measures to ensure biodiversity, protect water quality, protect natural values and cultural heritage, and take measures to ensure tourist and recreational activities. When exploiting the water energy potential, operators, and holders of concessions for special water use shall take into account the highest and lowest angles in dams and the rate of changes in water levels.
- Measures related to ensuring good water status in case of electricity production in small hydropower plants: The regulations stipulate that renewable energy production plants (hereinafter: RES) that exploit the energy potential of watercourses may receive support only for the amount of electricity produced by ensuring ecologically acceptable flow, which is one of the conditions and restrictions on the water use. If the RES production plant does not provide an ecologically acceptable flow, the decision to grant support shall be revoked and the support contract shall expire. Such a RES production plant is not eligible to re-obtain the decision to grant support.
- Measures related to ensuring good water status related to hydromorphological pressures: The Water Act *("Official Gazette Republic of Slovenia", no. 67/02, 2/04 – ZZdrI-A, 41/04 – ZVO-1, 57/08, 57/12, 100/13, 40/14, 56/15 in 65/20)* contains conditions, restrictions and measures related to the prevention of deterioration or improvement of water conditions related to hydromorphological pressures. The key mechanisms for implementing the written provisions are water consent and water rights.
- Restrictions, prohibitions and conditions of water use: The measure refers to (i) restrictions, prohibitions and conditions arising from the Water Act: - general restrictions and conditions related to the granting and exercise of water rights and water management, and - restrictions and conditions for the collection of alluvium, (ii) restrictions and conditions arising from the Rules on Commercial Ponds (*"Official Gazette Republic of Slovenia", no. 61/06*), (iii) restrictions, prohibitions and conditions of water use arising from regulations and ordinances on water protection areas, (iv) prohibitions, conditions and restrictions set by the RBMP Regulation and (v) restriction of water use resulting from the regulation defining environmental flow.

In **Croatia,** a regulatory framework has been established for introduction of obligation to provide information necessary for qualitative control of pressures resulting from water abstraction, control of compliance with the conditions for the discharge of

environmentally friendly flows, and the obligation of detailed recording and interpretation of losses in public water supply, have been introduced.

The program of introducing obligation to install water meters for all types of water abstraction/use is being implemented, in the program of installing individual water meters in buildings connected to municipal water structures. These activities are the basis for the establishment of a program to encourage the reduction of negative impacts of water use on water status. The enhancement of the Water Act ("*Official Gazzette",* no. 66/19) made it possible to prescribe a measure to limit water abstraction in cases where water protection objectives have not been achieved, which is being carried out in the ongoing process of revision and harmonization of water legal acts. A program for the public irrigation systems development co-financed by the European Agricultural Fund for Rural Development - EAFRD (EAFRD) is being implemented as a measure to reduce the uncontrolled load to surface and groundwater or approved individual water abstractions for irrigation.

The following measures are ongoing:

- Intensification of activities on water abstraction control, including monitoring of the water abstraction impact on the status of water bodies;
- Introduction of the obligation to analyse the cumulative impact of different water uses on the status of water bodies in the early stages of planning and development of the project documentation, - Methodology and criteria development for hydrological surface water quality elements (quantity and dynamics of water flow), which reflect the impact of water use/abstraction on the ecological status (good ecological status, good ecological potential, environmentally friendly flow);
- Development of incentive measures to reduce losses and rationalize consumption as a measure for achieving water protection goals;
- Further investments in the development of water supply infrastructure, with the aim of harmonizing with the health and safety standards for water intended for human consumption as a mean to increase the number of population connected to the public water supply systems;
- Encouraging public irrigation systems construction as a substitute for inefficient and environmentally risky individual water irrigation interventions.

In **Bosnia and Herzegovina,** a study on improving flow regime and establishing ecological flow and a study of long-term water supply of the population, economy and industry have been developed for Federation of Bosnia and Herzegovina, while for Republika Srpska is foreseen to be developed. In the future it would be necessary to reduce losses in the water supply systems and perform gradual transition to the water demand management practices.

In **Serbia,** a legal framework for setting the residual flow below the water abstractions, has been implemented partially, but the necessary bylaws and methodologies are still missing. In the future the methodology for determination of ecological flow is planned to be prepared.

For **Montenegro,** data and information related the measures on water abstraction were not available.

9.1.4.3 Hydrological alterations – impoundements measures

The management objectives for impoundments comprise a morphologically restructuring the sections of impoundments.

In **Slovenia,** measures related to the achievement of good ecological potential in the cases of electricity production in large hydropower plants are taken place (*described in detail in the 9.1.4.2 Hydrological alterations – water abstraction measures*).

For the **other Sava RB countries,** data and information regarding the measures considering impoundments were not available.

9.1.4.4 Hydrological alterations – hydropeaking measures

The management objectives regarding the hydropeaking are focused to the improvement of operational modifications.

In **Slovenia,** the measures are related to the achievement of good ecological potential in cases of the electricity production of in large hydropower plants. (*explained in more details in 9.1.4.2 Hydrological alterations – water abstraction measures*)

In **Croatia,** the attention is focused on the implementation of basic measures that will continue to be implemented. After completing the development of the new classification systems for biological elements, the conditions were met for the proposed classification systems for ecological potential to be included in the Regulation on water quality standard (in preparation) whose entering into force will enable assessment of the hydromorphological potential of all significantly altered water bodies and, if necessary, prescribe measures for the achievement of the good ecological potential, which will be implemented in the future.

In **Serbia,** the methodology for the HYMO assessment is planned to be prepared.

For **Bosnia and Herzegovina,** and **Montenegro,** data and information regarding measures considering hydropeaking were not available.

9.1.4.5 Morphological alteration measures

To achieve the management objectives for morphological alteration the basic measures include the restoration of natural river morphology where possible and, if it is not possible, implementation of the "no net-loss" principles.

In this regard in **Slovenia,** various measures in the field of hydromorphological pressures have been adopted mainly within the measures:

- Measures related to the achievement of good ecological potential in cases of the electricity production in large hydropower plants. (*Explained in more details in 9.1.4.2. Hydrological alterations – water abstraction measures*);
- Measures related to ensuring good water status in case of electricity production in small hydropower plants. (*Explained in more details in 9.1.4.2 Hydrological alterations – water abstraction measures*);
- Measures related to ensuring good water status related to hydromorphological pressures (*explained in more details in 9.1.4.2 Hydrological alterations – water abstraction measures*);
- Implementation of measures to reduce the negative impact of land use in the riparian zone on water status. To improve the ecological status, measures must be

taken to reduce the negative impact of altered land use on water bodies where significant pressures are identified due to land use change in the riparian zone and which is also reflected in moderate, poor, or bad water status. The measure envisages the preparation of expert reports, where appropriate technical measures are also defined. In general, three combinations of technical measures to improve the situation have been identified, establishment of a naturally characteristic riparian zone (controlled successive development), establishment of a naturally characteristic riparian zone (integrated planting of the riparian zone) and sustainable maintenance of autochthonous riparian vegetation (the measure is envisaged mainly on SWBs, where the establishment of a specific riparian zone use (e.g. urbanized areas) is not possible while only sustainable maintenance is possible);

- Implementation of measures to reduce the negative impact of regulations and other arrangements of watercourses, reservoirs, lakes, and the coastal sea on water status: In order to improve the ecological status, measures must be taken to reduce the negative impact of regulations or other arrangements on water bodies where significant pressures are identified due to regulations or other arrangements and which are reflected even in moderate, poor, or bad water status. The measure envisages the preparation of expert bases, which also define the relevant technical measures and the cost center of technical measures (according to the polluter pays principle). In general, two combinations of technical measures to improve the situation are identified: - restoration of a watercourse, lake, or coastal sea (technically feasible measure on SWBs where area is available for implementation) and - sustainable regulation of watercourses, reservoirs, lakes, or coastal seas (technically feasible measure on SWBs where area for the measure's implementation is limited).

In **Croatia,** a set of measures related to morphological changes is the same as given for hydrological changes (*described in detail in Chapter 9.1.4.4 Hydrological changes - measures to change the flow regime downstream of the dam (hydropeaking)).*

Given the specific situation in non-EU countries, the measures are to be implemented according to a timeframe which is realistic and acceptable to all non-EU countries.

For control over sand and gravel extraction, the Ministry of Agriculture, Forestry and Water Management of **Serbia** has enacted the Rulebook on determining the Plan for extraction of river sediments for the period 28 September 2019 - 28 September 2021 *("Official Gazette of the Republic of Serbia", no. 67/2019)-Plan*, which provided the conditions for the lease of water land owned by the Republic of Serbia for the extraction of river sediments at planned locations and within the permitted annual quantities. The Law on Waters *("Official Gazette of the Republic of Serbia", no. 30/10, 93/12 and 101/16)*, in Article 88a, stipulates that the extraction of river sediment is carried out from water land, at sites where it is of interest for conservation or improvement of the water regime, to the extent that it will not disturb the water regime, the existing use of groundwater, bank stability and the natural balance of aquatic and riparian ecosystems. Extraction of river sediments is performed exclusively at locations and in the quantities provided by the Plan. The measures on restoration and mitigation the effects of dredging have partially been implemented. Uncontrolled exploitation of materials in floodplains, not accompanied by appropriate remediation of borrow pits after exploitation, has a significant impact on the environment, indigenous ecosystems, and reduction of agricultural land, has been recognized at the national level as an issue in the draft RBMP

2021-27. The establishment of the sediment monitoring as a necessary prerequisite for identification of the appropriate measures is foreseen, as well as multidisciplinary studies of the impact of various sediment management activities which can affect habitats and functioning of water dependant ecosystems will be prepared.

In **Bosnia and Herzegovina,** in the second planning cycle, in Republika Srpska the preparation of a Study for the improvement of hydromorphological characteristics of watercourses with a catchment area of more than 10 km^2 and a Study of hydromorphological pressures and assessment of their impacts on watercourses with a catchment area of 10-100 km^2 are envisaged.

In **Montenegro,** as measures are implementing: Improving of hydromorphological conditions of Tara_2 WB body other than longitudinal continuity (Conditions of EIA), Improvements in flow regime and/or establishment of ecological flows on Komarače surface WB (Construction Design/Operation and Maintenance), on Bistrica surface WB (Construction Design/Operation and Maintenance), Bistrica (Lj) surface WB (Construction Design/Operation and Maintenance), Improving longitudinal continuity on Komarača surface WB (Construction Design/Operation and Maintenance), on Bistirca surface WB (Construction Design/Operation and Maintenance) and on Bistirca (Lj) surface WB (Construction Design/Operation and Maintenance)
In the future as measures are planned: improving hydromorphological conditions of Ćehotina_4 WB (other than longitudinal continuity) and Ćehotina_6 WB (downstream of Jalovište Gradac)

9.1.4.6 Future infrastructure projects

To achieve the management objectives for future infrastructure projects the measures are focused to:

- Conduction of an Environmental Impact Assessment (EIA) and/or a Strategic Environment Assessment (SEA) in conjunction with the requirements of WFD Article 4(7) during the planning phase of future infrastructure projects if required;
- Fulfilment of the conditions set out in WFD Article 4, in particular the provisions for new modifications specified in Article 4, Paragraph 7;
- Recommendations for stakeholders regarding the implementation of the best environmental practices and the best available techniques.

In **Slovenia** implementation of measures is focusing on

- EIA - Impact on water status: The Environmental Protection Act lays down procedures for examining the impact of plans and interventions on the environment in Slovenia and in neighbouring countries or other EU MS and parties to the Protocol on SEA to the Convention on Transboundary EIA. A comprehensive impact assessment is carried out for a plan that itself or in conjunction with other plans has a significant impact on the environment or on the protected area, which is determined in accordance with the nature conservation regulations. The comprehensive EIA procedure may also be carried out for plans for which the Ministry estimates that their implementation could have a significant impact on the environment. The criteria for assessing significant environmental impacts are determined by the Decree on criteria for assessing the probability of significant impacts of the implementation of a plan, program, plan or other general act and its changes on the environment in the comprehensive environmental impact assessment procedure ("*Official Gazette Republic of Slovenia", no. 9/09*). The aim of

conducting a comprehensive EIA is to ensure a high level of environmental protection and to contribute to the integration of environmental aspects into the preparation and adoption of plans and programs in order to promote sustainable development. Based on the performed EIA carried out for interventions that may have a significant impact on the environment, the competent authority issues an environmental consent. The Environmental Protection Act stipulates that before the implementation of interventions that may have a significant impact on the environment, the following shall be carried out: (i) Environmental impact assessments and obtaining of an environmental consent. (ii) Pre-litigation procedures to determine whether an environmental impact is likely to have a significant effect on the environment and requires an environmental impact assessment and environmental consent or does not require an environmental impact assessment and environmental consent does not need to be obtained.

- Program of basic measures taken in relation to transboundary EIA: The Environmental Protection Act stipulates that for plans and interventions that may have a significant transboundary impact on the environment, a comprehensive transboundary EIA shall be carried out. Cross-border assessments are carried out for: - plans under the Comprehensive Environmental Impact Assessment - programs under the Comprehensive Environmental Assessment, - projects under the Environmental Impact Assessment (EIA) and - installations under the Environmental Authorization (IED) procedure.

In **Serbia**, the development of EIA is regulated by the Decree on determining the list of projects for which an EIA is mandatory and the list of projects for which an EIA may be required ("*Official Gazette Republic of Serbia", no. 114/2008*). For new infrastructure projects, environmental requirements are an integral part of the planning and implementation process, assessing the impact of development activities on water status/potential. For new infrastructure projects, stakeholders' involvement in all phases of planning to ensure that the best environmental option is selected. New infrastructure projects are carried out in a transparent manner. In the future further harmonization of water legislation with WFD requirements is foreseen.

9.2 Ground water

9.2.1 Groundwater quality measures

To achieve the management objectives for groundwater quality the following measures should be implemented:

- Implementation of the prevention / limitation of pollutants inputs into groundwater according to the Ground Water Directive (2006/118/EC);
- Implementation of the Nitrates Directive (91/676/EEC);
- Implementation of the Sewage Sludge Directive (86/278/EEC);
- Implementation of the Sustainable Use of Pesticides Directive (Directive 2009/128/EC)[35], *Plant protection directive (Regulation No.1107/2009))*, and Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22

[35] Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides

May 2012 concerning the making available on the market and use of biocidal products;
- Implementation of the UWWT Directive (91/271/EEC);
- Implementation of the Directive on industrial emissions IED (2010/75/EC) which also relates to the Directive 2008/105/EC on environmental quality standards and Directive (2013/39/EC) related to priority substances in the field of water policy.

Given the specific situation in the non-EU countries, these management objectives are to be implemented according to country specific realistic and acceptable timeframe. The EU MS these management objectives should implement according to the deadlines set down in the Accession Treaties, i.e., Slovenia and Croatia until 2027.

There are also the supplementary measures comprising of:
- Implementation of the management objectives described for organic and nutrient pollution of surface water;
- Increase of wastewater treatment efficiency;
- Implementation of Best Available Techniques and Best Environmental Practices;
- Reduction of pesticide/biocides emission in the Sava River Basin.

In **Slovenia,** various measures have been taken in the field of ensuring good chemical status of groundwater as follows:
- Water protection areas: To protect a body of water, used for abstraction or intended for public drinking water supply, against pollution that could affect the health suitability of water or quantitative pressures, the government shall designate a water protection area. The size of inland areas shall be determined according to the type of surface or groundwater body and the characteristics of their supply area, based on the retention time of the pollutant, the dilution of the pollutant from the point of introduction to the catchment or the time for action. Activities in the water protection area may restrict or prohibit activities that could jeopardize the quantitative or qualitative status of water resources or oblige owners or landowners in the water protection area to implement or allow the implementation of measures to protect the quantity or quality of water resources.
- Protection of waters against pollution by nitrates from agricultural sources (Nitrates Directive (91/676/EEC). (*Explained in more details in 9.1.2 Nutrient pollution – measures*).
- Measures in the field of protection of waters against contamination by plant protection products. The existing legal frameworks for the regulation of plant protection products are still not sufficient to prevent the over-use of certain plant protection products in the EU. The Sustainable Use of Pesticides Directive (Directive 2009/128/EC) requires EU MS to take additional measures to protect the aquatic environment and drinking water sources from the effects of plant protection products, which must comply with water regulations and regulations governing the placing of plant protection products on the market. Active substances placed on the market must be approved and registered by competent authority. The decision on the authorization of plant protection products may also specify additional requirements for the marketing and use of plant protection products if this is necessary to reduce the risk to human health and the environment.
- Measures related to the use of chemicals and biocides. Measures in the field of use of chemicals and biocidal products include the placing on the market of plant

protection products, regulating their use and setting requirements for their use in preparations.

- Discharge and treatment of urban wastewater from agglomerations (with a total load greater or lower than 2000 PE*)*. The Decree on Discharge and Treatment of Municipal Wastewater ("*Official Gazette", no.98/15,76/17,81/19 and 194/21*) sets supply standards and requirements related to the discharge and treatment of municipal wastewater from agglomerations (greater or lower than 2000 PE), and mandatory tasks of the obligatory municipal public utility service for discharge and treatment of municipal wastewater and stormwater discharge. Under the Operational Program for Urban Wastewater Discharge and Treatment for the period 2005-2017, the regulatory requirements for these agglomerations are identified and broken down in more detail. For owners of buildings in the area equipped with public sewerage, connection to the public sewerage is mandatory.

In **Croatia,** the Groundwater Directive (2006/118/EC) is fully implemented in Regulation on the water quality standard *("Official Gazette", 96/2019).* (*Measures related to the protection of water against pollution by nitrates from agricultural sources are in more details explained in 9.1.2. Nutrient pollution – measures.*)

The implementation of the *Plant protection directive* is the ongoing process comprising of implementation of pesticides' metabolite in the Regulation on the water quality standard ("*Official Gazette", 96/2019*) and investigative monitoring on surface water for biocide, and metabolites of pesticides, and preparation of investigative monitoring on groundwater monitoring on biocide, and metabolites of pesticide.

In **Bosnia and Herzegovina,** a transposition of the Groundwater Directive (2006/118/EC) is ongoing, and it will continue in the future as well. Full transposition of all EU directives related to groundwater (nitrates, biocides, industrial emissions, landfills, waste) is needed. Development of the studies for the formation of protection zones which would determine measures and conditions for the diffuse pollution reduction, research to determine the measures to be prescribed in areas sensitive to nitrates and the continuation and improving of the monitoring of groundwater quality and quantity, are planned.

In **Serbia,** the EU Groundwater Directive (2006/118/EC) was transposed in national legislation in 2012 for nitrates and pesticides, while the transposition of the Nitrates Directive (91/676/EEC), *Plant Protection Directive* and UWWT Directive (91/271/EEC) is in progress. The Industrial Emission Directive-IED (2010/75/EU) has also been transposed and Directive (2013/39/EU) is partially transposed (the list of substances and environmental quality standards values transposed), but implementation process is slow. Further transposition and implementation of before mentioned Directives is foreseen to be continued.

In **Montenegro** set of measures for ground water pollution is equivalent to the measures for organic pollution (*in detailed provided explained in chapter 9.1.1. Measures for organic pollution*).

9.2.2 Groundwater quantity measures

To achieve the management objectives for groundwater quantity the following measures should be implemented:

- Over-abstraction from GWBs within the Sava River Basin will be avoided by sound groundwater management;
- Implementation of WFD (2000/60/EC) requirements that groundwater resources are not depleted by the long-term annual average rate of abstraction.

Given the specific situation in the non-EU countries, these management objectives are to be implemented according to timeframe which is realistic and acceptable for these countries. The EU MS these management objectives should be implemented according to the deadlines set down in the Accession Treaties, i.e., Slovenia Croatia until 2027.

In **Slovenia** the measures are defined in the following groups:

- Promoting efficient and sustainable water use: The introduction of efficient and sustainable water use is carried out through various instruments, such as:
  - implementation of measures of the Rural Development Program 2014–2020;
  - activities to reduce losses in water supply networks (providers of the obligatory municipal public utility service of drinking water supply);
  - raising user awareness by providers of the obligatory municipal public utility service environmental protection (example) and other instruments that help to protect water resources and the environment.
- Surface and groundwater monitoring: Implementation of monitoring programs includes: assessment of ecological and chemical status of surface water and quantitative and chemical status groundwater; assessment of water status in areas with special requirements; identifying the causes of excessive pollution; monitoring the impact of basic and complementary measures arising from the water management plan; monitoring any other deterioration of water status; monitoring long-term trends in the content of pollutants resulting from human activity; monitoring long-term changes in natural conditions in accordance with bilateral agreements, monitoring the status of border watercourses and groundwater flowing across the state border and monitoring the status of waters in accordance with international conventions.
- Ensuring control over the artificial supply or enrichment of groundwater bodies. The Water Act stipulates the preservation and regulation of water quantities in Art. 81, and the intervention in area that may affect the water regime in Art. 150. The conditions and rules for the management of artificial supply or enrichment aquifers for water protection areas are set out in Article 44 of the Rules on Criteria for Determining a Water Protection Area.
- Pricing policy measures for the economical use of drinking water: The pricing policy promotes the economical use of drinking water. In addition to other economic instruments, such as the payment for water rights and water reimbursement, it is also considered that the price of drinking water consumption, which is higher than the standard consumption, is increased by 50%. The legal basis for the pricing of drinking water supply services is the Decree on the methodology for pricing the services of compulsory municipal public utility services for environmental protection *("Official Gazette Republic of Slovenia", no 87/12, and 109/12)*.

In **Croatia,** set of ground water quantity measures is equivalent the set of measures in details elaborated in the chapter *9.1.4.2. Hydrological alteration-Water abstraction* measures.

In **Bosnia and Herzegovina,** a preparation a hydrogeological study of groundwater bodies with the implementation of the necessary exploration works and continuation of the establishment of a central database on the groundwater sources that are or planned to be used for the water supply of the population, are foreseen.

In **Serbia,** measures for ground water quantity are still not implemented, however the development and establishment of a national registry of groundwater abstraction are foreseen in the future.

For **Montenegro,** data and information regarding the measures on groundwater quantity were not available.

9.3 Measures related to Other Issues

9.3.1 Invasive alien species measures

To achieve management objectives the measures regarding the invasive alien species are:

- Promoting research into methods and approaches that improve the ability to assess whether or not alien organisms will have an adverse impact on biodiversity including an investigation of the influence of invasive species on ecological status;
- Developing and implementing effective ways to identify and monitor alien organisms;
- Determining priorities for allocating resources for the control of harmful alien organisms based on their impact on native biodiversity and economic resources, and implementing effective controls or, where possible, eradication measures;
- Identifying and eliminating common sources of unintentional introductions;
- Developing national and international databases that support the identification and anticipation of the introduction of potentially harmful alien organisms in order to develop control and prevention measures;
- Ensuring that there is adequate legislation and enforcement to control introductions or escapes of harmful alien organisms, and improving preventative mechanisms such as screening standards and risk assessment procedures;
- Enhancing public education and awareness on the impacts of harmful alien organisms and the steps that can be taken to prevent their introduction.

In **Slovenia** the following measures have already been implemented and will continue to be implemented in the future:

- Prevent and reduce the introduction of non-native aquatic species*:* The law governing nature conservation stipulates the obligation to obtain a permit for the settlement of plants or animals of non-native species, which the ministry may exceptionally allow if the nature risk assessment procedure determines that the intervention in nature will not endanger the natural balance or components of biodiversity. The regulations further stipulate the restriction or prohibition of the use of non-native species for the purposes of breeding and investment of non-native species in fishing areas for fishing purposes, implementation of preventive

measures to prevent intentional and unintentional introduction, direct disposal of non-native aquatic species, especially invasive fishing.

- Monitoring of non-native aquatic organisms: In the Freshwater Fisheries Act *("Official Gazette Republic of Slovenia", no. 61/06)* and in the Sea Fisheries Act *("Official Gazette Republic of Slovenia", no. 115/06)* fish monitoring is prescribed. Fish are also one of the biological elements of the ecological status according to the Rules on surface water monitoring ("*Official Gazette Republic of Slovenia", no. 10/09*).

In **Bosnia and Herzegovina,** a study "Inventory and geographical interpretation of invasive species in the Federation of Bosnia and Herzegovina" has been developed. In the future, the studies on invasive freshwater species, and development of the necessary legislation that will enable control of invasive species introduction into aquatic ecosystems and monitoring of already existing invasive species are planned.

In **Serbia,** the administrative and legislative measures, and studies which will enable identification of invasive species, and the establishment of monitoring of invasive species will be implemented.

For **Croatia and Montenegro,** data and information regarding the measures on invasive species were not available.

9.3.2 Sediment measures

To achieve the management objective for sediment management the measures are focused to:

- Evaluation of sediment balance and sediment quality and quantity;
- Measures to control erosion processes;
- Measures to ensure the integrity of the water regime with regard to quality and quantity and to protect wetland, floodplains, and retention areas;
- Monitoring of sediment;
- Measures to prevent impacts and the pollution of water or sediment;
- Measures to maintain conditions for safe navigation;
- Determination of designated areas for capital dredging;
- Guidance for sediment disposal, sediment treatment and use.

In **Slovenia,** the Study of river sediment issues from the point of view of achieving good water status is implemented. The measure envisages a review of the collected data on suspended sediment and bed load on watercourses, collects and reviews conducted studies and national and international projects addressing the issue of sediment, especially in terms of achieving environmental objectives (prevention of water deterioration and achieving good water status). Interstate liabilities are also reviewed, related to the transboundary movement of sediment, and prepare starting points for comprehensive treatment problems, with an emphasis on effective measures to improve sediment problems in watercourses. The implementation of the measure includes the preparation of expert bases for comprehensive treatment sediment issues in terms of achieving environmental objectives.

In **Croatia,** Croatian Meteorological and Hydrological Service issues an annual report of the sediment measurement in the Sava RB. It provides an overview on the hydrological regime, comparison of the annual value of hydrological parameters with a multi-year measurement period and regression relationships between hydrological parameters. The

regime of suspended sediment is analysed, and the emphasis is on the concentrations and transport of suspended sediment.

In **Bosnia and Herzegovina,** the study on sediment transport at the lower part of the Bosna River is finalized. In the future, it is planned to adopt bylaws that will regulate the issue of river sediment transport management; to develop an action plan for monitoring river sediment transport which should include the transport and quality of suspended sediment on characteristic profiles of the watercourse, and to establish regular monitoring of the river sediment transport/transport on characteristic profiles determined by the monitoring action plan.

In **Serbia,** sediment quality monitoring is performed at selected stations in the network in accordance with the annual surface water monitoring program which is prepared and performed by the Serbian Environment Protection Agency, and the monitoring of sediment will continue in accordance with the surface water monitoring program.

In **Montenegro,** as measure, the preparation of the feasibility study to reduce sediment load caused by soil erosion, surface run-off and prevent sediment loading in Plavsko Lake has been implemented.

In the future following measures are planned:

- Reduction of sediment from soil erosion and surface run-off in Tara river spring area (Komovi massif)
- Study/research on the reduction of sediment from soil erosion and surface run-off in Plav and Andrijevica municipality, Berane and Bijelo Polje municipalities.

At the **transboundary level** the following measures has already been implemented:

- Slovenia, Croatia, Bosna and Herzegovina and Serbia have ratified a Protocol on Sediment Management to the FASRB (Protocol on Sediment Management) which entered into force in October 2017. The Protocol emphasizes the importance of the sustainable sediment management to maintain water regime, to promote active international cooperation to enhance appropriate policies and to reinforce and coordinate action at all appropriate levels. It promotes sustainable sediment management related to quality and quantity sediment issues and sustainable sediment management solutions, which carefully balance the socio-economic and environmental values which need to be set within the whole Sava River Basin. The Protocol on Sediment management represents legal foundation for the implementation of the activities agreed by the Sava countries, via their joint platform – the Sava Commission.
- Within the project *Towards Practical Guidance for Sustainable Sediment Management using Sava River as a Showcase* the following steps has already been realized: resulting in:
  - Organizing the training course on basic sediment issues (October 2012);
  - Drafting the Guidance on Sustainable Sediment Management– Part I (draft finished in 2013);
  - Implementing of the projects:
    - Estimation of the Sediment Balance of the Sava River (2013); and
    - Proposal of the Establishment of the Sediment Monitoring System for the Sava RB (November 2015);
  - Establishment of pilot sediment monitoring stations in Sremska Mitrovica (RS) and Slavonski Brod (HR) (2017).

The Sava Commission has also adopted Program for development of the Sediment Management Plan and the activities on the Outline of the Sediment Management Plan for the Sava River Basin are ongoing. The aims of the Outline of Sediment Management Plan for the Sava River Basin are:

- to provide an overview on the existing sediment data on quantity and quality,
- to analyse the existing sediment monitoring system and propose the upgrade,
- to analyse the exiting measures to control erosion, torrents and other sediment processes, measures to ensure and maintain integrity of water regime, measures to provide, ensure and maintain conditions for safe navigation, measures to protect wetlands areas and retention spaces, measures to control reservoir sedimentation, sediment disposal, treatment and use
- to provide the overview of the improvements of above-mentioned measures
- to propose the institutional arrangements for further development of the Sediment Management Plan.

Protocol on Sediment Management also stipulates the exchange of data on planned dredging on yearly basis. The Parties to the FASRB are requested to provide information on locations, types of dredging, methods for sediment disposal and treatment for the Sava River and its main tributaries as well as summarized quantities of dredged sediment for the sub-basins of other tributaries. Based on received data Report on executed and planned dredging in the Sava River Basin is prepared by the Sava Commission.

9.3.3 Protected areas measures

To achieve the management objectives for protected areas the following measures are planned:

- Step-by-step harmonization of national legislation with EU legislation (relevant for non-EU countries) with regard to the protection of habitats and/or species (Natura 2000, sites subject to the Birds Directive (2009/147/EC) and the Habitats Directive (92/43/EEC) and provision of effective instruments for the implementation of mentioned documents;
- Preparation of relevant legislation regarding the areas designated to protect economically significant aquatic species in accordance with the WFD;
- Identification and characterization of bathing waters (relevant for non-EU countries), harmonization of national legislation with Bathing Water Directives 2006/7/EC) (not relevant for Slovenia and Croatia);
- Further work on the implementation of the Nitrates Directive 91/676/EEC and the UWWT Directive 91/271/EEC;
- Finalization of the delineation of drinking water protection zones in the region and the preparation of standardized national registers of drinking water protection zones (for groundwater and surface water) including all the necessary data, above all the size of the protection area and the amount of abstraction (relevant for non-EU countries).

In **Slovenia** the various measures have been implemented and fill continue in the future as follows:

- Ensuring a favourable status of species and habitat types as a function of water in Natura 2000 area: The law governing nature conservation stipulates the obligation to ensure a favourable state of conservation of species and habitat types from ratified international treaties in special protection areas (Natura 2000). Protection

is provided by assessing the acceptability of the impact of the implementation of plans or interventions in nature on the protection objectives of Natura sites, which must be carried out for plans, programs, spatial or other acts and is part of a comprehensive EIA. The assessment of acceptability for other interventions in nature is determined within the framework of environmental consent, nature protection consent, permit for intervention in nature or other permit (e.g., water permit), and indirectly also within the issuance of other water rights (e.g. determination of ecologically acceptable flow). The protection of other areas with nature protection status, namely the protection of natural values, ecologically important areas, protected areas and biodiversity outside areas with nature protection status, is also ensured within the framework of the environmental impact assessment mechanism. Further protection measures are measures under the law governing nature conservation and measures under other regulations that may contribute to the conservation of Natura sites, which are specified in more detail in the Operational Program - Natura 2000 Site Management Program. Water management measures relate particularly to reducing the impact of changes in the hydromorphological properties of surface waters and changes in the quantitative and chemical status of groundwater, in some areas also to renaturations, and are included in the relevant parts of water management plans through nature conservation guidelines.

- Measures in bathing water areas*:* Bathing waters determined on the basis of the Water Act are divided according to type into: - bathing areas where a large number of people bath or are expected to bath and bathing is not permanently prohibited or permanently advised against and natural bathing areas, which are areas where bathing is carried out as a direct use of water for the activity of bathing areas. In the field of bathing water, the ministry responsible for water in 2010 adopted the Framework Program for the Implementation of Regulations on Bathing Water Quality Management for the Period 2009-2015. The key management measures determined by Slovenian legislation on the basis of the relevant directives are, in particular: (a)monitoring of microbiological parameters and classification of bathing waters according to their quality; (b) bathing water quality management and informing the public about bathing water quality. Bathing water quality management measures include several other activities, such as establishing and maintaining bathing water profiles, determining the monitoring calendar, and carrying out bathing water monitoring, evaluating the quality and classifying bathing water by quality, identifying and preparing an assessment of the causes of potential pollution may affect the quality of bathing water and harm the health of bathers, inform the public, prevent pollution. The quality of bathing water, which is conditioned by ensuring compliance with the limit values for microbiological parameters, is conditioned by the appropriate implementation of basic measures governing the discharge and treatment of municipal waste and pollution with nitrates from agricultural sources. The implementation of these measures must be ensured not only in the immediate vicinity of the bathing water, i.e., in the bathing water impact area, but in the entire bathing water area.

In **Croatia** the drinking water protection zones are registered in accordance with relevant legislation.

In **Bosnia and Herzegovina** the protection zones of springs is regulated with the existing legislation i.e. Rulebook on the manner of determining the conditions for determining the

zones of sanitary protection and protective measures for water sources for public water supply of the population (*Official Gazette of the Federation of Bosnia and Herzegovina, No. 88/12*) and Rulebook on protection measures, manner of determination, maintenance and marking of sanitary protection zones ("*Official Gazette of the Republika Srpska", No: 76/16*).
In the future it is necessary to prepare the hydrogeological studies for grouping of GW bodies and consistently implement protection measures drinking water sources and establish a central database of the drinking water protected zones. In the he Republika Srpska is planned that study of the long-term water supply for population, economy and industry of the Republika Srpska is going to be prepared.

In **Serbia** the harmonization of national legislation with EU legislation is ongoing. Designation of the Natura 2000, sites subject to the Birds Directive (2009/147/EC), and the Habitats Directive (92/43/EEC) are in progress. Bathing areas are not fully in compliance with European directives. Therefore, a register for this type of protected areas cannot be established in accordance with the Law on Waters ("*Official Gazzette RS", br. 30/2010, 93/2012, 101/2016, 95/2018 i 95/2018*). It is planned that the harmonization of legislation will take place in the future. Transposition of the Nitrate Directive (91/676/EEC) and the UWWT Directive (91/271/EEC) is in progress, and criteria for delineation of vulnerable zones, their identification and designation, to spatially compile a register will be developed in the future. Delineation of drinking water protection zones and the standardized national register are partly implemented and will continue in the following planning cycle.

For **Montenegro,** data and information related to the protected areas measures were not available.

9.3.4 Other issues measures

Regarding the other issues the following measures are defined:
- Elaboration of a basin-wide inventory of potential accident risk spots;
- Estimation of the real risk at a particular site including assessment of an accidental pollution risk from the operational mines using checklists based on the related products of the ICPDR and the provisions of the Seveso-III- (Directive 2012/18/EU) and the UNECE Convention on the Transboundary Effects of Industrial Accidents;
- Elaboration of inventory of abandoned sites contaminated by waste disposal and by former industrial activities including abandoned tailing deposits with a special attention given to risk of flooding or leaking.

In **Slovenia** two groups of measures are implementing:
- Management of major-accident hazards involving dangerous substances (SEVESO III Directive): The Decree on the Prevention of Major Accidents and the Reduction of Their Consequences *(Official Gazette of the Republic of Slovenia, Nos. 71/08, 105/10 and 36/14)* imposes extended measures to protect against major accidents. In addition, it sets requirements for linking the results of risk assessments and spatial planning, considering the natural characteristics and vulnerability of the environment. The measure resulting from the above provisions is to obtain an environmental permit for the operation of an installation that may cause large-scale pollution, which the installations obtain on the basis of a report on measures implemented in industrial and other major disaster protection installations.

- Measures to protect against pollution caused by accidents involving the transport of dangerous goods by road, rail, air and se: protection and rescue plans. Preparation of Protection and Rescue Plans in accordance with the Protection against Natural and Other Disasters Act (2006) and by-laws. Based on the threat assessment and the findings of the profession, the plans elaborate the idea of protection, rescue, and assistance in the event of a specific natural or other disaster. Protection and rescue plans are drawn up by the state, municipalities, companies, institutes or other organizations (so-called planning bodies), and the plan is drawn up for each type of accident separately.

In Bosnia and Herzegovina, the study of the assessment of the pollution load on water resources originating from solid waste landfills has been finalized for the Federation of Bosnia and Herzegovina which is planned to be updated (with mining waste landfills), while in the Republika Srpska, the preparation of the Study for the assessment of the pollution load on water resources originating from solid waste landfills is planned in the future.

In **Serbia** elaboration of inventory of potential accident risk spots and the abandoned sites and the estimation of real risk at the particular site is in progress and will continue.

In **Montenegro** as other measures are planned to be implemented in the future: Construction of communal waste transfer station for municipalities Kolašin municipality Mojkovac, Andrijevica, Berane, Construction of communal waste landfill, regional and for Bijelo Polje municipality, Control of adverse impacts of recreation in municipalities Kolašin and Bijelo Polje and Water efficiency, implementation of technical measures for irrigation, industry, energy and households water sharing in Lim_3 WB and Bistrica (L)_2 WB.

For Croatia data and information related to implementation of the other measures were not available.

At the **transboundary level** the ICPDR in cooperation with the countries and the Sava Commission has finalized an inventory of Accident Risk Spots (ARS), which encompasses operational industrial sites associated with major risk of accidental pollution and Contaminated Sites (CS), including landfills and dumps in areas prone to flooding.

9.4 Financing the Programme of Measures

For successfully implementing the environmental goals of the WFD it is necessary to mobilize adequate ways of financing the planned measures. The WFD implementation is a national responsibility, and as such, the financing of measures is the responsibility of each national government (or private owners and operators of facilities which influence water quality).

A number of EU-supported funding programs are available for some of the measures. This is particularly important for new EU MS which will rely upon EU funding for measures with regard to wastewater treatment, agriculture or hydromorphological alterations. As far as possible, funds available for other programs (CAP, LIFE, etc.) have been in the past and can be in the future, utilized by EU MS to address a number of specific problems and to implement necessary measures. In general, the funding of measures in non-EU MS is more difficult than for those countries which have the legal obligation to fulfil the WFD.

New EU rules on water reuse and initiatives - kicked-off lately to align urban waste water legislation with the ambition of the European Green Deal - will provide excellent conditions and opportunity for instilling more sustainability and circularity into the water management sector in the near future.

Some of the suggested possibilities for the financing of Programme of Measures from the 2nd Sava RBMP are provided in the Table 46, while the elaboration of the specific way of financing can be found in the Background document Economic Analysis for the 2nd Sava RBMP.

Table 46: Overview SWMIs, measures and potential funding sources

Type of pressure	Measures	Possible financing source/program (EU member states)	Possible financing source/program (non – EU member states)
Organic pollution	UWWTP	NextGenEU (ERDF, CF)	IPAIII
	Industrial point sources (direct discharges)	NextGenEU (ERDF, CF, ESF for capacity building)	IPAIII
	Animal feeding/breeding lots	NextGenEU (EAFRD,EMFA)	IPAIII
Nutrient pollution	Diffuse sources: agriculture	NextGenEU (ERDF, EAFRD, ESF for capacity building)	IPAIII
	Diffuse sources: atmospheric deposition	NextGenEU (EAFRD)	IPAIII
	Diffuse sources: urban run-off	NextGenEU (CF)	LIFE, IPAIII
	UWWTP	NextGenEU (ERDF,CF)	IPAIII
	Industrial point sources (direct discharges)	NextGenEU (ERDF, CF, ESF for capacity building)	IPAIII
	Animal feeding/breeding lots	NextGenEU (EAFRD, EMFA)	IPAIII
Hazardous Substances pollution	Industrial point sources (direct discharges)	NextGenEU (ERDF, CF, ESF for capacity building)	IPAIII
	UWWTP	NextGenEU (ERDF, CF)	IPAIII
	Diffuse sources: urban run-off	NextGenEU (ERDF, CF)	
	Diffuse sources: agriculture	NextGenEU (EAFRD), LIFE	LIFE, IPAIII
	Diffuses sources: landfills, mining sites etc.	LIFE	LIFE, IPAIII

Type of pressure	Measures	Possible financing source/program (EU member states)	Possible financing source/program (non – EU member states)
Hydromorphological alterations	Interruption of river continuity and morphological alterations	NextGenEU (CF), LIFE	LIFE
	Reconnection of wetlands/ floodplains	NextGenEU (ERDF, CF)	LIFE, IPAIII
	Hydrological alterations (quantity and conditions of flow)	NextGenEU (CF), LIFE	LIFE, IPAIII

*Abbreviations are given in the List of abbreviations.

Furthermore, besides above mentioned, several additional instruments/organizations are potentially relevant for acquiring financing in the context of WFD implementation in the Sava RB:

- HORIZON EUROPE, the EU research framework funds research in EU Member States and Non-EU MS.
- The World Bank (IBRD/IDA) and the Global Environment Facility (GEF) provide mostly loans, but also grants, to developed and developing countries, also in the field of environmental protection and climate change adaptation,
- Other European and international banks (the European Investment Bank/EIB and the European Bank for Reconstruction and Development/EBRD) provide loans, mostly to the private sector (but possibly at reduced interest rates), supporting development, climate change adaptation and, mostly indirectly, environmental protection.

10 Integration of water protection in developments in the Sava RB

10.1 Introduction

River basin management and planning, in accordance with the central principal of EU water policy, should take into consideration multiple water dependent sectors as significant water users and/or water polluters. Integration of sectoral policies and coordinated development, could enhance potential synergetic effect, and prevent prospective conflicts, by decoupling future sectoral development with deterioration of the water resources.

Water protection and preservation should be ensured while water resources facilitate the development of the different water dependent sectors. For sustainable water resources management and planning within the Sava RB the most significant integration issues are flood risk management, hydropower development, navigation, and agriculture.

10.2 Flood risk management

Floods are natural phenomena which cannot be prevented. Besides, some human activities and climate change contribute to an increase in the likelihood and adverse impacts of flood events. Occurrence and characteristics of high waters in the Sava RB are greatly influenced by the basin features and shape, geographic and rainfall distribution season, state of the ground water level which affect infiltration of river water, spillage of waters into natural inundations, and by functioning of the flood protection systems. Flood events caused by high water waves in the Sava RB usually occur in autumn and spring. The autumn water waves are usually caused by intensive short rains and can result in extreme high flows. Longer spring flood waves are a result of snow melting, while over the past several years, spring flood events, caused by intensive short and long rains (e.g., event from May 2014) are quite frequent. A specific problem in the basin includes numerous torrential watercourses, which in the flood runoff carry huge quantities of material, which is deposited in riverbeds and prevents regular flow. A significant part of the basin surface is under threat of erosion.

The sustainable flood management is therefore a basis for decision-making at international, national, regional, and local levels. The Sava countries undertake coordinated sustainable flood risk management at the Sava RB level. This coordination has been firmly confirmed and strengthen by entering into force of the Protocol on Flood Protection to the FASRB, on November 27, 2015. The Protocol on Flood Protection defines framework for cooperation and implementation of the activities aimed at creating the conditions for sustainable flood risk management and emphasizes the importance of coordinated measures, works and activities for the reduction of flood risks throughout a river basin, and operation in accordance with “no harm rule” principle.

To contribute to reduction of adverse consequences of floods, especially for human health and life, the environment, cultural heritage, economic activity, and infrastructure associated with floods, the countries in the Sava River Basin agree to cooperate on:

- Undertaking of Preliminary Flood Risk Assessment (PFRA);

- Preparation of flood maps;
- Development of Flood Risk Management Plan (Sava FRMP);
- Establishment of the Flood forecasting, warning, and alarm system (Sava FFWS);
- Exchange of information significant for sustainable flood protection;
- Implementation of all measures and activities of mutual interest, originating from the abovementioned planning documents or activities, or other mutually agreed measures and activities.

In implementation of the commitments, the countries cooperate based on the Floods Directive(2007/60/EC)[36], which sets basis for reduction and management of flood risks, and in coordination with the WFD, also considering good practices of cooperation in the field of flood risk management.

The Sava FRMP represents a milestone in the cooperation within the Sava RB leading towards fulfilment of one of the main objectives of the FASRB – *to prevent or limit hazards and reduce and eliminate adverse consequences of floods*, has been developed according to the requirements of the Protocol on Flood Protection and partially aligned, to the extent possible, with the requirements of the Floods Directive (2007/60/EC).

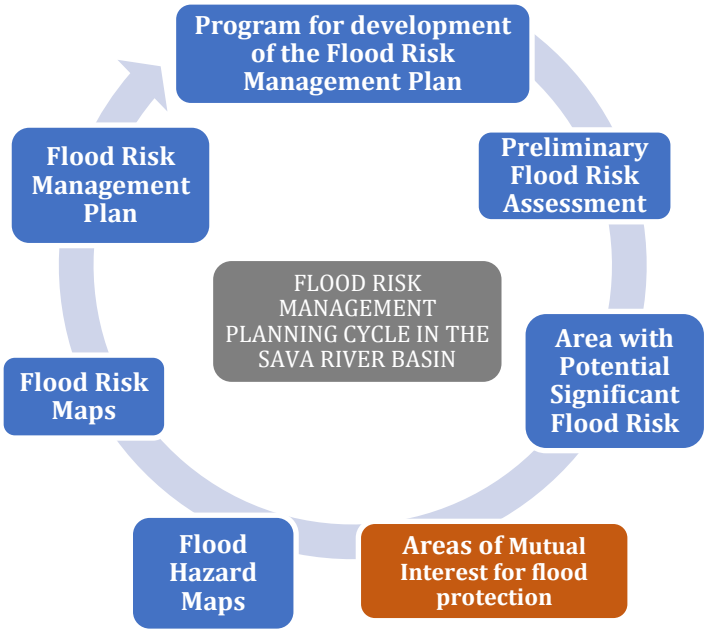


Figure 63: FRM and planning cycle at the Sava RB level

The first joint Sava FRMP[37] was prepared in close cooperation with the relevant national institutions and officially approved by the FASRB Parties at their 8th Meeting held in Sarajevo on October 24, 2019. In addition to the FASRB Parties, Montenegro was also actively involved in the development of the plan, thus ensuring the integrity of planning for the entire basin. The Sava FRMP establishes joint objectives of flood risk management in compliance with principles of long-term sustainability, identifies non-structural measures and structural measures in areas of mutual interest for flood protection and enables consistent and coordinated approach in managing flood risks at the level of entire

[36] Directive 2007/60/EC of the European Parliament and Council on 23 October 2007 on the assessment and management of flood risk

[37] Sava Flood Risk Management Plan - International Sava River Basin Commission (savacommission.org) available on the official languages of the FASRB Parties, as well as in English and Montenegrin

Sava RB. The preparation of the Sava FRMP respected the specific conditions of the Sava RB countries regarding the different stages of the EU accession process. Preparing the Sava FRMP under such conditions required a good international coordination and appropriate compromises when processing and evaluating information collected at different implementation stages at the national levels.

As the basic units for analysing the flood risks, based on the national areas with potential significant flood risk, the Sava FRMP identified 21 areas of mutual interest for flood protection at the Sava RB level (AMIs).

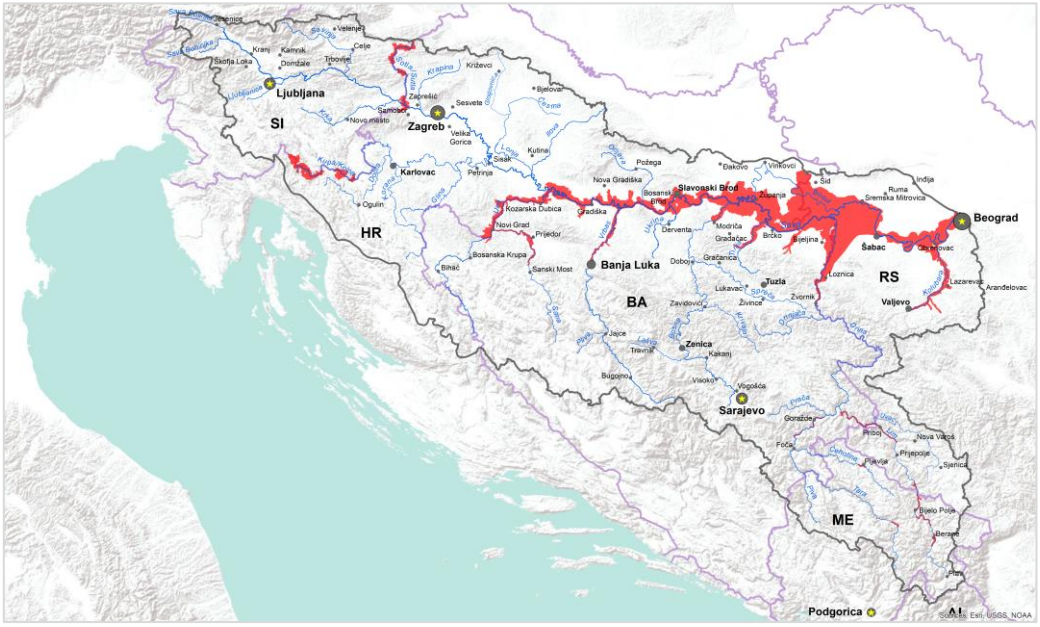


Figure 64: Areas of mutual interest for flood protection at the Sava RB level (AMIs)

AMIs are spread at the surface of 5,659 km^2, representing 5.8% of the Sava RB area and home to 1.4 million people. In AMIs, 38 structural measures were identified with a total value of over € 250 million altogether with 42 non-structural measures that mostly relate to the entire AMIs or the Sava RB. The implementation of the measures will strongly contribute to meeting the commonly agreed objectives – avoidance of new flood risks, reduction of existing flood risks during and after the floods, strengthening resilience, raising awareness about flood risks, and implementing solidarity principle. Coordination mechanisms at the Sava RB level, and cooperation in case of extraordinary flood defence were also analysed within the Sava FRMP along with recommendations for improvements.

In the period during development and after approval of the Sava RBMP, many actions related to the sustainable flood risk management planning were performed on the basin-wide level, while establishment of the *Flood Forecasting and Warning System in the Sava River Basin (Sava FFWS)* was a very important step in implementation of the Protocol and non-structural measure.

Sava FFWS was put it into operational use in October 2018 as a successful effort of ISRBC done in close cooperation with the relevant national institutions of the Sava countries. The Sava FFWS is a unique forecasting system at the international level, implemented as an open and flexible platform for managing the data handling, and forecasting processes, allowing a wide range of external data and models to be integrated.

The Sava FFWS concept is particularly important for the five Sava countries, each with its own specifics in terms of organization of the water sector, stage of monitoring and forecasting systems' development, and legal and regulatory framework for flood risk management. The Sava FFWS servers are installed in the four countries and are consisted of one primary and three back-up installations in the national institutions, while the archive and web servers are located in the ISRBC.

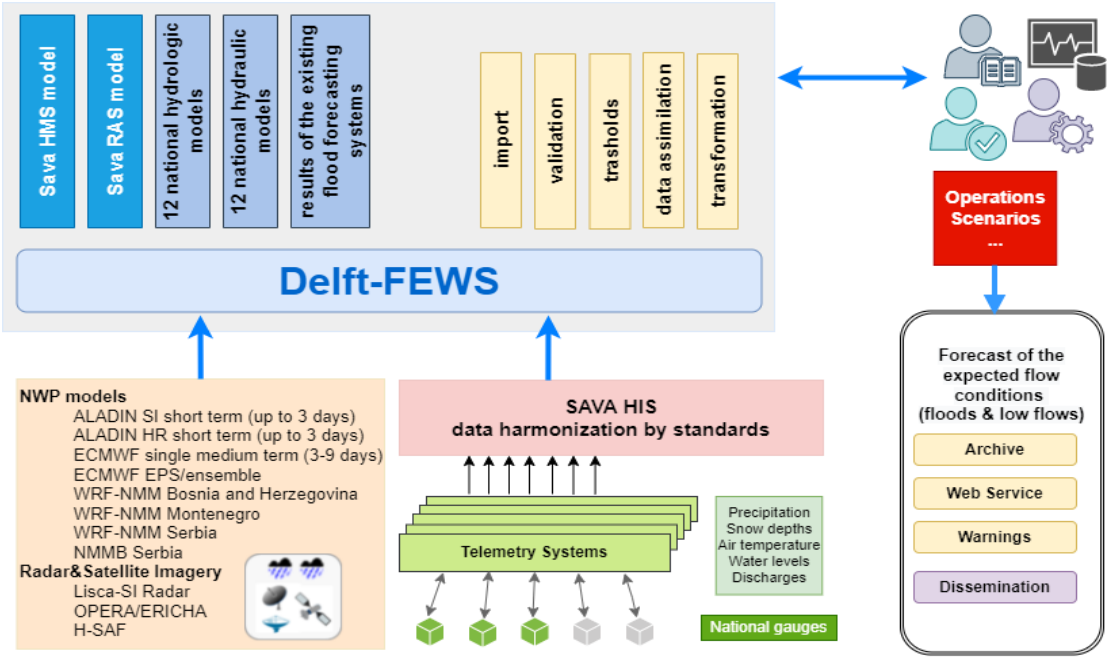


Figure 65: Overview of the Sava FFWS

The system is currently used by 10 organizations – hydrometeorological services and water agencies. In order to ensure the smooth operation of the system and its regular maintenance, and performance control of the system, as well as training of engaged personnel, in July 2020 the Sava countries signed the Memorandum of Understanding on cooperation concerning regular functioning and maintenance of the Sava FFWS. This agreement will ensure the long-term sustainability of the Sava FFWS as well as its further developments.

10.2.1 Priority pressures and related impacts in connection to floods

Flood protection structures can adversely affect river morphology, interrupt river continuity, and have impact on sediment transport. These interventions can significantly impact natural river dynamics and habitat of water dependent ecosystems which may results in the deterioration or not achieving the good water status. Furthermore, flooding of industrial areas, contaminated sites or waste disposal locations can cause accidental water pollution, affecting water quality, river ecosystems and human health. Pollution from rivers, during flooding, can reach protected areas. Consideration should also be given to waste water treatment plants if they are located in a floodplain.

In the Sava RB 26 SWBs (11 natural and 15 HMWBs) on the Sava River with length of 826.43 km and 70 SWBs (55 natural and 15 HMWBs) on the tributaries with length of 1,569.44 km are located in the AMIs. Many of SWBs located in the AMIs have poor

chemical, but more important is their moderate, poor, and bad ecological status or potential, considering that the flood protection within the Sava RB is recognized as the one of the main drivers for heavily modify water body designation.

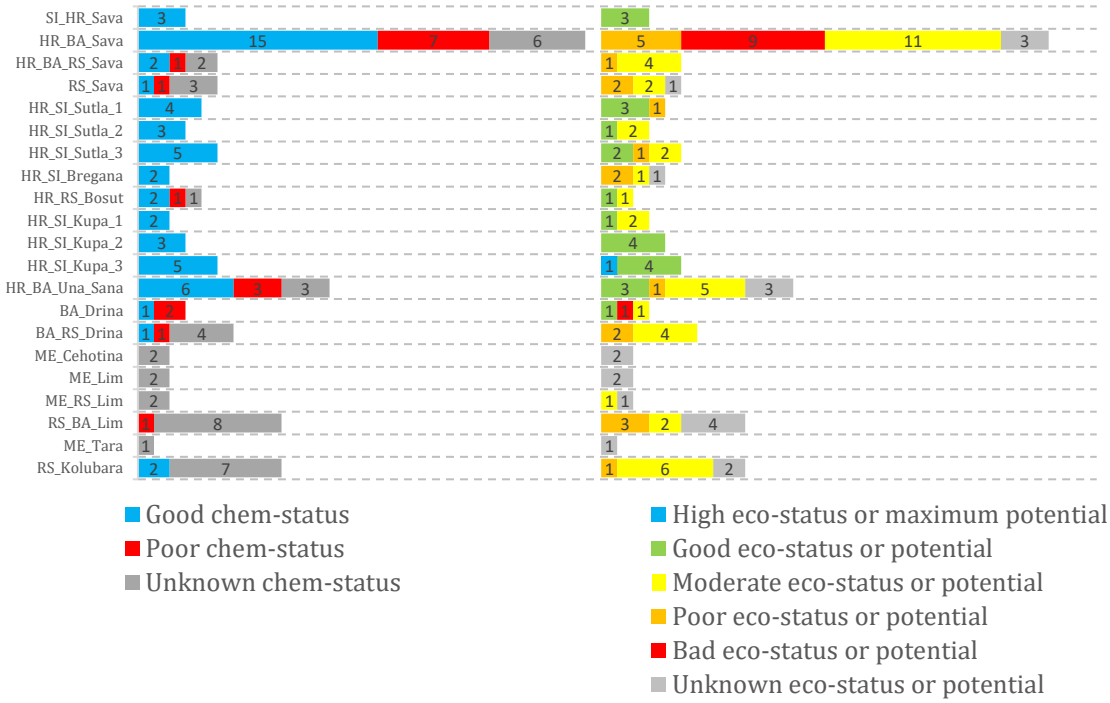


Figure 66: Overview of the SWBs' chemical and ecological status in AMI areas

10.2.2 Best practices to achieve the environmental objectives

Measures presented in the Sava FRMP represents a wider approach to flood risk management, observing the water bodies and their ecosystems in a holistic way – as an integrated part of environment. With such wider approach, the structural flood protection measures can also generate numerous positive effects in achieving good ecological status/potential of water bodies, which is the basic objective of the WFD. The Sava FRMP considered a preliminary assessment of the proposed structural measures, from the aspect of their potential synergies with environmental goals set forth in the WFD, following its requirements, recommendations, and guidelines for achieving potential synergy and coordination of the Floods Directive(2007/60/EC) and WFD.

Non-structural measures of the Sava FRMP in addition to other relevant principles (information exchange, improvements to data collection systems, as well as modelling and forecasting, and warning systems) included proposals for planning of more space for natural retention of water and recovery of previously flooded areas and better spatial planning. Development of capacities for retention of floods has been recognized as significant not only for the Sava River, but also for its tributaries, especially those with transboundary or downstream impact. Given the existence of large dams and reservoirs with downstream impacts that can cause material, human, and ecological catastrophes a timely analysis of their transboundary impacts were proposed, as well as analysis of improvements of the flood retention capacities, and better coordination among the Sava

countries in solving issues of mutual interest. Measures for sediment discharge were also emphasized as important for prevention and protection from flood risks.

Structural measures of the Sava FRMP represent a compilation of the measures defined based on the national FRM plans, the water management strategies, the information on the flood related projects and activities, regularly exchanged through ISRBC, and additional information based on proposals of the countries. These measures stressed the need for regular maintenance of the flood protection structures but also the reconstruction as well as the construction where necessary and where no other measures are possible to prevent catastrophic consequences.

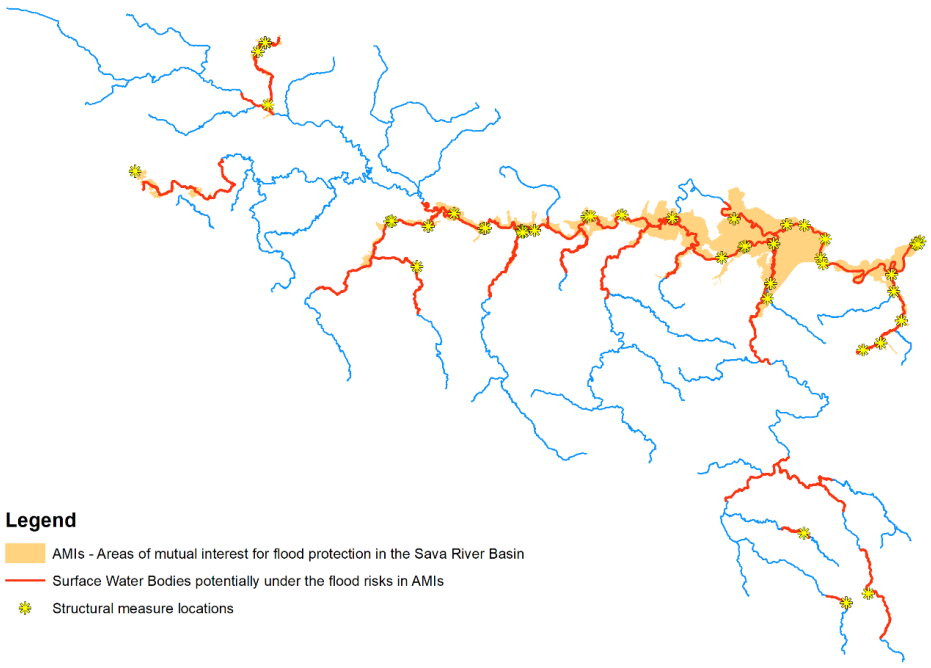


Figure 67: Overview of the SWBs within AMIs and locations of the structural measures listed in the Sava FRMP

Particular focus was put on analysis of national structural measures planned in AMIs, i.e., construction works planned by the countries in the forthcoming period. For each individual measure the following has been analysed: (1) the intensity of the potential adverse environmental impact, (2) the environmental vulnerability of the project implementation area, (3) possibility of transboundary impact, and (4) the proposal of basic measures to mitigate adverse impact. As a result, the preliminary assessment of potential environmental impact of the measures was carried out and the impact of measures has been categorized as follows:

- High: planned intervention is complex and may lead to significant irreversible environmental impacts, and/or the measure is located in vulnerable area, and/or requires application of complex measures for mitigation of impacts, and/or has significant transboundary effects (e.g., construction of dams, retentions, reservoirs);
- Medium: planned intervention is of medium complexity, but is implemented in vulnerable area, and/or is a linear project of significant duration, negative impacts require application of standard mitigation measures (e.g., construction of long embankments, discharge channels, regulation of river bed);

- Low: planned intervention is less complex, and no significant negative environmental or social impacts are expected, it requires application of simple mitigation measures (e.g., reconstruction and elevation of embankments, rehabilitation of shore defence structure, cleaning up of channels, reconstruction of pumping stations, and so on).

The main constraint during the analysis was the fact that projects are in different stages of development, some at the level of the proposal/concept, with insufficient information about the scope of the project and its components. In addition, during assessment of the environmental vulnerability, information about internationally protected Natura 2000 sites which were used, are official in Slovenia and Croatia, while in Serbia, Bosnia and Herzegovina and Montenegro are at the level of a proposal. It should also be emphasized that the proposed measures have a wide range of coverage – from complex systems to smaller reconstructions.

Potentially high environmental impact was recognized for 2 measures that are related to the construction of multipurpose reservoir and the river flow regulation. Implementation of the related projects may require larger land use, loss of fertile agricultural land, relocation of population, removal of roads, or adverse impact on protected habitats.

Medium environmental impact was rated for 18 measures (that include 19 projects). These projects mainly relate to the construction of dykes along the Sava River and riverbank protection structures, the construction of complex protective systems, the regulation of torrential tributaries.

Low impact was rated for the remaining 18 measures that relate to reconstruction and extension of dykes, reconstruction of riverbank protection structures, cleaning of channels, etc. Although several of these measures are located in protected areas, they do not represent significant environmental risk due to technical type and limited scope, and procedures to mitigate their impact are well known and simply applicable through the best management practices.

Although a lot of analyzed projects are located at the transboundary rivers, the expected environmental impact of these projects is spatially limited to local level, without significant transboundary effects.

The national regulations require implementation of a detailed and formal EIA study during the planning procedure and the permits obtaining for implementation of the planned measures. During preparation and implementation of all the measures, it is necessary to perform a detailed WFD Compliance Assessment and to define measures to mitigate the impact on the ecological status/potential of water bodies. Depending on the degree of compliance of the national legislation with the EU regulations, this can be implemented as a separate process, or for example as part of the EIA procedure.

When planning future measures in the forthcoming planning period, it will be of great importance to preserve existing retentions and natural floodplains that represent great ecological value in the basin. The Sava River flood protection system is notable for the preserved large natural retentions (Lonjsko polje, Mokro polje, Kupčina, Zelenik and Jantak) which have, together with the system of relief canals, a large positive impact on the flood regime in Croatia, as well as in the neighboring and downstream countries. In general, the large retention areas of the Sava are among the most effective flood control systems in Europe and of great ecological value.

10.3 Navigation

10.3.1 Priority pressures and related impacts in connection to navigation

Inland water transportation (IWT) is, in comparison to air and road transport, seen as more environmentally friendly and energy efficient, and can therefore contribute to sustainable socio-economic development of the region. A multimodal use of available transport possibilities (road, rail and IWT) has to be ensured. Transport policies to promote modal shift to rail and waterborne transport, as articulated for example in the EU's 2003, 2006 and 2011 Transport White Papers, European Green Deal and EU Sustainable and Smart Mobility Strategy 2020, are driving a wave of proposals for investments in waterway infrastructure, supported by the International Finance Institutions and the CEF programme of the EU.

Transport accounts for a quarter of the European Union's greenhouse gas emissions and these continue to grow. The European Green Deal seeks a 90% reduction in these emissions by 2050 and inland waterways, where unused potential exists, have to play an increasing role in achieving this objective. The European Green Deal calls for a substantial part of the 75% of inland freight carried today by road to shift to rail and inland waterways. To meet this goal will also require appropriate infrastructure to be developed.

Inland navigation offers important opportunities to move cargos on the Sava River instead on the roads, in an energy efficient manner (e.g., with regard to costs of goods transported per tonne-kilometre). It can contribute to mitigating road congestion on some routes. Making more intensive use of the free capacities of the Sava RB waterways can contribute to coping with traffic volumes in a manner that is environmentally and socially friendly, taking advantage of non-structural measures (such as fleet innovation) as well as infrastructure investments.

Considering the above-mentioned facts and the very favourable geopolitical position of the Sava River, which connects four countries of Southeast Europe and can serve as a link between the Adriatic and the Danube, the countries in the Sava RB have committed to sustainable development of inland navigation on the Sava River and its tributaries. This is one of the main goals of the FASRB, which is the basis of cooperation between the countries and is implemented under the auspices of the Sava Commission. In this regard, the Sava Commission and the Member States undertook a number of activities, including the preparation of studies necessary for the rehabilitation and development of the Sava River waterway, a development of number of rules and regulations in order to improve navigation safety, as well as the re-establishment of the waterway marking system on the Sava River.

In the field of navigation, it is obvious that the main and central priority of the Sava RB countries is the rehabilitation and development of navigation on the international part of the waterway, which includes the soonest possible waterway rehabilitation in accordance with the agreed navigability class, followed by a proper and regular maintenance and marking of the waterway. On a long run, continuation of the activities on the upgrading of the navigability class of the international part of the waterway, as well as the extension of navigability of the Sava River upstream of Sisak, will be considered, depending on the transport needs, tourism development and the environmental protection requirements.

In order to achieve the above-mentioned objective, it is necessary to:

- urgent start with the works on removing the most critical navigation bottlenecks on the Sava River waterway;
- coordinate activities on the rehabilitation of the Sava River Waterway and implementation of the *Joint Statement on Guiding Principles on the Development of Inland Navigation and Environmental Protection in the Danube River Basin* (Joint Statement);
- cooperate with the EU and other international organizations on initiatives and projects for the development of inland navigation;
- secure financing for the dredging and training works;
- properly and regularly maintain and mark the waterway;
- coordinate the operation of RIS;
- investigate the possibility for extension of navigability upstream of Sisak;
- facilitate the development of the sector and modernization of the IWT with the aim to achieve the goals of the European Green Deal.

Inland navigation can contribute to making transport more environmentally sustainable, particularly where it substitutes for road transport. On the other hand, it can also have significant influence on river ecosystems, jeopardizing the goals of the WFD

Of decisive effect are river engineering measures that impair the original hydro-morphological situation (e.g., bed-load transport, morpho-dynamic development of the channel network, exchange processes between rivers and floodplains, groundwater regime) and/or the natural composition of ecological communities (e.g., through barriers for migratory fish species or destruction of riverbank and riverbed habitats and spawning places). Navigation requirements can result in a stabilized, single thread, ecologically uniform river channel, lacking both natural in-stream structures with their gentle gradients and connectivity with the adjacent floodplains. In addition to other hydromorphological alterations this might lead to the loss of species.

In addition to hydromorphological impacts, navigation can also have other impacts on the water environment, such as pollution. From the mechanical point of view, ship traffic causes waves, which can disturb the reproduction habitats of fish, benthic invertebrates, other biota as well as de-root aquatic plants. Ship engines can also cause an unnatural suspension of fine sediments, leading to reduced light for plant and algae growth.

Inland water transportation and ecological integrity have certain basic needs to enable them to function and in order to develop mutually acceptable solutions such needs must first be clearly defined and further carefully balanced.

10.3.2 Best practices to achieve environmental objectives

In order to undertake activities to establish sustainable water management through appropriate measures to, at least, maintain and, if possible, improve environmental conditions in the Sava RB, the Sava River Basin Countries and Sava Commission gave special importance to sustainable and environmentally friendly development of navigation on the Sava River Basin. In this sense, the rehabilitation and development of the Sava River waterway should support is sustainable, environmentally, and socially responsible economic development in the Sava RB and the whole region.
Due to the fact that IWT plans, and projects have environmental implications an environmental assessment must be undertaken prior to decision making. This is required

by the SEA Directive (2001/42/EC)[38] for qualifying plans, programmes, and policies and is required by the EIA Directive (85/337/EEC)[39] for qualifying projects. This should govern actions with regard to future projects and studies of the waterways of the Sava RB.

In order to achieve good ecological status or good ecological potential for all surface waters and to prevent the deterioration of ecological status - according to the WFD - it is necessary to establish an integrated planning philosophy. A multi-purpose river landscape should be the ultimate goal (including, for example, the provision of habitats for flora and fauna, flood protection, inland navigation, fishing, tourism).

Recognizing the potential conflict between the development of inland waterway transport and WFD implementation the Sava Commission, together with the ICPDR and the Danube Commission, was one of the main driving forces in the process of drafting the Joint Statement adopted by the three commissions in December 2007/ January 2008. The Joint Statement was considered when drawing up plans for the development of waterway infrastructure, which were prepared after the statement was made. According to the Joint Statement, the future approach should strike a balance between navigation and environmental needs. In terms of ensuring their functioning, IWT and environmental integrity have certain basic needs. In order to develop solutions acceptable to both parties - first of all it is necessary to clearly define these needs. However, not all needs can be met in all cases. The implementation of the new, integrated planning policy aims to put things in the right place and help ensure the sustainable development of IWT and achieve all the required environmental goals. In addition, environmental mitigation or restoration measures should be proposed to prevent deterioration of ecological status as well as to ensure that environmental objectives are achieved. Both pressures and measures need to be identified through mutual agreement. This goal should be achieved within an interdisciplinary process. It is necessary to identify opportunities to improve both environmental and navigation conditions through a common approach to the project.

The Joint Statement summarizes principles and criteria for environmentally sustainable inland navigation on the Danube and its tributaries, including the maintenance of existing waterways and the development of future waterway infrastructure.

The `Joint Statement´ is a guiding document:
- for the development of the Programme of Measures requested by the WFD
- for the maintenance of current inland navigation;
- for planning and investments in future infrastructure and environmental protection projects.

The Joint Statement contains a list of navigation needs, respective measures, their general effects, and specific pressures on ecology. Ecological measures to achieve and ensure the environmental objective/sustainability are included. These measures should be referred to in setting the Programme of Measures for the Sava RB.

On the other hand, considering the existing navigation on the Sava River and in an attempt to improve regulations related to water protection, in 2007 the Sava Commission drafted the Protocol on Prevention of Water Pollution Caused by Navigation to the FASRB, which was signed at the second Meeting of the Parties to the FASRB June 1, 2009, in Belgrade

[38] Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment

[39] Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment

and entered into force on October 8t, 2017, aiming to prevent, control and reduce pollution from vessels, by implementation of following activities:

- equip the ports open for international traffic with required reception facilities for the collection of waste occurring on board;
- develop and implement a set of best available techniques and other measures, in order to identify the structure of special and contracted technical facilities, required for the response to spills, as well as the structure of the spill response organization;
- ensure immediate notification of pollution, especially transboundary, by means of effective communication networks, and take effective emergency response measures
- develop a program of joint action to prevent water pollution from shipping and establish a mutual information system.

10.4 Hydropower production

Hydropower production is identified as the main driving force for hydromorfological alteration as well as for HMWB designation within the Sava River Basin, affecting flow regime, river and habitat continuity, physico-chemical conditions, and natural sediment dynamics.

Impoundments, the major type of the hydrological pressures in the Sava RB, affect 63 SWBs (19 transboundary), 8 on the Sava river and 55 on the tributaries Vrbas, Drinjača, Spreča, Drina and Lim in Bosnia and Herzegovina, Kupa, Korana, Česma, Sutla, Orljava,Ilova, Glogovnica and Dobra in Croatia, and on the rivers Drina, Lim, Uvac and Bosut in Serbia and the Piva and Ćehotina in Montenegro. Total length of impounded SWBs represents 174.0 km on the Sava River (14% of the SWBs length) and 930.8 km on the tributaries (19% of the SWBs length).

Hydropeaking, as artificial water level fluctuation caused by hydropower generation, provokes alteration of discharge patterns along the river and can negatively affect water dependent ecosystems and other water uses,affects, with a difference in the significance, 25 SWBs in the Sava River Basin (6 on the Sava river and 19 on the tributaries Dobra in Croatia, Drina, Lim and Vrbas in Bosnia and Herzegovina and Drina and Lim in Serbia). As well hydropower is a driver causing 26 interruptions of river continuity and habitat, of which 6(5) are enabeling fish migration (HE Brežice, HE Krško, HE Arto-Blanca, HE Zvornik and MHE Ustiprača).

The number of 20 hydropower plants in the Sava RB with installed capacity exceeding 10 MW remains the same as in the previous planning cycle. In Slovenia, most of the plants are located on the Sava River, while in the other Sava countries the plants have been built on major tributaries (Drina, Vrbas, etc.). There are a large number of small and micro hydropower plants in Slovenia. The total installed capacity of the plants is 2,449 MW with yearly production of 6,445 GWh/year.

Table 47: Hydropower plants in the Sava RB with installed capacity exceeding 10 MW

Country	Name of the HPP	River	Installed		Average yearly production [2005-2007] (GWh/year)	Countries share in	
			Capacity (MW)	Discharge (m^3/s)		Average total production	Installed capacity
SI	Moste/ Završnica	Sava	21	35	64	9%	8%
	Mavčiče	Sava	38	260	62		
	Medvode	Sava	26.4	150	77		
	Vrhovo	Sava	34	501	116		
	Boštanj	Sava	33	500	115		
	Blanca	Sava	43	500	160		
HR	Gojak	Donja Dobra	55.5	57	213,5	4%	4%
	Lešće	Dobra	42	122.7	102		
BA	Bočac	Vrbas	110	240	308	29%	21%
	Višegrad	Drina	315	800	1,120		
	Jajce I	Pliva	60	74	259		
	Jajce II	Vrbas	30	80	181		
RS	Zvornik	Drina	96	620	515	46%	52%
	Uvac	Uvac	36	43	72		
	Kokin Brod	Uvac	21	37	60		
	Bistrica	Uvac	103	36	370		
	Bajina Bašta	Drina	360	644	1,691		
	Potpeć	Lim	51	165	201		
	RHE Bajina Bašta*	Drina	614	129	n/a		
ME	Piva	Piva	360	240	788	12%	15%
		Total	**2,449**		**6,445**	100%	100%

10.4.1 Best practices to achieve environmental objectives

Recognition of the pressure significance imposed on the SWBs within the Sava RB, by the hydropower operation and further development, highlights the importance of the broad discussion and multi sectoral cooperation among water management, hydro-power, environmental protection, and nature protection sector, and all relevant stakeholders.

Riparian countries and the Sava Commission are active in the several initiatives on the regional and Danube RB level, focused on dialogue facilitation between the sectors to achieve a common understanding of the topic. and with the objective to ensure water, nature and environmental protection as well as sustainable water resource management, and development of the region.

On the Danube RB level, ICPDR initiated a broad multisectoral dialogue resulting in the adoption of the "*Guiding Principles on Sustainable Hydropower Development in the Danube Basin"* in 2013. The guiding principles, as a reference document for the whole Danube RB, provides the principals for sustainable hydropower strategic planning and development, putting in focus technical upgrade of existing HPP towards ecological restoration, strategic planning approach for new hydropower development, and provides measures for mitigation of negative effects of HPP. Regarding the technical upgrade, it highlights that the technical upgrade on existing HPP should be promoted to increase energy production and should be linked to ecological criteria for the protection and improvement of water status. In the process of strategic planning, a two-level assessment is

recommended i.e., national/regional assessment followed by project specific assessment. In the first step assessment of those identified river stretches where HPP is forbidden by national/regional legislation, while in the second step all other stretches should be assessed. The new HPP should be directed to those areas where minimum impacts on the environment are expected. A project specific assessment provides a more detailed and in-depth assessment of benefits and impact of concrete HPP, in order to assess whether HPP is appropriately tailored for the specific location. New policy developments should be reflected accordingly, and incentive scheme for new HPP should take into account the result of strategic planning approach, and adequate mitigation measures. Mitigation measures have to be set to minimize negative impacts on aquatic ecosystems, ensure fish migration and ecological flows, improve sediment management, minimize negative effects of hydropeaking, maintain groundwater conditions, and restore specific habitats and riparian zones.

Under the UNECE Water Convention, the UNECE in cooperation with the international and national experts and the Sava Commission, coordinated the process of the assessment of water-food-energy-ecosystem services Nexus in the Sava RB. The aim of the Nexus have been to foster transboundary cooperation by identifying intersectoral synergies, and determining measures that could alleviate tensions related to the multiple needs of riparian countries for shared resources. It has been noticed that the natural resources of the Sava RB are the key to the current and the future development of the Sava countries. The resources are strongly interlinked, and under increasing pressure. It has been stressed that the transboundary Nexus approach, enabling cross-sectoral and cross-country interventions, is needed to address current challenges. The Sava Nexus assessment has identified a list of solutions to address specific intersectoral challenges in the Sava RB. These include institutional (e.g., improvement of relatively well-developed governance architecture by clarifying role and responsibilities), information (to develop shared knowledge base and access to information) and infrastructure solutions (e.g., promotion of multiple and flexible use of infrastructure). International coordination and cooperation at the basin and the regional level offers opportunities to “manage the nexus” beyond of what is possible at national level. Many benefits of adopting a transboundary nexus approach in intersectoral cooperation within the Sava RB have been identified through the process, related to and independent of economic activities.

The NEXUS approach has been implemented also in the Drina RB, to enhance water, energy, and food security by increasing efficiency, reducing trade-offs, building synergies, and improving governance, whilst also protecting ecosystems. It contributes to the implementation of the Sustainable Development Goals in Montenegro, Bosnia and Herzegovina and Serbia. One of the main challenges has been co-optimization of the flow regulation. It has been suggested that the overall policy direction should prioritize improving of the cooperation in the operation of dams and hydropower plants, exploring the opportunities generated by electricity trade between the Drina countries, and encouraging the implementation of energy efficiency measures.

10.5 Agriculture

Interlinkages between water management and planning, and agriculture are numerous. Development of the agricultural sector requires water in significant amount and of appropriate quality, facing water management issues like flooding, water pollution, water scarcity and droughts. Furthermore, agriculture can pose significant risk to ground and surface water resources in terms of quality and quantity, affecting the ecological and chemical status of surface water as well quantitative and qualitative status of ground water bodies.

Agricultural activities represent challenges to fulfilment of the WFD objectives related to water pollution from nutrients or agricultural chemicals, alteration of hydrological regimes by water abstraction for irrigation or land drainage, hydro morphological alterations caused by changing gazing patterns which can affect land use in the riparian zones or by soil erosion.

Legal background for regulation of agricultural activities related to water protection and preservation is based on EU level, upon following directives and EU CAP, while for non-MS countries on the national policies whose harmonization with EU acquis, , in terms of transposition, implementation, and enforcement, is still ongoing.

- Nitrates Directive (91/676/EEC);
- Directive on sustainable use of pesticides (2009/128/EC);
- Directive on industrial emissions-IED (2010/75/EU);
- Directive (98/83/EC) on the quality of water intended for human consumption;
- Sewage sludge Directive (83/278/EEC).

In the Sava RB agricultural land occupies 40% (3,897,700.73 ha) of its territory. The share of specific agricultural land use types is presented on the Figure 68. The majority of the agricultural area (1,497,299.54 ha) is used by complex cultivation patterns, mosaic of small, cultivated land parcels with different cultivation types -annual crops, pasture and/or permanent crops, eventually with scattered houses or gardens.

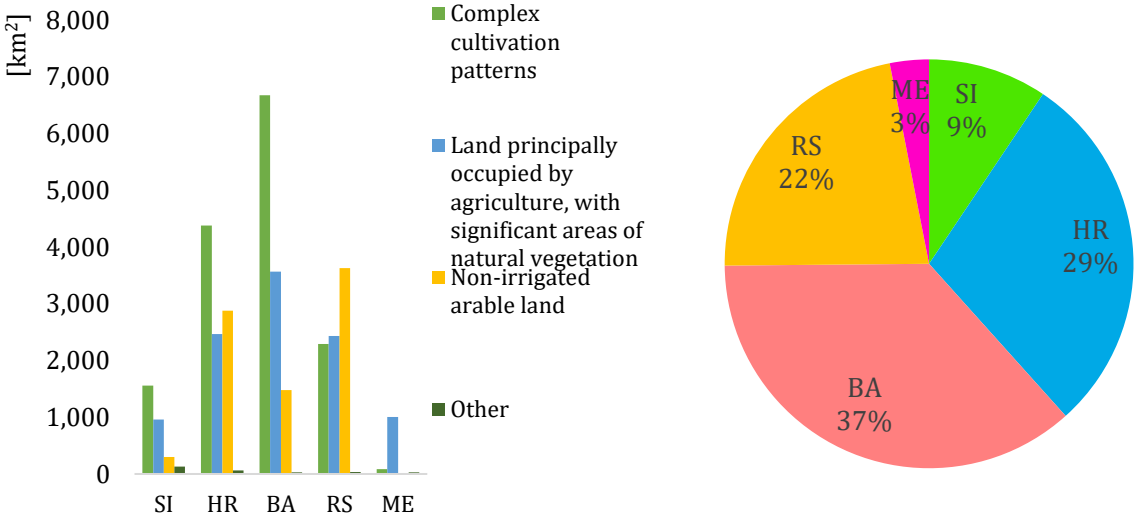


Figure 68: (A) The type of agricultural land in the SRB (B) Contribution of agricultural area to total agricultural land in the SRB

Recognizing the need and the necessity of effective cooperation of water and agriculture sectors, steps towards development of the knowledge base and discussion on their interconnection have been taken in Sava RB under the umbrella of ICPDR during the preparatory phase of the Guidance Document on Sustainable Agriculture in the Danube River Basin. It aims to provide recommendations for the Danube countries on possible policy tools, financing programs, and targeted measures in order to be more efficient in pollution load reduction, prevention of the new pollution hot-spots, and also to ensure resilience to climate change.

Agricultural sector is important economic activity in all Sava RB countries. Agriculture represents 2.5% of GVA in Slovenia, 4% in Croatia, 7% in Bosnia and Herzegovina and 10% in Serbia, with a share of the total employment of 7.8% in Slovenia, 7.6% in Croatia, 18% in Bosnia and Herzegovina and 10% in Serbia. Unfavourable condition for agricultural development throughout the basin is represented by many small unspecialized family farms which have unfavourable age structure, knowledge level, and technological equipment. The average farm size in Slovenia is 6.9 ha, in Croatia 5.6 ha in Serbia 5.4 ha (with the high variety of farm area in different regions, where in the farm size in low land Vojvodina region is 10.9 ha while 48% of the farmers have the holdings smaller than 2 ha).

Share of livestock production in the total value of agricultural production is highest in SI and account 46 % while it is 37.5% in Croatia, 37% in Bosnia and Herzegovina and app 30% in Serbia. Small production units predominate, especially for cattle, pigs, sheep, goats, and horses, while poultry production is characterized by large-scale production units. The crop production is dominant agriculture activity in all riparian countries. The most significant agricultural activities are, in order of importance: corn and wheat production, oil plant production (soy and sunflower), orchards and vineyards.

Future expected changes, by 2025

In accordance with the available information the future development of the agricultural sector, by 2025: (i) in Slovenia livestock production will remain the most important activity due to relatively small share of arable land and permanent crops. Production of meat and cereals is likely (wheat and corn maize) to increase. Due to environmental legislation intensification of livestock production will be limited. The number of agricultural holdings is likely to decline to around by 13% and the number of employees in agriculture is likely to decrease by 25% (compared to 2016); (ii) In Croatia the number of agricultural holdings is expected to decline (vineyards, dairy cows, and poultry the most), as well the number of employees by 15% (in comparison to 2013). Due to changes in farm structure livestock density is expected to decline and the production to be intensified. (iii)In Bosnia and Herzegovina no changes are expected on the farm structure. The area of arable land and permanent grassland in the period 2005-2015 remains stable while the area under permanent crops increased around 7% and will continue to grow with the same rate. The number of employees in agriculture is likely to decline by 13% compared to the level observed in 2015. (iv) In Serbia the number of farms is rapidly reducing with continuous increase in average size of holdings changing the production structure and the level of specialization of agricultural holdings. It is expected that livestock production and the production of cereals will increase for more than 50%. Areas of irrigated and drained agricultural land will increase per more than six times (covering about 250,000 ha of the territory of RS).

10.5.1 Best practices to achieve environmental objectives

A combination of basic measures and supplementary measures are expected to reduce agricultural pressures in water bodies to level compatible with the achievement of the WFD. The most-relevant measures associated with reducing nutrient and organic matter pollution from agriculture are related to (i) reduction of the nutrient pollution in agriculture in accordance with, and beyond the requirements of the Nitrates Directive (91/676/EEC), (ii) reduction of the pesticide's pollution in agriculture and (iii) development of the advisory services for agriculture that may facilitate the implementation of all selected measures.
For the successful implementation of cost-effective agro-environmental measures regarding land (buffer strips/zones along a water body), water (water saving measures such as change in irrigation practice and water storage), fertilizer and pesticides, plant management or, manure storage and disposal of animal waste, their integration into related sectoral policy documents is of a great importance. Furthermore, clear objectives of measures implementation, and the set of appropriate indicators should be selected or developed. Finally, of a great importance is that expected impacts of measures on the water status are clearly defined and communicated to the relevant stakeholders.

To achieve environmental objectives and to promote integrated river basin management, the WFD calls for the application of economic principles (e.g. the polluter pays and user pays principle), economic approaches and tools (e.g. cost effectiveness analysis) and instruments (e.g. water pricing). This type of measures should support the selection of a program of measures based on cost effectiveness criteria, assessed potential role of pricing in these programs of measures, which have implications on cost recovery evaluation, and the costs of process and control measures.

The major needs for successful implementation of agro environmental measures, better coordination, and alignment between water and agricultural policies, and development of common strategies and joint actions in the Sava RB countries, are:

- Establishment of a comprehensive framework for successful transposition and further harmonization with relevant EU directives;
- Establishment of a monitoring network that will provide relevant data for the assessment of the pollution load from agriculture, and their effect on the status on surface and ground water;
- Better understanding of the agro-environmental indicators, which can facilitate their selection, and establishment of their regular monitoring and assessment;
- Establishment of data base that would enable analysis to be carried out regarding water quality, water infrastructure, water use and economic issues in agriculture, to establish and follow trends and agricultural influence on the environment and also facilitate better policy– programming and long term investing plans;
- Establishment of cross sectoral platform for data and knowledge exchange which can facilitate and promote implementation of agricultural measures with focus to sustainable water use and water protection.

11 Climate change and RBM planning

11.1 Introduction

Climate change poses significant and complex challenges for transboundary water basins worldwide. As climate change increases, transboundary cooperation on adaptation and resilience-building strategies is essential to advancing sustainable development and ensuring social and political stability for basin countries and their people. The climate in the Sava riparian countries has already changed noticeably, with increases in temperatures, changes of precipitations, and more frequent and more intense extreme weather events (longer periods of drought and shorter and locally distributed periods of intense precipitation in the future predicted in all countries with an increasing risk of flooding). The climate change impacts the water resources, water quality, and economic sectors like agriculture, forestry, hydropower production, navigation, industry, tourism, as well as settlements, and ecosystems.

11.2 Legal background

Several existing policies and EU Directives contribute to efforts for adaptation to climate change regarding water issues. The most important ones are (i) WFD through which, although not explicitly addresses climate change adaptation, Member States agreed to consider the impact of the climate change in the implementation process; (ii)Floods Directive (2007/60/EC) and (iii) the EU strategy on adaptation[40] to climate change adopted by the European Commission which aims to make Europe more climate resilient. Besides the EU legislation, at the international level the most important documents relevant for the climate change adaptation are:

- The Paris Agreement adopted on 12 December 2015 by the 21st Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC)[41] which calls states for stronger adaptation commitments, being explicit about the multilevel nature of adaptation governance, and outlined stronger transparency mechanisms for assessing adaptation progress.
- Climate Adaptation Strategy for the Danube River Basin[42] developed by the ICPDR is based on a step-by-step approach and encompass an overview of relevant research and data collection, a vulnerability assessment, ensuring that measures and projects are climate proof, respectively “no regret measures”.
- Guidance on Water and adaptation to Climate Change[43] developed by UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention) aims to support decision makers from the local to the transboundary and international levels by offering advice on the water management and water-related challenges caused by climate change, and for development of the adaptation strategies.

At the Sava RB level, the following projects have addressed the climate change adaptation:

[40] https://ec.europa.eu/clima/policies/adaptation/what_en
[41] See http://unfccc.int/paris_agreement/items/9485.php
[42] ICPDR (2013): ICPDR Strategy on Adaptation to Climate Change
[43] UNECE (2009): Guidance on Water and Adaptation to Climate Change, availble at https://www.unece.org/fileadmin/DAM/env/water/publications/documents/Guidance_water_climate.pdf

- Water – Food – Energy – Ecosystems Nexus Assessment in the Sava River Basin, implemented within the Programme of Work for 2013–2015 under the UNECE Water Convention (finalized in 2015)[44];
- Danube Water Nexus Project – Sava Case Study, implemented by the EC Joint Research Centre[45] (finalized in 2016);
- Water and Climate Adaptation Plan for the Sava River Basin (WATCAP), implemented by World Bank (finalized in 2015)[46].
- Outline of the Climate Adaptation Strategy and basin-wide priority measures for the Sava River Basin[47].

11.3 Climate change scenarios and projected impacts

Although for the assessment of future climate parameters, various global and regional climate models and scenarios are used and many uncertainties exists, some common trends have been identified and projected as follows:

- for the future, a further increase in air temperature is expected within the Sava basin by around +1°C in the next 30 years;
- the precipitation change is complex, and expected changes are very variable. In general, an increase during the winter and a decrease for the summer months are expected. Summer precipitation deficit is more pronounced in the 2041-2070 period;
- Frequent and more intense extreme weather events will take place more often. Longer periods of droughts and shorter and locally distributed periods of intense precipitation in the future are predicted in all countries with an increasing risk of flooding.

The above-mentioned trends in temperature, precipitation, and the extreme weather events will have impacts to the water resources (e.g. reduction of the annual flow in surface waters and as a consequence a reduction of groundwater levels and water levels in lakes and reservoirs), potential changes in floods and low flows (e.g. floods will increase and low flows will decrease), and water quality (e.g. eutrophication of surface waters due to increased water temperature in combination with low flows, and as consequences water related epidemics in case of floods). The climate changes will have negative impacts to ecosystems, and would cause the spread of invasive alien species, habitat changes, and loss of biodiversity.

11.4 Guiding principles and targets on adaptation to climate change

In the process of the *Outline of the Climate Change Adaptation (CCA) Strategy* development, as guiding principles on adaptation to climate change for the Sava RB are identified, strengthening the knowledge base and agreement on basin wide approaches, using the synergies with other basin wide planning documents, and creating win-win

[44] http://www.unece.org/index.php?id=45241
[45] https://ec.europa.eu/jrc/sites/jrcsh/files/jrc-danube-water-nexus.pdf
[46] https://www.savacommission.org/project_detail/18/1
[47] http://www.savacommission.org/dms/docs/dokumenti/peg_rbm/ad.3.1_wm_issues_doc_8_outline_of_the_climate_adaptation_strategy_for_the_sava_rb.pdf

solutions. Furthermore, during adaptation process the adaptation needs should be sustainable, new risks avoided, and "no-regret" measures implemented.

As climate change adaptation targets are identified:

- Sustainable development of the basin;
- Increasing safety and, resilience to climate change, damage reduction;
- Definition of social and physical vulnerabilities;
- Promotion of nature-based solutions and their implementation;
- Sectoral studies that will address vulnerabilities (e.g. pilot studies, pilot sites);
- Continuing communication and education (e.g. create a specific task force).
- Transboundary adaptation measures.

Based on the Danube adaptation strategy developed by the ICPDR[48] the following categories of measures should be further considered (without any hierarchy in their order) and discussed at the Sava RB scale:

- Preparatory measures aiming to support CCA planning processes-coordination and consistency of data exchange and water information systems, monitoring devices and networks, warning systems and emergency plans, evaluation of mid-term changes, identification of risk areas, and the support of further research where needed;
- Ecosystem - based measures - "the use of biodiversity and ecosystem services to help people adapt to the adverse effects of climate change". Healthy ecosystems can contribute to resilience increase, to slow changes such as increasing summer temperatures or sudden impacts of floods and droughts. Ecosystems also contain direct indicators of climate change (variation in species and population, migration of bioclimatic layers) which should be developed in further steps;
- Behavioural changes measures aiming to raise awareness about possible future conditions, to modify behaviours and practices and to support sustainable management with a focus on the efficient use of water and conservation of good water quality. Inter alia, the propagation of best practices, where the education to risk prevention and the exchange of knowledge plays an important role but also the elaboration of risk management plans;
- Policy measures aiming to support the national, international and basin-wide coordination of activities, such as better implementation of existing instruments such as EIA or SEA which are compulsory in the EU countries and could be beneficial for others, but also the updating of existing RBMP;
- Common transnational threshold values, limits, restrictions, and expansions (e.g. for protection areas or nature reserves, etc.), should be considered;
- Technological measures on the infrastructure which have to be built or improved, such as dykes, reservoirs, water networks and transfers;
- Disaster risk reduction measures to reduce the risk of disasters and the adverse impacts of natural hazards, through systematic efforts to analyse and manage the causes of disasters, including avoidance of hazards, reduction of social and economic vulnerability to hazards, improvement of preparedness for adverse events, and emergency measures.

[48] ICPDR (2013): ICPDR Strategy on Adaptation to Climate Change

11.5 Future steps

The following future steps are recommended to be implemented in the next RBM planning cycles:

- Vulnerability assessment;
    - Currently, exposure and sensitivity of the systems (impacts) are known, but the adaptive capacity assessment remains to be performed;
- Analysis of cost and benefits.

An assessment at the Sava RB level can raise awareness. and the scale of adaptation. It can also provide inputs and facilitate discussion on possible funding and/or financing sources.

Priorities of actions:

- Based on an assessment of possible adaptation options, a selection of the most suitable actions should be carried out. Most often a multi-criteria analysis can prove useful for ranking and selecting preferred options. This analysis should include a set of criteria, such as :
    - Urgency with respect to already existing threats;
    - Early preparatory action (to avoid future damage costs);
    - Range of effect (options covering multiple risks might be favored);
    - Cost-benefit ratio;
    - Time-effectiveness;
    - Robustness under a broad range of likely future impacts;
    - Flexibility for adjustments or reversibility in case of diverging developments;
    - Political and cultural acceptability;
    - Enhancement of learning and autonomous adaptive capacity, etc.

Principles of measures implementation:

- The following principles of measures implementation are identified:
    - The measures with wider transboundary effects should be included in the mutual exchange of information within the Sava Commission and the ICPDR;
    - The information on regional measures with transboundary effects should be exchanged at a bilateral level or within the Sava Commission. Eventually, these measures should be coordinated on a bilateral or multilateral level to find joint solutions;
    - Regional or local measures without any transboundary effects should be planned and implemented regionally/locally.

Monitoring and evaluation of adaptation measures:

- It is necessary to analyse whether the resources invested in adaptation have led to desired adaptation outcomes (e.g. increased preparedness, reduced vulnerability, more resilient service delivery, etc.).

12 Summary of public participation activities

Public participation is one of core principle in sustainable water management as required by the FASRB and the WFD. Sava Commission stays devoted to ensuring and facilitating broad and active public participation in river basin management and planning process

12.1 Active involvement of stakeholders

As it is stipulated by the Art 16 of the Rules of procedures, Sava Commission may grant observer status to states, international, regional, and national governmental and non-governmental organizations. A major stakeholders/stakeholder groups have an opportunity to actively participate all activities of the Sava Commission, by gaining the observer status. This opportunity is well-utilized by organizations already holding this status to actively participate and to contribute to the development of this management plan.

Table 48: ISRBC's Observers as of August 2021

Observer	Web link
Republic of North Macedonia	https://vlada.mk/
International Commission for the Danube River Protection (ICPDR)	https://www.icpdr.org/main/
Danube Commission	https://www.danubecommission.org/dc/en/
Global Water Partnership for central and eastern Europe (GWP/CEE)	https://www.gwp.org/en/GWP-CEE/
World Wide Fund for Nature Adria	https://www.wwfadria.org/
EuroNatur Foundation	https://www.euronatur.org/en/

12.2 Public consultation process

Considering the utmost importance of the broad stakeholder as well as wide public involvement in the river basin management planning, Sava Commission continuously throughout the process of the 2nd Sava RBMP development worked to ensure and encourage active public participation and to create a mechanism which can facilitate involvement of all relevant stakeholders.

Public consultation for the 2nd Sava RBMP was organized via the web aiming to contribute to the pandemic suppression. On the web page within the renovated official web site of the Sava Commission the draft 2nd Sava RBMP and Public Questionnaire specially developed to facilitate commenting are available for all interested.

To launch and promote public consultation campaign, following the successful practice of the public participation and consultation activities in the river basin and flood risk management planning, Sava Stakeholder Forum as an online event was organized on the 17 December 2021.

The Sava Stakeholder Forum was attended by more than 80 participants, representatives of the Ministries, national authorities, public companies, NGOs, academia, scientific

institutes, and private sectors, as well as international organizations and Observers to the Sava Commission.

Stakeholders gathered in the Sava Stakeholder Forum expressed their support for further strengthening of the transboundary water cooperation, and preparation of the international Sava RBMPs with Programme of measures. The participants discussed issues related to planning process in the Sava RB, integrated issues and climate changes, and Programme of measures, in the 3 independent groups, moderated by the members of the PEG RBM and Secretariat of the Sava Commission.

The major outputs, comments, concerns raised, and suggestions collected during the Sava Stakeholder forum are assembled through the digital MIRO board and are available on the Sava commission web site[49]. Furthermore, comments collected during the public consultation process are used for the facilitation of the 2nd Sava RBMP final version development.

12.3 Information sharing and awareness raising

The information about the development of the RBMP were publicly accessible throughout the preparation period, on the Sava Commission official website.

Furthermore, information on the Sava RBMPs preparation, were disseminated through the official bulletin of the Sava Commission – Sava NewsFlash[50], a periodic publication regularly distributed to stakeholders directly and available through the Sava Commission official web site.

By the courtesy and the support of the ICPDR, the information about the development and public consultation for the 2nd Sava RBMP was as well distributed through the social media networks Facebook and Twitter.

Finally, the development phases of the 2nd Sava RBMP were presented at meetings of the different stakeholder groups, from the Parties to the FASRB and Montenegro, and on the international levels (meetings organized by ICPDR, UNECE, EU, Danube Strategy, etc.).

Detailed overview of all activities performed, aiming to public involvement in all phases of the 2nd Sava RBMP preparation, is available in the document Summary on Public Participation Activities-Process and Outcomes for the 2nd Sava RBMP and can be accessed on the official web page www. savacommission.org.

[49] Link: https://miro.com/app/board/uXjVOcUvgOU=/?invite_link_id=469094637288.

[50] Link: https://www.savacommission.org/UserDocsImages/06_media/SavaNewsFlash/sava_newsflash_no.21.pdf

13 Key findings

The preparation of the 2nd Sava RBMP shows the decisiveness of the riparian countries to comply with WFD requirements when dealing with water management issues in the transboundary international context. The key findings of the 2nd Sava RBMP on aspects of water management and the implementation of the WFD at the Sava River Basin-wide scale and related gaps and uncertainties are listed below. Complementary information on the considerable and important work taking place at the national levels can be obtained from the national RBMPs. Key findings provide the Sava River Basin specific guidelines for the future steps in RBM cycles.

Surface water status assessment

Water status assessment improved significantly in all countries from the 1st Sava RBMP in terms of methodological approach as well in the achieved confidence level. However, the status assessment of water bodies is not yet directly linked to the pressure assessment nor to measures and the effects of the measures at the basin-wide scale. Further research is needed in order to better understand the impact of significant pressures and the linkage between the effects of the measures and the water status at a basin-wide scale.

The assessment of the ecological status requiring WFD compliant methods for the analysis of biological quality elements significantly improved within the basin. Ecological status was assessed in all countries (data for ME were not available), using BQEs and supporting quality elements, as well increasing the confidence level for the status assessment.

As in the previous cycle the classifications schemes for assessment of the ecological status of the riparian floodplain habitats have not been developed yet, the assessment of ecological status is focusing on the identified SWBs. This issue of riparian floodplain habitats should therefore be considered in the next RBMP cycle.

Chemical status assessment was based on results of monitoring in combination with risk assessment. Monitoring schemes in the individual countries are not fully WFD-compliant and the methodologies for analysis of the WFD priority substances and assessment of the chemical status are not in all the Sava RB countries in compliance with the relevant directives.

Finally, full compliance of SWBs status assessment with WFD requirements in the whole in the Sava RB requires additional time and effort. Furthermore, the final HMWB designation (where is not performed) still needs validation based on high confidence assessment results regarding the ecological status.

Organic pollution

A comprehensive analysis of organic pollution from urban wastewater is provided in the plan. Data on collection and treatment of urban wastewater enabled to get a good overview of situation and a proper basis for designing the programme of measures. At the basin wide scale waste water sector from the agglomeration larger than 2,000 PE (PE 7,600,820) generate the emission load of 55,541.9 t/a BOD and 101,169.2 t/a COD. The emission value cannot be unambiguous compared between two planning cycle due to redefinition of agglomeration in all countries except SI and difference of total population load (1st Sava RBMP 6,817,357 PE). However significant decrease of estimated total emission load by 53% of BOD5 and by 57% for COD and due to increased number of agglomerations with WWTPs in the basin (14% of agglomeration with WWTP in 1st Sava

RBMP and 30% in the 2nd Sava RBMP mainly due to newly constructed WWTPs in SI and HR).

The comprehensive analysis of the pressure and impact assessment of the industrial polluters was not performed for this plan. The methodology for the definition of the significant polluters differs per country. Due to the lack of proper inventory of significant industrial polluters which will take their cumulative effects in the basin wide context, the available data for the assessment of industrial pollution were not complete. However, 426is known that still a significant volume of industrial wastewater in the basin is discharged without any or with insufficient pre-treatment into the public sewerage network or into the environment. The load from part of industrial sector is accounted into the agglomeration loads. This drawback has to be eliminated in future plans and more detailed inventory has to take place.

Nutrient pollution

Analysis of nutrient pollution from the waste water sector followed the methodology for organic pollution and was based on data collected in countries, providing a good insight into the current state-of-the-matter and a proper basis for preparing the programme of measures. The total amount of the emitted from the agglomeration is 12.905,2 t/a of TN and 2,410.2 t/a TP in comparison with 20,261.0 t/a of TN and 4.868.0 t/a of the TP which represent the decrease of 36% for TN and app 50% of TP.

Quantifying the pressure from diffuse pollution sources would be ideally assessed by using the monitoring data. Due to missing data on diffuse pollution sources (application of fertilizers to arable land and others) the MONERIS model for calculation of nutrient emissions was used with available data sets 2009-2012. The possibilities for the use of different mathematical models for the pressure and impact assessment within the Sava River basin can be explored in the following planning cycle.

Hazardous substances pollution

The lack of data for the performance of the comprehensive analysis related to hazardous substances within the Sava River basin is recognized in this planning cycle. The significant information gap is related to lack of monitoring data and lack of the methodology for the relevance assessment of these substances in the basin context and lack of data related to emissions of priority and priority hazardous substances in terms of their discharge and eventual losses.

Hydromorphological alterations

The assessment of hydromorphological pressures in 2nd Sava RBMP was focused on hydrological alterations, morphological alterations and disconnection of adjacent wetlands/floodplains and river and habitat continuity interruption, with future infrastructure projects. The analysis has been based on the available data obtained by monitoring of HYMO quality elements or by expert judgement. However, the issue related to the harmonization of the methodologies for transboundary water bodies remains significant in this planning cycle. The total length of impounded SWBs is 1,049.7 km, in the basin 35(33) river continuity interruptions were registered (9(8) with passes for fish) while according to morphological assessment 59% of the SWBs are in the near natural or slightly modified condition.

Future infrastructure projects

For any future infrastructure projects (FIP), it is of particular importance that environmental impacts and requirements are considered as an integral part of the planning and implementation process from its beginning and that guidelines are developed for cooperation with different sectors. According to the relevance criteria for FIPs harmonized with the ICPDR level, 10 projects are identified as relevant, 4 are from flood risk management 5 from hydro power production and 1 from the field of river navigation. General lack of relevant databases required for the identification of future infrastructure projects at the country level, while ICPDR relevance criteria for FIPs can be reassessed for the Sava River Basin in the next planning cycle.

Groundwater

Groundwater in the Sava RB remain to be the resource of the major importance and subject to a variety of uses, the most important of which are drinking water, industrial water supply and agricultural irrigation. In addition to its function as the main source of drinking water, it also recharges river flows (especially during dry periods) and is critical for the maintenance of wetlands and the support of aquatic eco-systems.

The number of GWBs increase from 48 in the 1st Sava RBMP to 60 in the 2nd Sava RBMP due to new and improved delineation.

Groundwater quality

The harmonization of trans-boundary GWBs between countries is a necessary step for the future joint management of shared GW resources by the establishment of joint monitoring programmes and data exchange.

Groundwater quantity

The results of quantitative status assessment show that less than 10% of GWBs of basin-wide importance have poor quantitative status (or are at risk of not achieving good quantitative status). Groundwater depletion due to over-abstraction does not appear as a severe problem, but the lowering of GW levels due to lowering of surface water levels (as a consequence of the deepening of the riverbed and its erosion), combined with abstraction and the possible impact of climate change could pose a threat to some local uses, as well as to ecosystem services. Measures, such as controls over the abstraction of groundwater including a register of significant water abstractions with basin wide impact, are foreseen as key instruments in achieving good quantitative status.

Protected areas

The national legislation in non-EU Sava countries is still not fully harmonized with EU standards, and the complete inventory of protected areas as required by WFD could not be coherently established for the whole basin. Therefore, a modified approach has been applied and a set of measures has been identified to complete the registers of protected areas as required by the WFD. Total protected area per each type of the protection within the basin increased in comparison to the 1st Sava RBMP.

Invasive alien species

Establishing a coordination platform for cooperation on IAS issues within the Sava RB is needed. Based on analyses of the available information on IAS within the Sava River Basin, the following can be concluded that IAS represents a significant pressure within the region and an important management issue. The general lack of systematized comparable

data on IAS, and the effective regulation and clear institutional organization regarding invasive species mitigation in the SRB is recognized. Further work on data collection and development of methods for IAS assessment is needed, as well as raising of capacity of institutions responsible for suppression of biological invasions in the SRB is needed in the next planning cycle.

Quantity and quality aspects for sediments

The basic legal document which regulates the procedures of mutual cooperation related to sustainable sediment management to protect the integrity of the water and sediment regime in the Sava River Basin is the Protocol on sediment management which stipulates the development of the Sediment Management Plan for the Sava River Basin (to be adopted by the Parties no later than six years after the Protocol enters into force and to be revised in subsequent six-year cycles), which will include a set of measures addressing the quality and quantity of sediments.

Programme of measures

The Programme of measures aiming at achievement of the environmental objectives according to the WFD, visions and management objectives developed for the Sava RB is built on the national measures that are already in place and outline the actions to be taken in the forthcoming river basin management cycles to achieve good water status.

The Programme of Measures is focused on implementation of the relevant EU water related directives considering the status of the EU and non-EU countries.

Integration issues

Any kind of development in the Sava River Basin should be integrated into transboundary multisectoral and multimodal solutions. Utilization of sustainable energy sources, decreasing flood risk, accumulating water for use in drought periods and navigation should seek for multiple functions with minimized impact on environment, covering also measures originating from the EU climate energy package.

Flood protection - The Sava FRMP elaborated a summary of 42 non-structural measures divided into 11 groups, as well as 38 national structural measures in AMIs and also considered a synergy of these measures to the river basin management planning and provided preliminary analyses of measures according to various parameters.

Within the Sava FRMP a preliminary assessment of the proposed structural measures from the aspect of their potential synergies with environmental goals set forth in the WFD), i.e. measures defined in the 1st Sava RBMP.

The 2nd Sava RBMP showed that 29 water bodies (14 natural and 15 with heavily modified status) on the Sava River with length of 896.77 km and 70 water (55 natural and 15 with heavily modified status) bodies on the tributaries with length of 1,569.26 km are at the flood risk.

Navigation - Inland navigation can contribute to making transport more environmentally sustainable, particularly where it substitutes for road transport. On the other hand, it can also have significant influence on river ecosystems, jeopardizing the goals of the WFD. In addition to hydromorphological impacts, navigation can also have other impacts on the water environment, such as pollution. Recognizing the potential conflict between the development of inland waterway transport and WFD implementation the Sava Commission, together with

the ICPDR and the Danube Commission, was one of the main driving forces in the process of drafting the Joint Statement adopted by the three commissions in December 2007/ January 2008. The Joint Statement was considered when drawing up plans for the development of waterway infrastructure, which were prepared after the statement was made. According to the Joint Statement, the future approach should strike a balance between navigation and environmental needs, taking into account the existing navigation on the Sava River and in an attempt to improve regulations related to water protection, in 2007 the Sava Commission drafted the Protocol on Prevention of Water Pollution Caused by Navigation to the FASRB, aiming to prevent, control and reduce pollution from vessels: (a) equip the ports open for international traffic with required reception facilities for the collection of waste occurring on board; (b)develop and implement a set of best available techniques and other measures, in order to identify the structure of special and contracted technical facilities, required for the response to spills, as well as the structure of the spill response organization; (c) ensure immediate notification of pollution, especially transboundary, by means of effective communication networks, and take effective emergency response measures; (d) develop a program of joint action to prevent water pollution from shipping, and (e) establish a mutual information system

Hydropower- Hydropower production is identified as the main driving force for hydromorfological alteration as well as for the HMWB designation within the Sava RB, affecting flow regime, river and habitat continuity, and alternating physico-chemical conditions and natural sediment dynamics. The number of 20 hydropower plants in the Sava RB, with installed capacity exceeding 10 MW, remains the same as in the previous cycle. Riparian countries and ISRBC are active in the several initiatives, on the regional and Danube River Basin level. Focus of the initiatives is on facilitation of the dialogue between the sectors in order to achieve a common understanding of the topic. Common objectives are to ensure water, nature and environmental protection, sustainable water resource management, and development of the region. "Guiding Principles on Sustainable Hydropower Development in the Danube Basin" have been in adopted in 2013, as a basin wide reference document which provides the principals for sustainable hydropower strategic planning and development, putting in focus technical upgrade of existing HPPs towards ecological restoration, strategic planning approach for new hydropower development, and provides measures for mitigation of negative effects of HPPs. Furthermore, in cooperation with UNECE, assessment of water-food-energy-ecosystem services Nexus in the Sava River Basin was performed, to foster transboundary cooperation by identifying intersectoral synergies, and to determine measures that could alleviate tensions related to the multiple needs of riparian countries for shared resources. It has been noticed that the natural resources of the Sava River Basin are the key to the current and future development of the Sava countries.

Agriculture - In the Sava River Basin agricultural land occupies 40% (3,897,700.73 ha) of the surface areas. The majority of the agricultural area (1,497,299.54 ha) is used by complex cultivation patterns, which represents mosaic of small, cultivated land parcels with different cultivation types -annual crops, pasture and/or permanent crops, eventually with scattered houses or gardens. Share of livestock production in the total value of agricultural production

is highest in Slovenia and account 46 % while it is 37.5% in Croatia, 37% in Bosna and Herzegovina and app 30% in Serbia. Small production units predominate, especially for cattle, pigs, sheep, goats, and horses, while poultry production is characterized by large-scale production units. The crop production is dominant agriculture activity in all riparian countries. The most significant agricultural activities are, in order of importance: corn and wheat production, oil plant production (soy and sunflower), orchards and vineyards. The major needs for successful implementation of agro-environmental measures, better coordination and alignment between water and agricultural policies, and for development of common strategies and joint actions in the Sava RB countries, are: (i) establishment of a comprehensive framework for successful transposition and further harmonization with relevant EU directives, (ii) establishment of a monitoring network that will provide relevant data for the assessment of the pollution load from agriculture, and their effects on the status on surface and ground water, (iii) better understanding of the agro-environmental indicators which can facilitate their selection, and establishment of their regular monitoring and assessment, (iv) establishment of data base that would enable analysis to be carried out regarding water quality, water infrastructure, water use and economic issues in agriculture, in order to establish and follow trends and agricultural influence on the environment, and also for better policy–programming and long term investing plans, establishment of cross sectoral platform for data and knowledge exchange which can facilitate and promote implementation of agricultural measures with focus to sustainable water use and water protection.

Economic analysis:

Summary and key findings related to the economic analysis are exposed in the Chapter 8. Detailed elaboration of the economic analysis of water use and water services in the Sava RB and potentials for financing the Programme of measures can be found in the Background document: Economic Analysis for the 2nd Sava RBMP.

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ANNEXES

Annex 1

List of the competent authorities and national institutions responsible for implementation of the FASRB

List of the competent authorities and national institutions responsible for implementation of the FASRB, and Memorandum of Understanding with Montenegro

	Institution	Contact details
Bosnia and Herzegovina		
1.	Ministry of Communications and Transport of Bosnia and Herzegovina	Trg Bosne i Hercegovine 1, 71000 Sarajevo Tel: +387 33 284 750 *Web link: www.mkt.gov.ba*
2.	Ministry of Foreign Trade and Economic Relations of Bosnia and Herzegovina	Musala 9, 71000 Sarajevo Tel: +387 33 220 093 *Web link: www.mvteo.gov.ba*
3.	Ministry of Agriculture, Forestry and Water Management Republika Srpska	Trg Republike Srpske 1, 78000 Banjaluka Tel: + 387 51 338 549 *Web link: www.vladars.net*
4.	Federal Ministry of Agriculture, Water Management and Forestry	Hamdije Ćemerlića 2, 71000 Sarajevo Tel: +387 33 726 550 *Web link: www.fmpvs.gov.ba*
5.	Ministry of Transport and Communications Republika Srpska	Trg Republike Srpske 1, 78000 Banjaluka Tel: +387 51 339 603 *Web link: www.vladars.net*
6.	Federal Ministry of Transport and Communications	Braće Fejića bb, 88000 Mostar Tel: +387 36 550 025 *Web link: www.fmpik.gov.ba*
7.	Ministry of Spatial Planning, Civil Engineering and Ecology Republika Srpska	Trg Republike Srpske 1, 78000 Banjaluka Tel: +387 51 339 520 *Web link: www.vladars.net*
8.	Federal Ministry of Environment and Tourism	Hamdije Ćemerlića 2, 71000 Sarajevo Tel: +387 33 726 700 *Web link: www.fmoit.gov.ba*
9.	Government of the Brčko District Bosnia and Herzegovina	Bulevar mira 1, 76100 Brčko Tel: +387 49 240-600 *Web link: www.bdcentral.net*
Republic of Croatia		
1.	Ministry of the Sea, Transport and Infrastructure of the Republic of Croatia	Prisavlje 14, 10000 Zagreb Tel: +385 1 6169 111 *Web link: www.mmpi.gov.hr*
2.	Ministry of Economy and Sustainable Development	Radnička cesta 80, 10000Zagreb Tel: +385 1 3717 111 *Web link: https://mingor.gov.hr*

Republic of Serbia		
1.	Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia-Republic Water Directorate	Bulevar umetnosti 2a 11070 Novi Beograd Tel: +381 11 2013 360 *Web link: www.rdvode.gov.rs*
2.	Ministry of Construction, Transport and Infrastructure of the Republic of Serbia	Nemanjina 22-26, 11000 Beograd Tel: +381 11 3619 833 *Web link: www.mgsi.gov.rs*
3.	Ministry of Foreign Affairs of the Republic of Serbia	Kneza Miloša 24-26, 11000 Beograd Tel: +381 11 3616 333 *Web link: www.mfa.gov.rs*
4.	Ministry of Environmental Protection of the Republic of Serbia	Omladinskih brigada 1, 11070 Novi Beograd Tel: +381 11 3110 271 *Web link: www.ekologija.gov.rs*
5.	Republic Hydro-meteorological Service of Serbia	Kneza Višeslava 66, 11000 Beograd Tel: +381 11 3050 864 *Web link: www.hidmet.gov.rs*
6.	Republic Geodetic Authority	Bulevar vojvode Mišića 39, 11000 Beograd Tel: +381 11 265 22 22 *Web link: www.rgz.gov.rs*
Republic of Slovenia		
1.	Ministry for Environment and Spatial Planning of the Republic of Slovenia	Dunajska cesta 47, 1000 Ljubljana Tel: +386 1 478 70 00
2.	Ministry of Foreign Affairs of the Republic of Slovenia	Prešernova cesta 25, 1000 Ljubljana Tel: +386 1 478 2000 *Web link: www.mzz.gov.si*
3.	Ministry of Economic Development and Technology of the Republic of Slovenia	Kotnikova 5, 1000 Ljubljana Tel: +386 1 400 33 11 *Web link: www.mgrt.gov.si*
4.	Ministry of Infrastructure of the Republic of Slovenia	Langusova ulica 4, 1535 Ljubljana Tel:+386 1 478 80 00 *Web link: www.mzip.gov.si*
Montenegro*		
	Ministry of Agriculture , Forestry, and Water Management	*Rimski trg 46* *81 000 Podgorica* *+382 20 482 109* *Web link: www.minpolj.gov.me*

*Montenegro is not a Party to the FASRB

Annex 2

List of multilateral and bilateral agreements in the Sava River Basin

List of multilateral and bilateral agreements in the Sava River Basin

Table 1: FASRB and its Protocols and Multilateral treaties and agreements

No	Treaty	In force since	Available
1	*Framework Agreement on the Sava River Basin* (Kranjska Gora, 2002)	December 29, 2004	http://www.savacommission.org/dms/docs/dokumenti/documents_publications/basic_documents/fasrb.pdf
2	*Protocol on the Navigation Regime to the Framework Agreement on the Sava River Basin* (Kranjska Gora, 2002)	December 29, 2004	http://www.savacommission.org/dms/docs/dokumenti/documents_publications/basic_documents/protocol_on_navigation_regime.pdf
3	*Protocol on Prevention of the Water Pollution caused by Navigation to the Framework Agreement on the Sava River Basin* (Beograd, 2009)	October. 08, 2017	http://www.savacommission.org/dms/docs/dokumenti/sastanci_strana/2._sastanak_strana_fasrb/protocol_on_prevention_of_water_pollution_caused_by_navigation_signed.pdf
4	*Protocol on Flood Protection to the Framework Agreement on the Sava River Basin* (Gradiška, 2010)	November 27, 2015	http://www.savacommission.org/dms/docs/dokumenti/documents_publications/basic_documents/protocols/protocol_on_flood_protection_to_the_fasrb.pdf
5	*Protocol on Sediment Management to the Framework Agreement on the Sava River Basin* (Brčko, 2015)	October 08, 2017	http://www.savacommission.org/dms/docs/dokumenti/documents_publications/basic_documents/protocols/protocol_on_sediment_management.pdf

Multilateral treaties and agreements relevant for the Sava River Basin -overview of the signatory/Parties

No	Treaty	In force	Slovenia		Croatia		B&H		**Serbia**	
			S	R	S	R	S	R	S	**R**
1	***Convention on Wetlands of International Importance Especially as Waterfowl Habitat*** (*Ramsar Convention*, 1971)	●		●		●		●		●
2	***Convention on Environmental Impact Assessment in a Transboundary Context*** (*Espoo Convention*, 1991)	●		●		●		●		●
3	***Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary Context*** (SEA Protocol - Kiev, 2003)	●		●		●	●			●
4	***Convention on the Protection and Use of Transboundary Watercourses and International Lakes*** (*UN/ECE Water Convention* - Helsinki, 1992)	●		●		●		●		●
5	***Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes*** (London, 1999)	●	●			●				
6	***Convention on the Transboundary Effects of Industrial Accidents*** (*Helsinki Convention*, 1992)	●		●		●				●
7	***Protocol on Civil Liability and compensation for damage caused by the transboundary effects of industrial accidents on transboundary waters*** (Kiev, 2003, in the framework of the *UN/ECE Water Conv. & Helsinki Conv. – Ind. Acc.*)	—					●			

8	***Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters*** (*Aarhus Convention*, 1998)	●		●		●		●		●
9	***Protocol on Pollutant Release and Transfer Register*** (Kiev, 2003*)*	●		●		●	●		●	
10	***Danube River Protection Convention*** (Sofia, 1994)	●		●		●		●		●
11	***The Convention on the Danube Navigation Regime*** (*Belgrade Convention* – 1948)	●				●				●
12	***Budapest Convention on the Contract for the Carriage of Goods by Inland Waterway*** (*CMNI*, 2001)	●				●				●
13	***European Agreement on Main Inland Waterways of International Importance*** (*AGN*, 1996)	●				●		●		
14	***European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways* (*ADN*, 2000)**	●				●				●

Notes: S – signed; R – ratified

Table 2. Bilateral agreements of importance for the Sava River Basin in the light of Article 29 paragraph 3 of FASRB

Bilateral agreements between the Republic of Croatia and the Republic of Slovenia			
Title	Signed	Provisional enforcement	Entered into force
Agreement between the Government of the Republic of Croatia and the Republic of Slovenia on water management relations	October 25, 1996		March 19, 1998
Rulebook of the Permanent Croatian – Slovenian Commission for water management	October 25, 1996		March 19, 1998
Agreement between the Government of the Republic of Slovenia and the Government of the Republic of Croatia on cooperation on protection against natural and civil disasters	September 22, 1997		November 1, 1999
Bilateral agreements between Bosnia and Herzegovina and the Republic of Croatia			
Title	Signed	Provisional enforcement	Entered into force
Agreement between the Council of Ministers of the Bosnia and Herzegovina and the Government of the Republic of Croatia on water management relations	July 11, 1996		January 31, 1997
Protocol on establishment of navigation on the Sava River waterway and its tributaries between Bosnia and Herzegovina and Republic of Croatia	October 16, 1998		November 15, 1998
Agreement between the Council of Ministers of the Bosnia and Herzegovina and the Government of the Republic of Croatia on cooperation on protection against natural and civil disasters	June 1, 2001	June 1, 2001	

Agreement between the Council of Ministers of the Bosnia and Herzegovina and the Government of the Republic of Croatia on navigation on the navigable waterways and its marking and maintenance	February 20, 2004		November 6, 2009
Agreement between the Government of the Republic of Croatia and Council of Ministers of Bosnia and Herzegovina on the financing and development of the Detailed Design and conducting administrative procedures for environmental impact assessment and obtaining location permits, approval and construction permits for the project "Rehabilitation and modernization of the Sava River waterway from Račinovci to Sisak"	December 1, 2010	December 1, 2010	
Agreement between the Council of Ministers of Bosnia and Herzegovina and the Government of the Republic of Croatia and the on rules and regulations of using water from public water supply systems cut by the state border	July 6, 2015		February 9, 2016
Agreement between the Government of the Republic of Croatia and the Council of Ministers of Bosnia and Herzegovina on cooperation in the field of environmental protection and sustainable development	April 27, 2016		March 24, 2017
Bilateral agreement between the Republic of Croatia and the Republic of Serbia			
Title	Signed	Provisional enforcement	Entered into force
Agreement between the Government of the Republic of Croatia and the Government of the Republic of Serbia on navigation on the inland waterways and its maintenance	October 13, 2009		July 30, 2010
Agreement between the Government of the Republic of Croatia and the Government of the Republic of Serbia on cooperation in protection against natural and other disasters	July 15, 2009		May 1, 2015
Agreement between the Government of the Republic of Croatia and the Government of the Republic of Serbia on cooperation in the field of environmental protection and nature conservation	June 8, 2015		November 2, 2018
Bilateral agreement between Bosnia and Herzegovina and the Republic of Serbia			
Title	Signed	Provisional enforcement	Entered into force
Agreement between the Government of the Republic of Serbia and Council of Ministers of Bosnia and Herzegovina on navigation on the inland waterways and its marking and technical maintenance	May 4, 2012		February 22, 2013

Bilateral agreement between the Republic of Croatia and Montenegro			
Title	Signed	Provisional enforcement	Entered into force
Agreement between the Government of the Republic of Croatia and the Government of the Republic of Montenegro on water management relations	September 4, 2007		April 12, 2008
Bilateral agreement between the Republic of Serbia and Montenegro			
Title	Signed	Provisional enforcement	Entered into force
Agreement between the Government of the Republic of Serbia and the Government of Montenegro on cooperation on protection against natural and civil disasters	October 4, 2010		

Annex 3

List of delineated surface water bodies and status assessment

Table 1: List of delineated surface water bodies

RIVER	EU SWB Code	Length (km)	Trans boundary	Natural SWB	HMWB (x)/Preliminary HWMB (px)
Sava	SI111VT5	23.77	N	x	
Sava	SI111VT7	10.84	N		x
Sava	SI1VT137	25.38	N	x	
Sava	SI1VT150	9.60	N	x	
Sava	SI1VT170	13.22	N		x
Sava	SI1VT310	22.19	N	x	
Sava	SI1VT519	25.71	N	x	
Sava	SI1VT557	31.35	N	x	
Sava	SI1VT713	17.12	N		x
Sava	SI1VT739	17.06	N	x	
Sava	SI1VT913	21.56	N	x	
Sava	SI1VT930	3.20	N	x	
Sava	HRCSRI0001_021	4.65	Y	x	
Sava	HRCSRN0001_020	9.49	N	x	
Sava	HRCSRN0001_019	31.06	N	x	
Sava	HRCSRN0001_018	20.51	N		x
Sava	HRCSRN0001_017	11.34	N		x
Sava	HRCSRN0001_016	19.34	N		x
Sava	HRCSRN0001_015	26.52	N		x
Sava	HRCSRN0001_014	41.03	N		x
Sava	HRCSRN0001_013	9.90	N		x
Sava	HRCSRN0001_012	25.60	N	x	
Sava	HRCSRI0001_011	41.20	Y		x
Sava	HRCSRI0001_010	12.75	Y		x
Sava	HRCSRI0001_009	36.04	Y		x
Sava	BA_RS_SA_3	88.77	Y		px
Sava	HRCSRI0001_008	23.83	Y		x
Sava	HRCSRI0001_007	22.09	Y	x	
Sava	HRCSRI0001_006	16.53	Y		x
Sava	HRCSRI0001_005	25.71	Y	x	
Sava	BA_RS_SA_2B	80.40	Y		px
Sava	BA_SA_2A	32.34	Y		px
Sava	HRCSRI0001_004	25.06	Y		x
Sava	BA_RS_SA_1D	1.41	Y		px
Sava	HRCSRI0001_003	37.88	Y	x	
Sava	BA_SA_1C	68.25	Y		px
Sava	HRCSRI0001_002	38.56	Y	x	
Sava	BA_BD_SA_1B	34.80	Y		px
Sava	HRCSRI0001_001	28.92	Y		x
Sava	BA_RS_SA_1A	34.26	Y		px
Sava	RSSA_7	33.64	N	x	
Sava	RSSA_6	28.97	N	x	
Sava	RSSA_5	28.61	N	x	
Sava	RSSA_4	28.15	N	x	
Sava	RSSA_3	13.69	N	x	
Sava	RSSA_2	32.84	N	x	
Sava	RSSA_1	27.13	N		px
Ljubljanica	SI14VT77	23.17	N	x	
Ljubljanica	SI14VT93	4.57	N		x
Ljubljanica	SI14VT97	12.29	N	x	
Savinja	SI16VT17	44.98	N	x	
Savinja	SI16VT70	24.57	N	x	

RIVER	EU SWB Code	Length (km)	Trans boundary	Natural SWB	HMWB (x)/Preliminary HWMB (px)
Savinja	SI16VT97	24.42	N	x	
Krka	SI18VT31	31.12	N	x	
Krka	SI18VT77	24.43	N	x	
Krka	SI18VT97	39.35	N	x	
Sotla/Sutla	SI192VT1	31.87	Y	x	
Sotla/Sutla	HRCSRI0029_006	20.15	Y	x	
Sotla/Sutla	HRCSRI0029_005	23.13	Y		x
Sotla/Sutla	HRCSRI0029_004	23.13	Y	x	
Sotla/Sutla	SI192VT5	58.93	Y	x	
Sotla/Sutla	HRCSRI0029_003	5.68	Y	x	
Sotla/Sutla	HRCSRI0029_002	19.79	Y	x	
Sotla/Sutla	HRCSRI0029_001	10.82	Y	x	
Krapina	HRCSRN0019_005	10.86	N	x	
Krapina	HRCSRN0019_004	13.54	N	x	
Krapina	HRCSRN0019_003	18.51	N	x	
Krapina	HRCSRN0019_002	16.47	N	x	
Krapina	HRCSRN0019_001	23.29	N		x
Kupa/Kolpa	HRCSRN0004_018	5.14	N	x	
Kupa/Kolpa	HRCSRI0004_017	21.41	Y	x	
Kupa/Kolpa	SI21VT13	21.30	Y	x	
Kupa/Kolpa	HRCSRI0004_016	17.29	Y	x	
Kupa/Kolpa	SI21VT50	85.00	Y	x	
Kupa/Kolpa	HRCSRI0004_015	15.00	Y	x	
Kupa/Kolpa	HRCSRI0004_014	30.09	Y	x	
Kupa/Kolpa	HRCSRI0004_013	14.46	Y	x	
Kupa/Kolpa	HRCSRI0004_012	20.20	Y	x	
Kupa/Kolpa	SI21VT70	12.04	Y	x	
Kupa/Kolpa	HRCSRN0004_011	9.16	N	x	
Kupa/Kolpa	HRCSRN0004_010	0.64	N		x
Kupa/Kolpa	HRCSRN0004_009	0.80	N	x	
Kupa/Kolpa	HRCSRN0004_008	15.39	N	x	
Kupa/Kolpa	HRCSRN0004_007	13.34	N	x	
Kupa/Kolpa	HRCSRN0004_006	10.56	N	x	
Kupa/Kolpa	HRCSRN0004_005	22.37	N	x	
Kupa/Kolpa	HRCSRN0004_004	18.46	N	x	
Kupa/Kolpa	HRCSRN0004_003	20.45	N	x	
Kupa/Kolpa	HRCSRN0004_002	37.98	N	x	
Kupa/Kolpa	HRCSRN0004_001	23.60	N	x	
Dobra	HRCSRN0040_005	4.62	N	x	
Dobra	HRCSRN0040_004	16.46	N	x	
Dobra	HRCSRN0040_003	25.09	N	x	
Dobra	HRCSRN0021_004	16.05	N		x
Dobra	HRCSRN0021_003	7.50	N	x	
Dobra	HRCSRN0021_002	10.58	N	x	
Dobra	HRCSRN0021_001	20.97	N	x	
Korana	HRCSRN0012_008	18.61	N	x	
Korana	HRCSRI0012_007	23.42	Y	x	
Korana	BA_KORANA	23.34	Y	x	
Korana	HRCSRN0012_006	24.63	N	x	
Korana	HRCSRN0012_005	10.63	N	x	
Korana	HRCSRN0012_004	24.28	N	x	
Korana	HRCSRN0012_003	15.93	N	x	
Korana	HRCSRN0012_002	13.22	N	x	
Korana	HRCSRN0012_001	7.91	N	x	

RIVER	EU SWB Code	Length (km)	Trans boundary	Natural SWB	HMWB (x)/Preliminary HWMB (px)
Glina	HRCSRN0017_006	24.51	N	x	
Glina	HRCSRN0017_005	11.46	N	x	
Glina	HRCSRI0017_004	22.55	Y	x	
Glina	HRCSRN0017_003	26.86	N	x	
Glina	HRCSRN0017_002	13.49	N	x	
Glina	HRCSRN0017_001	13.67	N	x	
Lonja Trebež	HRCSRN0007_003	22.32	N	x	
Lonja Trebež	HRCSRN0007_002	5.99	N	x	
Lonja Trebež	HRCSRN0007_001	35.92	N	x	
Česma(Grđevica)	HRCSRN0010_008	26.78	N	x	
Česma	HRCSRN0010_007	13.66	N	x	
Česma	HRCSRN0010_006	4.49	N	x	
Česma	HRCSRN0010_005	4.29	N		x
Česma	HRCSRN0010_004	10.52	N		x
Česma	HRCSRN0010_003	4.46	N		x
Česma	HRCSRN0010_002	16.68	N		x
Česma	HRCSRN0010_001	27.08	N		x
Glogovnica	HRCSRN0028_002	22.12	N	x	
Glogovnica	HRCSRN0028_001	18.75	N	x	
spojni kanal Zelina-Lonja-Glog	HRCSRN0018_001	24.74	N		x
Ilova	HRCSRN0022_005	25.73	N	x	
Ilova	HRCSRN0022_004	21.34	N		x
Ilova	HRCSRN0022_003	12.72	N		x
Ilova	HRCSRN0022_002	14.00	N		x
Ilova	HRCSRN0022_001	17.49	N	x	
Ilova	HRCSRN0013_002	3.21	N	x	
Ilova (Stari Trebež)	HRCSRN0013_001	7.54	N	x	
Una	HRCSRN0005_007	4.05	N	x	
Una	HRCSRI0005_006	8.18	Y	x	
Una	BA_UNA_4	9.84	Y	x	
Una	BA_UNA_3	72.94	Y		px
Una	HRCSRI0005_005	23.39	Y	x	
Una	BA_RS_UNA_2B	8.08	N	x	
Una	BA_UNA_2C	45.71	N	x	
Una	BA_RS_UNA_2A	13.18	Y	x	
Una	HRCSRI0005_004	14.47	Y	x	
Una	BA_RS_UNA_1	70.54	Y	x	
Una	HRCSRI0005_003	17.87	Y	x	
Una	HRCSRI0005_002	28.55	Y	x	
Una	HRCSRI0005_001	24.62	Y	x	
Sana	BA_RS_Una_SAN_5	16.62	N	x	
Sana	BA_RS_Una_SAN_4C	10.01	N	x	
Sana	BA_RS_Una_SAN_4B	1.72	N	x	
Sana	BA_UNA_SAN_4A	26.71	N	x	
Sana	BA_UNA_SAN_3	15.37	N	x	
Sana	BA_UNA_SAN_2C	14.57	N	x	
Sana	BA_RS_Una_SAN_2B	2.06	N	x	
Sana	BA_RS_Una_SAN_2A	23.08	N	x	
Sana	BA_RS_Una_SAN_1	34.66	N	x	
Vrbas	BA_VRB_8	14.50	N	x	
Vrbas	BA_VRB_7	57.75	N	x	
Vrbas	BA_VRB_6	25.08	N	x	
Vrbas	BA_VRB_5	13.55	N		px

RIVER	EU SWB Code	Length (km)	Trans boundary	Natural SWB	HMWB (x)/Preliminary HWMB (px)
Vrbas	BA_VRB_4B	6.81	N		px
Vrbas	BA_RS_VRB_4A	14.18	N		px
Vrbas	BA_RS_VRB_3	26.79	N		px
Vrbas	BA_RS_VRB_2	17.27	N		px
Vrbas	BA_RS_VRB_1	73.68	N		px
Pliva	BA_RS_Vrb_PLI_4	10.66	N	x	
Pliva	BA_RS_Vrb_PLI_3	12.87	N	x	
Pliva	BA_VRB_PLIVA_2	5.99	N		px
Pliva	BA_VRB_PLIVA_1	2.92	N		px
Orljava	HRCSRN0015_006	13.33	N	x	
Orljava	HRCSRN0015_005	5.99	N	x	
Orljava	HRCSRN0015_004	26.07	N	x	
Orljava	HRCSRN0015_003	18.26	N	x	
Orljava	HRCSRN0015_002	19.78	N	x	
Orljava	HRCSRN0015_001	8.90	N		x
Ukrina	BA_RS_UK_2	17.75	N	x	
Ukrina	BA_RS_UK_1	63.16	N		px
Bosna	BA_BOS_7	8.37	N	x	
Bosna	BA_BOS_6	22.04	N	x	
Bosna	BA_BOS_5	48.68	N	x	
Bosna	BA_BOS_4	36.92	N	x	
Bosna	BA_BOS_3	37.66	N	x	
Bosna	BA_RS_BOS_2A	18.39	N	x	
Bosna	BA_BOS_2B	45.89	N	x	
Bosna	BA_RS_BOS_1C	66.23	N		px
Bosna	BA_BOS_1B	13.42	N	x	
Bosna	BA_RS_BOS_1A	13.44	N		px
Lašva	BA_BOS_LAS_5	2.13	N	x	
Lašva	BA_BOS_LAS_4	21.75	N	x	
Lašva	BA_BOS_LAS_3	11.72	N		px
Lašva	BA_BOS_LAS_1	19.15	N		px
Krivaja	BA_BOS_KRI_4	4.73	N	x	
Krivaja	BA_BOS_KRI_3	6.46	N	x	
Krivaja	BA_BOS_KRI_1	61.71	N	x	
Spreča	BA_RS_Bos_SPR_4	11.44	N	x	
Spreča	BA_RS_Bos_SPR_3B	3.01	N	x	
Spreča	BA_BOS_SPR_3A	50.35	N	x	
Spreča	BA_BOS_SPR_2	8.15	N		px
Spreča	BA_BOS_SPR_1C	65.21	N	x	
Spreča	BA_RS_Bos_SPR_1B	47.71	N	x	
Spreča	BA_RS_Bos_SPR_1A	5.84	N	x	
Tinja	BA_SA_TIN_4	25.51	N	x	
Tinja	BA_SA_TIN_3	18.24	N	x	
Tinja	BA_BD_Sa_TIN_2	19.87	N	x	
Tinja	BA_BD_Sa_TIN_1	23.36	N		px
Drina	BA_RS_DR_8	23.69	N	x	
Drina	BA_RS_DR_7	8.30	N		px
Drina	BA_DR_6	21.85	N	x	
Drina	BA_DR_5B	5.36	N		px
Drina	BA_RS_DR_5A	31.18	N		px
Drina	BA_RS_DR_4B	31.88	N		px
Drina	BA_RS_DR_4A	23.63	Y		px
Drina	RSDR_4	22.52	Y		px
Drina	BA_RS_DR_3B	34.10	Y	x	

RIVER	EU SWB Code	Length (km)	Trans boundary	Natural SWB	HMWB (x)/Preliminary HWMB (px)
Drina	RSDR_3_C	24.37	Y	x	
Drina	RSDR_3_B	39.49	Y	x	
Drina	BA_RS_DR_3A	43.57	Y	x	
Drina	RSDR_3_A	20.61	Y	x	
Drina	RSDR_2	12.47	Y		px
Drina	BA_RS_DR_2	28.44	Y		px
Drina	RSDR_1_C	23.80	Y	x	
Drina	BA_RS_DR_1	83.70	Y		px
Drina	RSDR_1_B	8.90	Y	x	
Drina	RSDR_1_A	21.34	Y	x	
Piva	MEPiva_PivaRes	30.73	U		px
Piva	MEPiva	9.72	U	x	
Tara	METara_1	5.95	U	x	
Tara	METara_2	7.03	U		px
Tara	METara_3	30.82	U	x	
Tara	METara_4	18.80	U	x	
Tara	METara_5	80.89	U	x	
Ćehotina	MEDehotina_1	15.80	U	x	
Ćehotina	MEDehotina_2	8.27	U	x	
Ćehotina	MEDehotina_3	7.11	U	x	
Ćehotina	MEDehotina_Otilovici	9.27	U		px
Ćehotina	MEDehotina_4	7.38	U		px
Ćehotina	MEDehotina_5	19.10	U	x	
Ćehotina	MEDehotina_6	38.68	U	x	
Ćehotina	BA_RS_Dr_CEO_2	10.46	Y	x	
Ćehotina	BA_RS_Dr_CEO_1	25.59	N	x	
Prača	BA_RS_Dr_PR_7	5.39	N	x	
Prača	BA_RS_Dr_PR_6	6.05	N	x	
Prača	BA_RS_Dr_PR_5	6.21	N	x	
Prača	BA_DR_PRA_4	12.13	N	x	
Prača	BA_RS_Dr_PR_3B	3.28	N	x	
Prača	BA_DR_PRA_3A	5.45	N	x	
Prača	BA_RS_Dr_PR_2C	7.10	N	x	
Prača	BA_RS_Dr_PR_2B	3.18	N		px
Prača	BA_RS_Dr_PR_2A	10.07	N	x	
Prača	BA_RS_Dr_PR_1	4.75	N		px
Lim	MELim_1	26.02	U	x	
Lim	MELim_2	44.14	U	x	
Lim	MELim_3	23.84	U	x	
Lim	RSLIM_4_D	14.40	Y	x	
Lim	RSLIM_4_C	16.16	Y	x	
Lim	RSLIM_4_B	8.12	Y	x	
Lim	RSLIM_4_A	5.97	Y	x	
Lim	RSLIM_3	14.04	Y		px
Lim	RSLIM_2	12.81	Y	x	
Lim	RSLIM_1	13.83	Y	x	
Lim	BA_RS_Dr_LIM_4	11.41	N	x	
Lim	BA_RS_Dr_LIM_3	5.22	Y		px
Lim	BA_RS_Dr_LIM_2	8.99	N		px
Lim	BA_RS_Dr_LIM_1	19.12	N		px
Uvac	RSUV_7	23.80	Y	x	
Uvac	RSUV_6	6.30	Y		px
Uvac	RSUV_5	21.19	Y		px
Uvac	RSUV_4	21.64	Y		px

RIVER	EU SWB Code	Length (km)	Trans boundary	Natural SWB	HMWB (x)/Preliminary HWMB (px)
Uvac	RSUV_3	8.90	Y	x	
Uvac	RSUV_2	22.52	Y	x	
Uvac	RSUV_1	14.04	Y	x	
Uvac	BA_RS_Dr_Lim_UVA	8.26	Y		px
Drinjača	BA_DR_DRNJ_6	20.76	N	x	
Drinjača	BA_DR_DRNJ_4B	16.51	N	x	
Drinjača	BA_RS_Dr_DRNJ_4A	8.78	N	x	
Drinjača	BA_RS_Dr_DRNJ_3	33.51	N	x	
Drinjača	BA_RS_Dr_DRNJ_2	6.87	N	x	
Drinjača	BA_RS_Dr_DRNJ_1B	1.27	N		px
Drinjača	BA_RS_Dr_DRNJ_1A	3.66	N		px
Bosut	HRCSRN0011_007	18.03	N	x	
Bosut	HRCSRN0011_006	16.24	N	x	
Bosut	HRCSRN0011_005	21.68	N	x	
Bosut	HRCSRN0011_004	15.53	N	x	
Bosut	HRCSRN0011_003	4.85	N	x	
Bosut	HRCSRI0011_002	22.20	Y	x	
Bosut	HRCSRI0011_001	1.40	Y	x	
Bosut	RSBOS_2	27.13	N	x	
Bosut	RSBOS_1	11.39	N		px
Kolubara	RSKOL_6	14.83	N	x	
Kolubara	RSKOL_5	6.76	N	x	
Kolubara	RSKOL_4_C	7.77	N	x	
Kolubara	RSKOL_4_B	6.76	N	x	
Kolubara	RSKOL_4_A	7.69	N	x	
Kolubara	RSKOL_3_B	18.77	N	x	
Kolubara	RSKOL_3_A	23.60	N	x	
Kolubara	RSKOL_2	13.44	N	x	
Kolubara	RSKOL_1	14.83	N	x	

LEGEND:
EU SWB Code-unique identifier of the SWB
Transboundary- Transboundary SWB (Yes, No)
Natural SWB- Yes (x), SWB has no natural character (no label)
HWMB (x) -Heavily modified water body
Preliminary HWMB (px) -Preliminarily heavily modified water body

Table 2: Status assessment of surface water bodies

River	Water body code	Biological Quality Elements										Hydromorphology - High Status (Y/N)	General Physical and Chemical conditions	Specific pollutants		ECOLOGICAL STATUS	Confidence class (Overall Ecol.Status)	Artificial and HMWB			Chemical Status Class		Main Pressure					
		Fish	Bentic invertebrates	Benthic invertebrates-saprobnost	Benthic invertebrates HYMO spremljenost	Phytobenthos	Macrophytes	Phytobenthos and Macrophytes-saprobnost	Phytobenthos and Macrophytes-trofičnost	Phytoplankton	Overall Biological Status	Confidence (Overall Biological Status)			Other WB Specific pollutants	Confidence (Specific pollutants)			Artificial Water Body (Y/N)	HMWB (Y/Preliminary (pY)	Ecological Potential Class	CHEMICAL STATUS CLASS	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations	POINT pressure unknown	DIFFUSE pressure unknown
Sava	SI111VT5	3		1	1			1	2		3		ANN	1	1	U	3	H	N			2	H					x	x
Sava	SI111VT7	NoM		2	4			3	3		4		ANN	1	1	U		H	N	Y	3	2	H	x	x	x	x	x	x
Sava	SI1VT137	NoM		2	2			1	1		2		ANN	2	1	U	2	H	N			2	H	x		x		x	x
Sava	SI1VT150	NoM		1	2			1	1		2		ANN	1	1	U	2	M	N			2	H	x	x	x		x	x
Sava	SI1VT170	NoM		3	4			1	1		4		ANN	1	2	U		H	N	Y	3	2	M	x	x	x	x	x	x
Sava	SI1VT310	NoM		2	2			2	1		2		ANN	1	1	U	2	H	N			2	H				x	x	x
Sava	SI1VT519	NoM		2	2			1	1		2		ANN	2	1	U	2	H	N			2	H	x	x	x	x	x	x
Sava	SI1VT557	NoM		2	2			1	1		2		ANN	2	1	U	2	H	N			2	H	x	x	x		x	x
Sava	SI1VT713	NoM		4	4			2	2		4		ANN	2	2	U		M	N	Y	4	2	M	x	x	x	x	x	x
Sava	SI1VT739	NoM		3	3			1	2		3		ANN	2	2	U	3	H	N			2	H	x	x	x	x	x	x
Sava	SI1VT913	NoM		2	2			1	2		2		ANN	1	1	U	2	M	N			2	H	x	x	x	x	x	x
Sava	SI1VT930	NoM		1	2			1	1		2		ANN	1	1	U	2	H	N			2	H		x			x	x
Sava	HRCSRI0001_021		2			2					2			2	1		2	H	N			2	H				x		
Sava	HRCSRN0001_020													2	1		2	M	N			2	M				x		
Sava	HRCSRN0001_019		2			3					3			2	1		3	H	N			2	H	x	x	x	x		
Sava	HRCSRN0001_018		4			2					4			2	1			H		Y	4	2	H	x	x	x	x		
Sava	HRCSRN0001_017													2	1			M		Y	5	2	M	x	x		x		
Sava	HRCSRN0001_016													2	1			M		Y	5	2	M	x	x		x		
Sava	HRCSRN0001_015		3			3					3			2	1			H		Y	5	2	H	x	x	x	x		
Sava	HRCSRN0001_014		2			3					3			2	1			H		Y	4	2	H	x	x	x	x		

River	Water body code	Biological Quality Elements											Hydromorphology - High Status (Y/N)	General Physical and Chemical conditions	Specific pollutants		ECOLOGICAL STATUS	Confidence class (Overall Ecol.Status)	Artificial and HMWB			Chemical Status Class		Main Pressure					
		Fish	Bentic invertebrates	Benthic invertebrates-saprobnost	Benthic invertebrates HYMO spremljenost	Phytobenthos	Macrophytes	Phytobenthos and Macrophytes-saprobnost	Phytobenthos and Macrophytes-trofičnost	Phytoplankton	Overall Biological Status	Confidence (Overall Biological Status)			Other WB Specific pollutants	Confidence (Specific pollutants)			Artificial Water Body (Y/N)	HMWB (Y/Preliminary (pY)	Ecological Potential Class	CHEMICAL STATUS CLASS	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations	POINT pressure unknown	DIFFUSE pressure unknown
Sava	HRCSRN0001_013													2	1			M		Y	5	3	M	x	x	x	x		
Sava	HRCSRN0001_012		2			2				2	2			2	1		4	H	N			2	H	x	x	x	x		
Sava	HRCSRI0001_011		3			2				2	3			2	1			H		Y	4	2	M	x	x	x	x		
Sava	HRCSRI0001_010													2	1			M		Y	5	2	M	x	x	x	x		
Sava	HRCSRI0001_009		3			3					3			2	1			H		Y	4	2	M	x	x	x	x		
Sava	BA_RS_SA_3										2	M		3	2	L	3	M		Y		3	L		x				
Sava	HRCSRI0001_008													2	1			M		Y	5	2	M	x	x	x	x		
Sava	HRCSRI0001_007		2			2					3			2	1		5	H	N			2	H	x	x	x	x		
Sava	HRCSRI0001_006													2	1			M		Y	5	2	M	x	x	x	x		
Sava	HRCSRI0001_005		2			2					2			2	1		4	H	N			2	H	x	x	x	x		
Sava	BA_RS_SA_2B										2	M		3	2	L	3	M		pY		U	U		x				
Sava	BA_SA_2A											U	N	2	-	U	5	U		pY		2	U						
Sava	HRCSRI0001_004													2	1			M		pY	5	2	M	x	x	x	x		
Sava	BA_RS_SA_1D																U	U		pY		U	U						
Sava	HRCSRI0001_003		2			2					2			2	1		5	H	N			2	H	x	x	x	x		
Sava	BA_SA_1C											U	N	2	-	U	3	U		pY		3	U						
Sava	HRCSRI0001_002		2			2				2	2			2	1		5	H	N			2	H	x	x	x	x		
Sava	BA_BD_SA_1B																3	L		pY		U	U		x				
Sava	HRCSRI0001_001		3			3					3			2	1			H		pY	4	2	H	x	x	x	x		
Sava	BA_RS_SA_1A										2	M		3	2	L	3	M		pY		3	L		x				
Sava	RSSA_7		2					2		3	3			3	2	m	3	M	N			2	M				x	x	x

River	Water body code	Biological Quality Elements										Hydromorphology - High Status (Y/N)	General Physical and Chemical conditions	Specific pollutants		ECOLOGICAL STATUS	Confidence class (Overall Ecol.Status)	Artificial and HMWB			Chemical Status Class		Main Pressure					
		Fish	Bentic invertebrates	Benthic invertebrates-saprobnost	Benthic invertebrates HYMO spremljenost	Phytobenthos	Macrophytes	Phytobenthos and Macrophytes-saprobnost	Phytobenthos and Macrophytes-trofičnost	Phytoplankton	Overall Biological Status	Confidence (Overall Biological Status)			Other WB Specific pollutants	Confidence (Specific pollutants)			Artificial Water Body (Y/N)	HMWB (Y/Preliminary (pY)	Ecological Potential Class	CHEMICAL STATUS CLASS	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations	POINT pressure unknown	DIFFUSE pressure unknown
Sava	RSSA_6		3					3			3						3	M	N			U	U				x		
Sava	RSSA_5		3					3		3	3						3	M	N			U	U				x		
Sava	RSSA_4		3					2		3	3			2	3	m	3	M	N			2	M	x	x	x	x	x	x
Sava	RSSA_3		3					2		3	3						3	M	N			u	U				x		
Sava	RSSA_2		2					2		3	3						3	M	N			u	U				x	x	x
Sava	RSSA_1		3					3		4	4			3	2	m		M		pY	4	3	M				x		
Ljubljanica	SI14VT77	NoM		1	4			2	1		2		ANN	2	1	U	4	M	N			2	U	x	x	x	x	x	x
Ljubljanica	SI14VT93	NoM		1	2			1	3		3		ANN	1	1	U		M	N	Y	3	2	U	x	x	x	x	x	x
Ljubljanica	SI14VT97	NoM		2	2			2	2		2		ANN	2	1	U	2	H	N			2	U	x	x	x	x	x	x
Savinja	SI16VT17	2		2	2			1	1		2		ANN	1	1	U	2	H	N			2	U	x	x	x		x	x
Savinja	SI16VT70	3		2	2			1	1		3		ANN	2	2	U	3	M	N			2	U	x	x	x		x	x
Savinja	SI16VT97	NoM		2	2			1	1		2		ANN	2	2	U	2	H	N			2	U	x	x	x		x	x
Krka	SI18VT31	NoM		2	3			2	2		3		ANN	2	1	U	3	M	N			2	U	x	x	x	x	x	x
Krka	SI18VT77	NoM		1	3			1	2		3		ANN	1	1	U	3	M	N			2	U	x	x	x		x	x
Krka	SI18VT97	NoM		1	2			1	2		2		ANN	1	1	U	2	H	N			2	U	x	x	x	x	x	x
Sotla	SI192VT1	3		3	2			2	3		3		ANN	2	2	U	3	H	N			2	U	x	x	x	x	x	x
Sutla	HRCSRI0029_006		3			4	4				2			2	1		4	H	N			2	H	x	x	x	x		
Sutla	HRCSRI0029_005													3	1					Y	3	2	U	x	x	x	x		
Sutla	HRCSRI0029_004													2	1		2	M	N			2	M				x		
Sotla	SI192VT5	NoM		1	2			1	1		2		ANN	1	2	U	2	H	N			2	U	x	x	x	x	x	x
Sutla	HRCSRI0029_003		2			2					2			2	1		2	H	N			2	H				x		

River	Water body code	Biological Quality Elements											Hydromorphology - High Status (Y/N)	General Physical and Chemical conditions	Specific pollutants		ECOLOGICAL STATUS	Confidence class (Overall Ecol.Status)	Artificial and HMWB			Chemical Status Class		Main Pressure					
		Fish	Bentic invertebrates	Benthic invertebrates-saprobnost	Benthic invertebrates HYMO spremljenost	Phytobenthos	Macrophytes	Phytobenthos and Macrophytes-saprobnost	Phytobenthos and Macrophytes-trofičnost	Phytoplankton	Overall Biological Status	Confidence (Overall Biological Status)			Other WB Specific pollutants	Confidence (Specific pollutants)			Artificial Water Body (Y/N)	HMWB (Y/Preliminary (pY)	Ecological Potential Class	CHEMICAL STATUS CLASS	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations	POINT pressure unknown	DIFFUSE pressure unknown
Sutla	HRCSRI0029_002													2	1		2	M	N			2	M				x		
Sutla	HRCSRI0029_001		3			2	4				4			2	1		4	H	N			2	H	x	x	x	x		
Krapina	HRCSRN0019_005		2			2					2			3	1		3	H	N			2	H	x	x	x	x		
Krapina	HRCSRN0019_004													3	1		3	M	N			2	M	x	x	x	x		
Krapina	HRCSRN0019_003		4			2					4			3	1		4	H	N			2	H	x	x	x	x		
Krapina	HRCSRN0019_002		4			2					4			3	1		4	H	N			2	M	x	x	x	x		
Krapina	HRCSRN0019_001		4			3					4			3	1			H		Y	4	2	H	x	x	x	x		
Kupa	HRCSRN0004_018		2			2					2			1	1		2	H	N			2	H				x		
Kupa	HRCSRI0004_017		2			2					2			1	1		2	H	N			2	H				x		
Kolpa	SI21VT13	NoM		1	1			1	1		1		Y	1	1	U	1	H	N			2	U	x	x	x		x	x
Kupa	HRCSRI0004_016		2			2					2			1	1		2	H	N			2	M				x		
Kolpa	SI21VT50	NoM		1	2			1	1		2		ANN	1	1	U	2	M	N			U	U	x	x	x	x	x	x
Kupa	HRCSRI0004_015													1	1		3	M	N			2	M	x	x		x		
Kupa	HRCSRI0004_014		3			1					3			1	1		3	H	N			2	M	x	x	x	x		
Kupa	HRCSRI0004_013													2	1		2	M	N			2	M				x		
Kupa	HRCSRI0004_012		2			2					2			2	1		2	H	N			2	H				x		
Kolpa	SI21VT70	NoM		1	2			1	2		2		ANN	1	1	U	2	H	N			2	U	x	x	x	x	x	x
Kupa	HRCSRN0004_011		2			2	1				2			2	1		2	M	N			2	M				x		
Kupa	HRCSRN0004_010													2	1			M		Y	3	2	M	x	x	x	x		
Kupa	HRCSRN0004_009													2	1		2	M	N			2	M				x		
Kupa	HRCSRN0004_008		3			2					3			1	1		3	H	N			2	M	x	x	x	x		

River	Water body code	Biological Quality Elements										Hydromorphology - High Status (Y/N)	General Physical and Chemical conditions	Specific pollutants		ECOLOGICAL STATUS	Confidence class (Overall Ecol.Status)	Artificial and HMWB			Chemical Status Class		Main Pressure					
		Fish	Bentic invertebrates	Benthic invertebrates-saprobnost	Benthic invertebrates HYMO spremljenost	Phytobenthos	Macrophytes	Phytobenthos and Macrophytes-saprobnost	Phytobenthos and Macrophytes-trofičnost	Phytoplankton	Overall Biological Status	Confidence (Overall Biological Status)			Other WB Specific pollutants	Confidence (Specific pollutants)			Artificial Water Body (Y/N)	HMWB (Y/Preliminary (pY)	Ecological Potential Class	CHEMICAL STATUS CLASS	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations	POINT pressure unknown	DIFFUSE pressure unknown
Kupa	HRCSRN0004_007		3			2					3		2	1		3	H	N			2	H	x	x	x	x		
Kupa	HRCSRN0004_006		3			2					3		2	1		3	M	N			2	H	x	x	x	x		
Kupa	HRCSRN0004_005												2	1		2	M	N			2	M				x		
Kupa	HRCSRN0004_004		5			2					5		2	1		5	H	N			2	M	x	x	x	x		
Kupa	HRCSRN0004_003		4			2					4		2	1		4	H	N			2	M	x	x	x	x		
Kupa	HRCSRN0004_002		4			2	4				4		2	1		4	M	N			2	H	x	x	x	x		
Kupa	HRCSRN0004_001		5			2					5		2	1		5	H	N			2	H	x	x	x	x		
Dobra	HRCSRN0040_005												1	1		2	M	N			2	M				x		
Dobra	HRCSRN0040_004												2	1		2	M	N			2	M				x		
Dobra	HRCSRN0040_003		2			2					2		1	1		3	H	N			2	H	x	x	x	x		
Dobra	HRCSRN0021_004												2	3			M		Y	5	3	L	x	x	x	x		
Dobra	HRCSRN0021_003		3			1					3		2	3		5	H	N			3	M	x	x		x		
Dobra	HRCSRN0021_002												1	3		5	M	N			3	M	x	x	x	x		
Dobra	HRCSRN0021_001		3			2					3		2	3		3	H	N			3	H	x	x	x	x		
Korana	HRCSRN0012_008		2			2					2		2	1		2	H	N			2	M				x		
Korana	HRCSRI0012_007		3			2					3		3	1		3	H	N			2	M	x	x		x		
Korana	BA_KORANA										U		U	U		U	U				U	U						
Korana	HRCSRN0012_006		4			2	3				4		2	3		4	M	N			2	H	x	x		x		
Korana	HRCSRN0012_005		4			2	3				4		2	1		4	M	N			2	M	x	x	x	x		
Korana	HRCSRN0012_004		2			2	2				2		2	1		2	M	N			2	H				x		
Korana	HRCSRN0012_003		3			2					3		2	3		3	H	N			2	M	x	x	x	x		

River	Water body code	Biological Quality Elements										Hydromorphology - High Status (Y/N)	General Physical and Chemical conditions	Specific pollutants		ECOLOGICAL STATUS	Confidence class (Overall Ecol.Status)	Artificial and HMWB			Chemical Status Class		Main Pressure					
		Fish	Bentic invertebrates	Benthic invertebrates-saprobnost	Benthic invertebrates HYMO spremljenost	Phytobenthos	Macrophytes	Phytobenthos and Macrophytes-saprobnost	Phytobenthos and Macrophytes-trofičnost	Phytoplankton	Overall Biological Status	Confidence (Overall Biological Status)			Other WB Specific pollutants	Confidence (Specific pollutants)			Artificial Water Body (Y/N)	HMWB (Y/Preliminary (pY)	Ecological Potential Class	CHEMICAL STATUS CLASS	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations	POINT pressure unknown	DIFFUSE pressure unknown
Korana	HRCSRN0012_002		3			2					3		2	1		3	H	N			2	M	x	x	x	x		
Korana	HRCSRN0012_001		3			2	2				3		2	1		3	M	N			2	H	x	x	x	x		
Glina	HRCSRN0017_006												2	1		2	L	N			2	L				x		
Glina	HRCSRN0017_005												2	1		2	L	N			2	L				x		
Glina	HRCSRI0017_004												2	1		2	M	N			2	L				x		
Glina	HRCSRN0017_003												2	1		2	M	N			2	L				x		
Glina	HRCSRN0017_002		4			2	4				4		2	1		4	H	N			2	M	x	x	x	x		
Glina	HRCSRN0017_001		4			2	4				4		2	1		4	H	N			2	M	x	x	x	x		
Lonja Trebež	HRCSRN0007_003												4	1		4	M	N			2	M	x	x	x	x		
Lonja Trebež	HRCSRN0007_002												4	1		4	M	N			3	M		x		x		
Lonja Trebež	HRCSRN0007_001												4	3		4	M	N			3	H	x	x	x	x		
Česma (Grđevica)	HRCSRN0010_008												2	1		2	L	N			2	L				x		
Česma	HRCSRN0010_007												4	1		4	L	N			2	L	x	x	x	x		
Česma	HRCSRN0010_006												4	1		4	M	N			2	M	x	x		x		
Česma	HRCSRN0010_005												4	1			M		Y	4	2	M	x	x		x		
Česma	HRCSRN0010_004		4			2	4				4		5	1			H		Y	5	2	H	x	x	x	x		
Česma	HRCSRN0010_003												5	1			M		Y	5	2	M		x				

River	Water body code	Biological Quality Elements										Hydromorphology - High Status (Y/N)	General Physical and Chemical conditions	Specific pollutants		ECOLOGICAL STATUS	Confidence class (Overall Ecol.Status)	Artificial and HMWB			Chemical Status Class		Main Pressure					
		Fish	Bentic invertebrates	Benthic invertebrates-saprobnost	Benthic invertebrates HYMO spremljenost	Phytobenthos	Macrophytes	Phytobenthos and Macrophytes-saprobnost	Phytobenthos and Macrophytes-trofičnost	Phytoplankton	Overall Biological Status	Confidence (Overall Biological Status)			Other WB Specific pollutants	Confidence (Specific pollutants)			Artificial Water Body (Y/N)	HMWB (Y/Preliminary (pY)	Ecological Potential Class	CHEMICAL STATUS CLASS	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations	POINT pressure unknown	DIFFUSE pressure unknown
Česma	HRCSRN0010_002		4			3	4				4			5	1			H		Y	5	2	H	x	x	x	x		
Česma	HRCSRN0010_001		5			3	4				5			4	1			H		Y	5	3	H	x	x	x	x		
Glogovnica	HRCSRN0028_002		4			2					4			3	1		4	H	N			2	M	x	x	x	x		
Glogovnica	HRCSRN0028_001		4			2					4			5	1		5	H	N			2	M	x	x	x	x		
spojni canal Zelina-Lonja-Glog	HRCSRN0018_001		4			2	4				4			5	1			H		Y	5	2	H	x	x	x	x		
Ilova	HRCSRN0022_005													2	1		2	M	N			2	L				x		
Ilova	HRCSRN0022_004													2	1			M		Y	4	2	L	x	x	x	x		
Ilova	HRCSRN0022_003		5			2	3				5			3	1			H		Y	5	2	L	x	x	x	x		
Ilova	HRCSRN0022_002		4			2	4				4			3	1			H		Y	4	2	M	x	x	x	x		
Ilova	HRCSRN0022_001		4			2	4				4			5	1		5	M	N			2	M	x	x	x	x		
Ilova	HRCSRN0013_002													5	1		5	M	N			2	M		x		x		
Ilova (Stari Trebež)	HRCSRN0013_001													5	1		5	M	N			2	M	x	x	x	x		
Una	HRCSRN0005_007		2			2					2			1	1		2	H	N			2	H				x		
Una	HRCSRI0005_006													1	1		2	M	N			2	M					x	x
Una	BA_UNA_4											U	N	1	2	U	2	U				2	U						
Una	BA_UNA_3											U	N	2	2	U	3	U		pY		2	U						
Una	HRCSRI0005_005													1	1		1	L	N			2	L					x	x
Una	BA_RS_UNA_2B																U	U	N			U	U						

River	Water body code	Biological Quality Elements											Hydromorphology - High Status (Y/N)	General Physical and Chemical conditions	Specific pollutants		ECOLOGICAL STATUS	Confidence class (Overall Ecol.Status)	Artificial and HMWB			Chemical Status Class		Main Pressure					
		Fish	Bentic invertebrates	Benthic invertebrates-saprobnost	Benthic invertebrates HYMO spremljenost	Phytobenthos	Macrophytes	Phytobenthos and Macrophytes-saprobnost	Phytobenthos and Macrophytes-trofičnost	Phytoplankton	Overall Biological Status	Confidence (Overall Biological Status)			Other WB Specific pollutants	Confidence (Specific pollutants)			Artificial Water Body (Y/N)	HMWB (Y/Preliminary (pY)	Ecological Potential Class	CHEMICAL STATUS CLASS	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations	POINT pressure unknown	DIFFUSE pressure unknown
Una	BA_UNA_2C											U	N	2	2	U	2	U				2	U						
Una	BA_RS_UNA_2A		2								2	M		3	2	3	3	M	N			3	L						
Una	HRCSRI0005_004													2	1		2	M	N			2	L					x	x
Una	BA_RS_UNA_1		2								2	M		3	2	3	3	M	N			3	L						
Una	HRCSRI0005_003		4			2					4			2	1		4	H	N			2	M	x	x	x	x		
Una	HRCSRI0005_002		3			2					3			2	1		3	H	N			2	M	x	x	x			
Una	HRCSRI0005_001		3			2					3			2	1		3	H	N			2	H	x	x	x	x		
Sana	BA_RS_Una_SAN_5																U	U	N			U	U						
Sana	BA_RS_Una_SAN_4C		2								2	M		2	2	3	2	2	N			3	M						
Sana	BA_RS_Una_SAN_4B																U	U	N			U	U						
Sana	BA_UNA_SAN_4A											U	N	1	2	U	2	U				2	U						
Sana	BA_UNA_SAN_3											U	N	2	2	U	2	U				2	U						
Sana	BA_UNA_SAN_2C											U	N	2	2	U	2	U				2	U						
Sana	BA_RS_Una_SAN_2B																U	U	N			U	U						
Sana	BA_RS_Una_SAN_2A																U	U	N			U	U						
Sana	BA_RS_Una_SAN_1		2								2	M		3	2	L	3	M	N			3	L	x	x	x			
Vrbas	BA_VRB_8											U	Y	3	2	U	4	U				2	U						
Vrbas	BA_VRB_7											U	N	2	2	U	2	U				3	U						
Vrbas	BA_VRB_6											U	N	1	2	U	2	U				3	U						
Vrbas	BA_VRB_5											U	N	1	-	U	3	U		pY		3	U						
Vrbas	BA_VRB_4B											U	N	1	-	U	5	U		pY		2	U						

River	Water body code	Biological Quality Elements											Hydromorphology - High Status (Y/N)	General Physical and Chemical conditions	Specific pollutants		ECOLOGICAL STATUS	Confidence class (Overall Ecol.Status)	Artificial and HMWB			Chemical Status Class		Main Pressure						
		Fish	Bentic invertebrates	Benthic invertebrates-saprobnost	Benthic invertebrates HYMO spremljenost	Phytobenthos	Macrophytes	Phytobenthos and Macrophytes-saprobnost	Phytobenthos and Macrophytes-trofičnost	Phytoplankton	Overall Biological Status	Confidence (Overall Biological Status)			Other WB Specific pollutants	Confidence (Specific pollutants)			Artificial Water Body (Y/N)	HMWB (Y/Preliminary (pY)	Ecological Potential Class	CHEMICAL STATUS CLASS	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations	POINT pressure unknown	DIFFUSE pressure unknown
Vrbas	BA_RS_VRB_4A		2								2	M		2	2	L	2	M		pY		2	L						
Vrbas	BA_RS_VRB_3																U	U	N			U	U						
Vrbas	BA_RS_VRB_2		2								2	M		2	2	L	2	2		pY		2	M						
Vrbas	BA_RS_VRB_1		2								2	M		3	2	L	3	2		pY		3	H	x	x	x			
Pliva	BA_RS_Vrb_PLI_4																U	U	N			U	U						
Pliva	BA_RS_Vrb_PLI_3																U	U	N			U	U						
Pliva	BA_VRB_PLIVA_2											U	N	-	-	U	-	U		pY		2	U						
Pliva	BA_VRB_PLIVA_1		3								3	U	N	2	2	U	4	U		pY		2	U						
Orljava	HRCSRN0015_006													1	1		1	M	N			2	L					x	x
Orljava	HRCSRN0015_005													1	1		2	M	N			2	M				x		
Orljava	HRCSRN0015_004		2			2	2				2			2	1		2	H	N			2	M				x		
Orljava	HRCSRN0015_003		4			2	4				4			4	5		5	H	N			3	H	x	x	x	x		
Orljava	HRCSRN0015_002													3	5		5	M	N			3	M	x	x	x	x		
Orljava	HRCSRN0015_001		3			2					3			3	5			H		Y	5	2	M	x	x	x	x		
Ukrina	BA_RS_UK_2																U	U	N			U	U						
Ukrina	BA_RS_UK_1		3								3	M		3	2	L	3	M		pY		3	M	x	x				
Bosna	BA_BOS_7											U	N	1	2	U	2	U				3	U						
Bosna	BA_BOS_6		4								4	U	N	4-5	-	U	5	U				3	U						
Bosna	BA_BOS_5											U	N	4-5	-	U	4	U				2	U						
Bosna	BA_BOS_4											U	N	4-5	2	U	4	U				3	U						
Bosna	BA_BOS_3											U	N	3	-	U	3	U				3	U						

River	Water body code	Biological Quality Elements										Hydromorphology - High Status (Y/N)	General Physical and Chemical conditions	Specific pollutants		ECOLOGICAL STATUS	Confidence class (Overall Ecol.Status)	Artificial and HMWB			Chemical Status Class		Main Pressure					
		Fish	Bentic invertebrates	Benthic invertebrates-saprobnost	Benthic invertebrates HYMO spremljenost	Phytobenthos	Macrophytes	Phytobenthos and Macrophytes-saprobnost	Phytobenthos and Macrophytes-trofičnost	Phytoplankton	Overall Biological Status	Confidence (Overall Biological Status)			Other WB Specific pollutants	Confidence (Specific pollutants)			Artificial Water Body (Y/N)	HMWB (Y/Preliminary (pY)	Ecological Potential Class	CHEMICAL STATUS CLASS	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations	POINT pressure unknown	DIFFUSE pressure unknown
Bosna	BA_RS_BOS_2A		3								3	m		3	2	L	3	M	N			3	L						
Bosna	BA_BOS_2B											U	N	3	2	U	3	U				3	U						
Bosna	BA_RS_BOS_1C		3								3	M		3	2	L	3	M		pY		3	L					x	
Bosna	BA_BOS_1B											U	N	U	U	U	U	U				U	U						
Bosna	BA_RS_BOS_1A		3								3	M		3	2	L	3	M		pY		3	L					x	
Lasva	BA_BOS_LAS_5											U	N	2	-	U	2	U				3	U						
Lasva	BA_BOS_LAS_4											U	N	3	-	U	3	U				2	U						
Lasva	BA_BOS_LAS_3											U	N	2	-	U	3	U		pY		3	U						
Lasva	BA_BOS_LAS_1											U	N	2	2	U	2	U		pY		3	U						
Krivaja	BA_BOS_KRI_4											U	N	3	2	U	3	U				2	U						
Krivaja	BA_BOS_KRI_3											U	N	2	-	U	2	U				2	U						
Krivaja	BA_BOS_KRI_1											U	N	2	2	U	2	U				2	U						
Spreča	BA_RS_Bos_SPR_4																U	U	N			U	U						
Spreča	BA_RS_Bos_SPR_3B																U	U	N			U	U						
Spreča	BA_BOS_SPR_3A											U	N	4-5	2	U	4	U				3	U						
Spreča	BA_BOS_SPR_2											U	N	-	-	U	-	U		pY		3	U						
Spreča	BA_BOS_SPR_1C											U	N	4-5	-	U	4	U				3	U						
Spreča	BA_RS_Bos_SPR_1B																U	U	N			U	U					x	
Spreča	BA_RS_Bos_SPR_1A		3								3	M		3	3	M	3	M	N			3	M					x	
Tinja	BA_SA_TIN_4											U	N	4-5	-	U	5	U				3	U						
Tinja	BA_SA_TIN_3											U	N	2	-	U	3	U				2	U						

River	Water body code	Biological Quality Elements											Hydromorphology - High Status (Y/N)	General Physical and Chemical conditions	Specific pollutants		ECOLOGICAL STATUS	Confidence class (Overall Ecol.Status)	Artificial and HMWB			Chemical Status Class		Main Pressure					
		Fish	Bentic invertebrates	Benthic invertebrates-saprobnost	Benthic invertebrates HYMO spremljenost	Phytobenthos	Macrophytes	Phytobenthos and Macrophytes-saprobnost	Phytobenthos and Macrophytes-trofičnost	Phytoplankton	Overall Biological Status	Confidence (Overall Biological Status)			Other WB Specific pollutants	Confidence (Specific pollutants)			Artificial Water Body (Y/N)	HMWB (Y/Preliminary (pY)	Ecological Potential Class	CHEMICAL STATUS CLASS	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations	POINT pressure unknown	DIFFUSE pressure unknown
Tinja	BA_BD_Sa_TIN_2																U	U	N			U	U						
Tinja	BA_BD_Sa_TIN_1																3	L		pY		U	U					x	
Drina	BA_RS_DR_8																U	U	N			U	U						
Drina	BA_RS_DR_7		2								2	M		3	2	L	3	M		pY		3	H						
Drina	BA_DR_6											U	N	1	2	U	2	U				3	U						
Drina	BA_DR_5B		3								3	U	Y	2	5	U	5	U		pY		2	U						
Drina	BA_RS_DR_5A		2								2			3	3	3	3	2		pY		3	M						
Drina	BA_RS_DR_4B																U	U		pY		U	U						
Drina	BA_RS_DR_4A																U	U		pY		U	U						
Drina	RSDR_4		4					4		3	4							M		pY	4	U	U				x		
Drina	BA_RS_DR_3B																U	U	N			U	U						
Drina	RSDR_3_C		4					2			4			2	2	m	4	M	N			2	M				x		
Drina	RSDR_3_B		2					2			2						2	M	N			U	U					x	x
Drina	BA_RS_DR_3A																U	U	N			U	U						
Drina	RSDR_3_A		2					2			2			3	5	m	2	M	N			U	U				x	x	x
Drina	RSDR_2		4					4		3	3			3	3	m		M		pY	4	U	U				x		
Drina	BA_RS_DR_2																	U	N	pY	U	U	U						
Drina	RSDR_1_C		4					3			4						3	M	N			U	U				x		
Drina	BA_RS_DR_1										2			3	2	3	3	2		pY		3	H					x	
Drina	RSDR_1_B		3					3			3						3	M	N			U	U				x		
Drina	RSDR_1_A		3					2			3			2	5	m	4	M	N			2	M				x		

River	Water body code	Biological Quality Elements										Hydromorphology - High Status (Y/N)	General Physical and Chemical conditions	Specific pollutants		ECOLOGICAL STATUS	Confidence class (Overall Ecol.Status)	Artificial and HMWB			Chemical Status Class		Main Pressure					
		Fish	Bentic invertebrates	Benthic invertebrates-saprobnost	Benthic invertebrates HYMO spremljenost	Phytobenthos	Macrophytes	Phytobenthos and Macrophytes-saprobnost	Phytobenthos and Macrophytes-trofičnost	Phytoplankton	Overall Biological Status	Confidence (Overall Biological Status)			Other WB Specific pollutants	Confidence (Specific pollutants)			Artificial Water Body (Y/N)	HMWB (Y/Preliminary (pY)	Ecological Potential Class	CHEMICAL STATUS CLASS	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations	POINT pressure unknown	DIFFUSE pressure unknown
Ćehotina	BA_RS_Dr_CEO_2																U	U	N			U	U						
Ćehotina	BA_RS_Dr_CEO_1		2								2			3	2	3	3	2	N			3	H						
Prača	BA_RS_Dr_PR_7		2								2						U	U	N			U	U						
Prača	BA_RS_Dr_PR_6																U	U	N			U	U						
Prača	BA_RS_Dr_PR_5																U	U	N			U	U						
Prača	BA_DR_PRA_4											U	N	1	-	U	2	U				2	U						
Prača	BA_RS_Dr_PR_3B																U	U	N			U	U						
Prača	BA_DR_PRA_3A											U	N	U	U	U	U	U				U	U						
Prača	BA_RS_Dr_PR_2C																U	U	N			U	U						
Prača	BA_RS_Dr_PR_2B																U	U		pY		U	U						
Prača	BA_RS_Dr_PR_2A																U	U	N			U	U						
Prača	BA_RS_Dr_PR_1		2								2			3	2	3	3	2		pY		2	L						
Lim	RSLIM_4_D		3					2		0	3						3	M	N			U	U					x	x
Lim	RSLIM_4_C		2					2		0	2						2	M	N			U	U					x	x
Lim	RSLIM_4_B		2					2		0	2			2	2	m	2	M	N			2	M					x	
Lim	RSLIM_4_A		3					2		0	3						3	M	N			U	U					x	
Lim	RSLIM_3		4					2		0	4							M		pY	4	U	U				x		
Lim	RSLIM_2		4					3		2	4						4	M	N			U	U					x	x
Lim	RSLIM_1		4					2		0	4						4	M	N			U	U						
Lim	BA_RS_Dr_LIM_4																	U		pY	U	U	U						
Lim	BA_RS_Dr_LIM_3																	U		pY	U	U	U						

River	Water body code	Biological Quality Elements										Hydromorphology - High Status (Y/N)	General Physical and Chemical conditions	Specific pollutants		ECOLOGICAL STATUS	Confidence class (Overall Ecol.Status)	Artificial and HMWB			Chemical Status Class		Main Pressure					
		Fish	Bentic invertebrates	Benthic invertebrates-saprobnost	Benthic invertebrates HYMO spremljenost	Phytobenthos	Macrophytes	Phytobenthos and Macrophytes-saprobnost	Phytobenthos and Macrophytes-trofičnost	Phytoplankton	Overall Biological Status	Confidence (Overall Biological Status)			Other WB Specific pollutants	Confidence (Specific pollutants)			Artificial Water Body (Y/N)	HMWB (Y/Preliminary (pY)	Ecological Potential Class	CHEMICAL STATUS CLASS	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations	POINT pressure unknown	DIFFUSE pressure unknown
Lim	BA_RS_Dr_LIM_2																U		pY	U	U	U						
Lim	BA_RS_Dr_LIM_1		2								2	M		3	2	L	3	M		pY		3	M						
Uvac	RSUV_7	1	1					1		0	1						1	M	N			2	M					x	x
Uvac	RSUV_6		3					0		2	3			2	2	M		L		pY	3	U	U				x		
Uvac	RSUV_5		4					0		2	4							L		pY	4	U	U				x		
Uvac	RSUV_4		3					0		2	3			3	2	M		L		pY	3	U	U				x		
Uvac	RSUV_3		4					1			4			2	2	M	4	M	N			2	M				x		
Uvac	RSUV_2		2					1			2						2	M	N			2	M				x		
Uvac	RSUV_1		3					2			3			5	2	M	3	L	N			U	U				x		
Uvac	BA_RS_Dr_Lim_UVA																	U		pY	U	U	U						
Drinjača	BA_DR_DRNJ_6											U	N	3	-	U	3	U				3	U						
Drinjača	BA_DR_DRNJ_4B											U	N	2	-	U	4	U				2	U						
Drinjača	BA_RS_Dr_DRNJ_4A																U	U	N			U	U						
Drinjača	BA_RS_Dr_DRNJ_3																U	U	N			U	U						
Drinjača	BA_RS_Dr_DRNJ_2		2								2			3	2	L	3	M	N			2	L						
Drinjača	BA_RS_Dr_DRNJ_1B																U	U		pY		U	U						
Drinjača	BA_RS_Dr_DRNJ_1A																U	U		pY		U	U						
Bosut	HRCSRN0011_007													3	1		3	M	N			2	M	x	x	x	x		
Bosut	HRCSRN0011_006		4			2	4				4			3	1		4	H	N			2	M	x	x	x	x		
Bosut	HRCSRN0011_005		4			2	4				4			5	1		5	H	N			3	H	x	x	x	x		
Bosut	HRCSRN0011_004													3	1		3	M	N			3	M	x	x		x		

River	Water body code	Biological Quality Elements										Hydromorphology - High Status (Y/N)	General Physical and Chemical conditions	Specific pollutants		ECOLOGICAL STATUS	Confidence class (Overall Ecol.Status)	Artificial and HMWB			Chemical Status Class		Main Pressure					
		Fish	Bentic invertebrates	Benthic invertebrates-saprobnost	Benthic invertebrates HYMO spremljenost	Phytobenthos	Macrophytes	Phytobenthos and Macrophytes-saprobnost	Phytobenthos and Macrophytes-trofičnost	Phytoplankton	Overall Biological Status	Confidence (Overall Biological Status)			Other WB Specific pollutants	Confidence (Specific pollutants)			Artificial Water Body (Y/N)	HMWB (Y/Preliminary (pY)	Ecological Potential Class	CHEMICAL STATUS CLASS	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations	POINT pressure unknown	DIFFUSE pressure unknown
Bosut	HRCSRN0011_003												3	1		3	M	N			3	M	x	x		x		
Bosut	HRCSRI0011_002		3			3	4				4		3	1		4	H	N			3	M	x	x	x	x		
Bosut	HRCSRI0011_001												3	1		3	M	N			2	M		x				
Bosut	RSBOS_2															4	U	N			U	U	x			x		
Bosut	RSBOS_1		4							2	4		5	3	M		L		pY	U	2	M				x		
Kolubara	RSKOL_6		3					2			3					3	M	N			U	U	x	x	x	x		
Kolubara	RSKOL_5		3					2			3					3	M	N			U	U					x	
Kolubara	RSKOL_4_C		3					2								3	M	N			U	U					x	
Kolubara	RSKOL_4_B															U	U	N			U	U						
Kolubara	RSKOL_4_A															U	U	N			U	U				x		x
Kolubara	RSKOL_3_B		3					2			3		3	3	M	3	M	N			2	M				x		
Kolubara	RSKOL_3_A		3					2			3					3	M	N			U	U				x		x
Kolubara	RSKOL_2		3					2			3					3	M	N			U	U					x	x
Kolubara	RSKOL_1		4					2			4					4	M	N			2	M				x	x	x

NOTE/LEGEND

NoM	Currently there is no methodology for the parameter assessment
ANN	Assessment not needed

Ecological Status Assessment

1	High status / maximum potential
2	Good status or maximum potential
3	Moderate status or potential
4	Poor status or potential
5	Bad status or potential

Chemical Status Assessment

2	Good status
3	Failing to achieve good status

Confidence level

U	Unknown confidence level
L	Low confidence level
M	M-Medium confidence level
H	H-High confidence level

***data related to status assessment for the SWBs in Montenegro were not available

Annex 4

List of delineated groundwater bodies and status assessment

List of delineated groundwater bodies and status assessment

Country (number of GWBs)	GWB Name	EU GWB Code *	GWB Trans boundary	GWB Area (km²)	RISK		STATUS	
					Chem	Quant	Chem	Quant
SI (11)	Sava Valley and Ljubljana's Marshes	SIGWB1001	NO	773.55	U	U	Good	Good
	Savinja Valley	SIGWB1002	NO	109.13	U	U	Poor	Good
	Krško Valley	SIGWB1003	YES	96.76	U	U	Good	Good
	Julian Alps in the Sava River Basin	SIGWB1004	YES	782.83	U	U	Good	Good
	Karavanke	SIGWB1005	YES	403.58	U	U	Good	Good
	Kamnik and Savinja Alps	SIGWB1006	NO	1,112.23	U	U	Good	Good
	Cerklje, Škofja Loka and Polhov Gradec Hills	SIGWB1007	NO	850.04	U	U	Good	Good
	Posavje Hills to the mid Sotla River	SIGWB1008	YES	1,791.62	U	U	Good	Good
	Lower part of the Savinja River to the Sotla River	SIGWB1009	YES	1,396.99	U	U	Good	Good
	Karst's Ljubljanica	SIGWB1010	NO	1,306.91	U	U	Good	Good
	Dolenjska Karst	SIGWB1011	YES	3,354.50	U	U	Good	Good
HR (14)	Kupa	HRCSGI-14	NO	1,027.00	NO	NO	Good	Good
	Korana	HRCSGI-17	YES	1,227.00	NO	NO	Good	Good
	Una	HRCSGI-18	YES	1,561.00	NO	NO	Good	Good
	Sutla and Krapina catchment	HRCSGI-24	YES	1,405.00	NO	NO	Good	Good
	Zagreb	HRCSGI-27	YES	988.00	NO	NO	Good	Good
	Lekenik - Lužani	HRCSGI-28	YES	3,444.00	NO	NO	Good	Good
	East slavonija - Sava sub-basin	HRCSGI-29	YES	3,328.00	NO	NO	Good	Good
	Žumberak - Samobors mountains	HRCSGI-30	YES	443.00	NO	NO	Good	Good
	Kupa	HRCSGI-31	YES	2,870.00	NO	NO	Good	Good
	Una	HRCSGI-32	YES	541.00	NO	NO	Good	Good
	Dobra	HRCSGN-15	NO	755.00	NO	NO	Good	Good
	Mrežnica	HRCSGN-16	NO	1,372.00	NO	NO	Good	Good
	Lonja - Ilova - Pakra cathment	HRCSGN-25	NO	5,186.00	NO	NO	Good	Good
	Orljava cathcment	HRCSGN-26	NO	1,575.00	NO	NO	Good	Good
BA (17)	Grmeč	BA_SA_4	NO	823.79	NO	NO	Good	Good
	Grmeč	BA_RS_SA_4	NO	199.58	NO	NO	Good	Good
	Upper Una Catchment	BA_SA_5	YES	1,171.33	NO	NO	Good	Good
	Mid_Sana Catchment	BA_SA_6	NO	837.65	NO	NO	Good	Good
	Mid_Sana Catchment	BA_RS_SA_6	NO	269.93	NO	NO	Good	Good
	Upper Sana Catchment	BA_SA_7	NO	911.90	NO	NO	Good	Good
	Upper_Sana Catchment	BA_RS_SA_7	NO	667.87	NO	NO	Good	Good
	Upper_Vrbas Catchment	BA_SA_8	NO	1,128.49	NO	NO	Good	Good

Country (number of GWBs)	GWB Name	EU GWB Code *	GWB Trans boundary	GWB Area (km²)	RISK		STATUS	
					Chem	Quant	Chem	Quant
	Upper_ Vrbas Catchment	BA_RS_SA_8	NO	520.37	NO	NO	Good	Good
	Mid Vrbas Catchment	BA_SA_9	NO	226.4	NO	NO	Good	Good
	Mid _Vrbas Catchment	BA_RS_SA_9	NO	943.53	NO	NO	Good	Good
	Lijevče_Polje	BA_RS_SA_10	NO	595.69	YES	NO	Poor	Good
	Posavina	BA_SA_19	YES	376.34	YES	YES	Poor	Poor
	Posavina	BA_RS_SA_19	NO	808.57	YES	YES	Poor	Poor
	Semberija	BA_RS_SA_20	NO	465.07	YES	NO	Poor	Good
	Romanija_Devetak	BA_RS_SA_22	NO	1,299.49	NO	NO	Good	Good
	Posavina	BA_BD_SA_50	NO	309.13	YES	YES	Poor	Poor
RS (5)	Eastern Srem - OVK	RS_SA_GW_I_2	NO	1,593.65	U	YES	U	Poor
	Mačva – OVK	RS_SA_GW_I_3	NO	763.41	U	U	U	Good
	Western Srem - pliocene	RS_SA_GW_I_6	NO	1,172.92	U	YES	U	Poor
	Eastern Srem - pliocene	RS_SA_GW_I_7	NO	2,248.99	U	YES	U	Poor
	Mačva - pliocene	RS_SA_GW_I_8	NO	1,577.53	U	U	U	Good
ME (13)	Pivska Mountain	ME-1_1	NO	629.91	U	U	U	U
	Morača	ME-1_2	YES	355.16	U	U	U	U
	Brezna-Maglić	ME-1_3	YES	702.93	U	U	U	U
	Pljevlja basin	ME-2_1	YES	554.02	U	U	U	U
	Maoče	ME-2_2	YES	526.7	U	U	U	U
	Beranska bistrica	ME-3_1	YES	327.73	U	U	U	U
	Pešter	ME-3_2	YES	117.02	U	U	U	U
	Komovi	ME-3_3	YES	127.76	U	U	U	U
	Prokletije	ME-3_4	YES	69.17	U	U	U	U
	Lješnica	ME-3_5	YES	239.92	U	U	U	U
	Sinjajevina	ME-4_1	NO	405.97	U	U	U	U
	Kosanica	ME-4_2	YES	377.47	U	U	U	U
	Durmitor	ME-4_3	YES	429.15	U	U	U	U

LEGEND*:*
Country (number of GWBs) Country Code
GWB NAME*: Name of the important groundwater body*
EU GWB Code*: Unique identifier of the GWB.*
GWB Transboundary*: Yes/No*
GWB Area (km²): *Whole area of the groundwater body*
Risk*: Indicates whether a groundwater body is at risk of failing good status. Chemical-Chem (Yes, No, U(Unknown)), Quantitative-Quant (Yes, No, U(Unknown)),*
Status*: Assessment of GWB status. Chemical (God, Poor, U(Unknown)), Quantitative (Good, Poor, U(Unknown)),*

Annex 5

List of agglomerations in the Sava River Basin

List of agglomerations in the Sava River Basin

COUNTRY/ Sava RB	1st Sava RBMP		2nd Sava RBMP	
	NUMBER OF AGGLOMERATIONS	GENERATED LOAD, PE	NUMBER OF AGGLOMERATIONS	GENERATED LOAD, PE
SIZE OF AGGLOMERATIONS > 2,000 PE				
SI	89	964,966	89	964,968
HR	104	2,442,741	91	2,012,057
BA	248	2,634,237	173	2,609,787
RS	108	698,663	70	2,140,259
ME	7	7,675	8	88,103
Sava RB	**556**	**6,817,357**	**431**	**7,815,174**
SIZE OF AGGLOMERATIONS 2,000 – 10,000 PE				
SI	71	296,574	71	296,576
HR	76	303,212	63	240,242
BA	196	743,507	122	537,153
RS	93	345,546	53	296,576
ME	4	1,675	5	23,156
Sava RB	**440**	**1,705,589**	**314**	**1,393,703**
SIZE OF AGGLOMERATIONS > 10,000 PE				
SI	18	668,392	18	668,392
HR	28	2,139,529	28	1,771,815
BA	52	1,890,730	51	668,392
RS	15	353,117	17	1,917,090
ME	3	60,000	3	64,944
Sava RB	**116**	**5,111,768**	**117**	**5,090,633**
SIZE OF AGGLOMERATIONS 10,001 – 100,000 PE				
SI	17	366,099	17	366,099
HR	25	72,612	27	814,514
BA	49	1,151,230	47	366,099
RS	15	353,117	16	500,518
ME	3	60,000	3	64,944
Sava RB	**109**	**2,389,368**	**110**	**2,112,177**
SIZE OF AGGLOMERATIONS > 100,000 PE				
SI	1	302,293	1	302,293
HR	3	1,413,409	1	957,301
BA	3	739,500	4	989,536
RS	0	0	1	1,416,572
ME	0	0	0	0
Sava RB	**7**	**2,455,202**	**7**	**3,665,702**

Annex 6

Significant industrial pollution sources in the Sava River Basin

Significant industrial pollution sources in the Sava River Basin

Country	Code of industrial installation	Name of industrial installation/plant	Location	Code EPER	Main production process	Main activity	Discharge to surface water	
							Direct (D) /Indirect (I)	Recipient
SI		Cinkarna Celje d.d.	Celje	4.(b).(v)	Chemical industry	Non-metals, metal oxides or other inorganic compounds	Direct	
SI		KRKA, d.d., Novo mesto	Krško	4.(b).(v)		Industrial scale production of basic pharmaceutical products	Direct	
SI		KRKA, d.d., Novo mesto	Novo mesto	4.(e)			Direct	
SI		JPČN Domžale-Kamnik d.o.o.	Domžale	5.(f)	Waste and waste water management	Urban waste-water treatment plants	Direct	
SI		VIPAP VIDEM KRŠKO D.D.	Krško	6.(b)	Paper and wood production processing	Production of paper and board and other primary wood products	Direct	
SI		Količevo Karton, d.o.o.	Domžale	6.1.(b) and 1.(c)	Paper and wood production processing	Production of paper and board and other primary wood products	Direct	
						Thermal power stations and other combustion installations		
HR	HR010221255	INA-Industrija nafte, d.d.	Sisak	1.(a)	Energy sector	Mineral oil and gas refineries	Direct	
HR	HR010272127	INA-Industrija nafte, d.d.	Ivanić-Grad				Indirect	
HR	HR010271953	HEP-PROIZVODNJA d.o.o.	Zagreb	1.(c)		Thermal power stations and other combustion installations	Indirect	
HR	HR010243844	HEP-PROIZVODNJA d.o.o.	Zagreb				Indirect	
HR	HR010250085	HEP-PROIZVODNJA d.o.o.	Konjščina				Direct	
HR	HR010255834	HEP-PROIZVODNJA d.o.o.	Sisak-Caprag				Direct	
HR	HR010210776	ABS Sisak d.o.o.	Sisak-Caprag	2.(b)	Production and processing of metals	Installations for the production of pig iron or steel (primary or secondary melting) including continuous casting	Indirect	
HR	HR010289399	UNIOR Vinkovci d.o.o.	Vinkovci	2.(c)		Smitheries with hammers, Installations for the processing of ferrous metals	Indirect	
HR	HR010266216	Plamen d.o.o	Požega	2.(d)		Ferrous metal foundries	Indirect	
HR	HR010376224	C.I.A.K. d.o.o. Građevina za privremeno skladištenje opasnog i neopasnog otpada	Zabok	2.(e)		For the smelting, including the alloying, of non-ferrous metals, including recovered products (refining, foundry casting)	Indirect	
HR	HR010203095	EUROCABLE GROUP d.d.	Jakovlje				Direct	
HR	HR010255796	Almos d.o.o.	Kutina				Direct	
HR	HR010252711	GALOKS	Vrbovec	2.(f)			Direct	

Country	Code of industrial installation	Name of industrial installation/plant	Location	Code EPER	Main production process	Main activity	Discharge to surface water	
							Direct (D) /Indirect (I)	Recipient
HR	HR010230432	DALEKOVOD PROIZVODNJA d.o.o.	Dugo Selo	2.(f)		Installations for surface treatment of metals and plastic materials using an electrolytic or chemical process	No data	
HR	HR010269703	Sab d.o.o.	Daruvar				No data	
HR	HR010258426	Kamen Sirač d.d.	Sirač	3.(b)	Mineral industry	Opencast mining and quarrying	Direct	
HR	HR010353704	IGM Šljunčara Trstenik d.o.o.	Sesvetski Kraljevec				No data	
HR	HR010239022	Vetropack Straža d.d.	Hum na Sutli	3.(e)		Installations for the manufacture of glass, including glass fibre	Direct	
HR	HR010267727	Wienerberger-Ilovac d.o.o.	Karlovac	3.(g)		Installations for the manufacture of ceramic products by firing	Direct	
HR	HR010260404	Wienerberger d.o.o.	Đakovo				Direct	
HR	HR010375082	"CHROMOS" d.d., Tvornica grafičkih boja	Samobor	4.(a)	Chemical industry	Dyes and pigments	Indirect	
HR	HR010310231	Scott Bader d.o.o.	Zagreb	4.(a)		Basic plastic materials (polymers, synthetic fibres and cellulose-based fibres) Chemical installations for the production on an industrial scale of basic organic chemicals	Indirect	
HR	HR010263136	GTG plin d.o.o.	Mahično	4.(a)		Chemical installations for the production on an industrial scale of basic organic chemical	Direct	
HR	HR010296239	Petrokemija d.d.tvornica gnojiva	Kutina	4.(c)		Chemical installations for the production on an industrial scale of phosphorous-, nitrogen- or potassium-based fertilisers	Direct	
HR	HR010266607	Pliva Hrvatska d.o.o.	Prigorje Brdovečko	4.(e)		Installations using a chemical or biological process for the production on an industrial scale of basic pharmaceutical products	Indirect	
HR	HR010268227	Hospira Zagreb d.o.o., Pfizer grupa	Prigorje Brdovečko	4.(e)			Indirect	
HR	HR010304720	CE-ZA-R d.o.o.	Zagreb-Susedgrad	5.(a)	Waste and waste water management	Installations for the recovery or disposal of hazardous waste	Indirect	
HR	HR010220852	INA MAZIVA d.o.o.	Zagreb	5.(a)			Indirect	
HR	HR010228365	Spectra - Media d.o.o. za privatnu zaštitu, proizodnju, trgovinu i usluge	Donja Bistra	5.(a)			pogon u Virovitici - Indirect	

Country	Code of industrial installation	Name of industrial installation/plant	Location	Code EPER	Main production process	Main activity	Discharge to surface water	
							Direct (D) /Indirect (I)	Recipient
HR	HR010280618	Komunalije Hrgovčić d.o.o.	Županja	5.(a)	Waste and waste water management	Installations for the recovery or disposal of hazardous waste	Indirect	
HR	HR010259775	AEKS d.o.o.	Ivanić-Grad	5.(a)			Direct	
HR	HR010241612	CE-ZA-R d.o.o.	Slavonski Brod	5.(a)			No data	
HR	HR010212655	Podružnica ZGOS-odlagalište Prudinec/Jakuševac	Zagreb	5.(d)		Landfills	Indirect	
HR	HR010363955	KOMUNALAC POŽEGA d.o.o. za komunalne djelatnosti-odlagalište Vinogradine	Požega	5.(d)			Direct/ Indirect	
HR	HR010314776	Čistoća Županja d.o.o.	Županja	5.(d)			Direct/ Indirect	
HR	HR010246959	Agroproteinka d.d.	Sesvete-Kraljevec	5.(e)		Installations for the disposal or recycling of animal carcasses and animal waste	Direct	
HR	HR010224335	Zagrebačke otpadne vode - upravljanje i pogon d.o.o.	Zagreb-Dubrava	5.(f)		Urban waste-water treatment plants	Indirect	
HR	HR010306897	Vodoopkrba i odvodnja d.o.o.	Zagreb	5.(f)			No data	
HR	HR010218394	PAN- papirna industrija - tvornica papira Zagreb d.o.o.	Zagreb	5.(f)	Paper and wood production processing		No data	
HR	HR010224831	Strizivojna hrast d.o.o.	Strizivojna	6.(a)		Industrial plants for the production of pulp from timber or similar fibrous materials	Direct	
HR	HR010226281	KRONOSPAN CRO d.o.o	Bjelovar	6.(b)		Industrial plants for the production of paper and board and other primary wood products	Indirect	
HR	HR010225919	SPIN VALIS d.d.	Požega	6.(c)		Industrial plants for the preservation of wood and wood products with chemicals	Indirect	
HR	HR010254706	PIK VRBOVEC PLUS D.O.O.	Vrbovec	8.(a)	Animal and vegetable products from the food and beverage sector	Slaughterhouses	Direct	
HR	HR010252754	Heineken Hrvatska d.o.o.	Karlovac	8.(b)		Vegetable raw materials	Indirect	
HR	HR010262466	P P K karlovačka mesna industrija, dioničko društvo	Karlovac	8.(b)		Animal raw materials (other than milk)	Indirect	
HR	HR010214992	Zagrebačka pivovara d.o.o.	Zagreb	8.(b)			Indirect	

Country	Code of industrial installation	Name of industrial installation/plant	Location	Code EPER	Main production process	Main activity	Discharge to surface water	
							Direct (D) /Indirect (I)	Recipient
HR	HR010231676	Granolio d.d. za proizvodnju, trgovinu i usluge	Gornji Draganec	8.(b)		Vegetable raw materials Treatment and processing intended for the production of food and beverage products from:	Direct	
HR	HR010211900	HRVATSKA INDUSTRIJA ŠEĆERA d.d., POGON ŽUPANJA	Županja	8.(b)			Direct	
HR	HR010212884	Tvornica Sirela Bjelovar	Bjelovar	8.(c)		Treatment and processing of milk	Indirect	
HR	HR010266046	DUKAT d.d.	Zagreb	8.(c)			Indirect	
HR	HR010281592	KIM MLJEKARA KARLOVAC	Karlovac	8.(c)			Indirect	
HR	HR010202161	LANA-KARLOVAČKA TISKARA D.D.	Karlovac	9.(c)	Other activities	Installations for the surface treatment of substances, objects or products using organic solvents	Indirect	
HR	HR010205934	SELK d.d.	Kutina	9.(c)			Direct	
HR	HR010262342	FLAMMIFER d.o.o.	Ozalj	9.(c)			Indirect	
HR	HR010261028	Bakrotisak d.d.	Garešnica	9.(c)		Installations for the surface treatment of substances, objects or products using organic solvents, in particular for dressing, printing, coating, degreasing, waterproofing, sizing, painting, cleaning or impregnating	Indirect	
HR		C.I.A.K. d.o.o. Centar za reciklažu akumulatora i baterija	Zabok				Indirect	
HR		KOMUNALAC POŽEGA d.o.o. za komunalne djelatnosti-deponija Alilovci					Indirect	
BA		RITE Ugljevik	Ugljevik		Energy sector	Termo power plant		Mezgaja
BA	BA243	TERMOELEKTRANA KAKANJ	Kakanj			Thermal power stations and other combustion installations		
BA	BA235	TERMOELEKTRANA TUZLA	Tuzla					
BA	BA170	Arcelor Mittal Zenica d.o.o.	Zenica		Production and processing of metals	Installations for the production of pig iron or steel including continuous casting		
BA		Alpro a.d.	Vlasenica			Aluminum products		Tabahana
BA		Fabrika za pocinčavanje	Srebrenica			Installations for surface treatment of metals a		Križevica
BA	BA492	RMU Zenica d.o.o.	Zenica		Mineral industry	Opencast mining and quarrying		

Country	Code of industrial installation	Name of industrial installation/plant	Location	Code EPER	Main production process	Main activity	Discharge to surface water	
							Direct (D) /Indirect (I)	Recipient
BA		RiTE Ugljevik	Ugljevik					Mezgaja
BA		Boksit a.d.	Milići					Zeleni jadar
BA		EFT Stanari d.o.o.	Stanari					Ostružnja
BA		Rudnik olova i srebra GROSS doo	Srebrenica			Underground mining and related operations		Saška rijeka
BA		Arcelor Mittal doo	Prijedor					GOmjenica
BA		Arcelor Mittal doo	Prijedor					Gomjenica
BA	BA196	UNIS GINEX	Goražde		Chemical industry	Installations for the production on an industrial scale of explosives and pyrotechnic products		
BA	BA199	GIKIL Global I.K Industrija doo	Lukavac			Coke ovens		
BA	BA760	SISECAM SODA LUKAVAC d.o.o.	Lukavac			Salts		
BA		Rafinerija nafte Brod a.d.	Brod			Petrol industry		Sava
BA		Rafinerija ulja Modriča a.d.	Modriča			Oil rafinery		Bosna
BA		Destilacija Teslić a.d.	Teslić			Production of acetic acid		Mala Usora
BA		Fabrika glinice Alumina a.d.	Zvornik		Chemical industry	Chemical industry		Drina
BA		Hemofarm d.o.o.	Banja Luka			Pharmaceautical production		
BA		V Group Palas d.o.o.	Brčko Distrikt			Production of ethyl alcohol. and animal feed		Sava
BA		Depot j.p.	Banja Luka		Waste management	Landfill		
BA		Eko Dep JP	Bijelijna			Municipal landfill		Majevički kanal
BA	BA168	Natron - Hayat d.o.o. Maglaj	Maglaj		Paper and wood production processing	Industrial plants for the production of paper and board and other primary wood products		
BA		SHP Celex d.o.o.	Banja Luka			Paper production		Vrbas
BA	BA893	SUŠA COMMERCE d.o.o.	Visoko		Animal and vegetable products from the food and beverage sector	Animal raw materials (other than milk)		
BA	BA477	INMER d.o.o.	Gradačac			Treatment and processing of milk		
BA		Mljekoprodukt d.o.o.	Kozarska Dubica		Food industry	Milk treatment and processing		Una

Country	Code of industrial installation	Name of industrial installation/plant	Location	Code EPER	Main production process	Main activity	Discharge to surface water	
							Direct (D) /Indirect (I)	Recipient
BA		Mira a.d.	Prijedor			Candy Production		Sana
BA		Banjalučka pivra a.d.	Banja Luka			Brewery		Vrbas
BA		Vitaminka a.d.	Banja Luka			Fruits and vegetable processing		Vrbas
BA		Tulumović d.o.o.	Laktaši			Meat production and processing		Vrbas
BA		Marbo d.o.o.	Laktaši			Vegetable processing		Vrbas
BA		Perutnina Ptuj pp	Srbac			Meat processing		Brnjavica
BA		PI Savasemberija a.d.	Bijeljina			Fruit and vegetable processing		Kanal Drina Dasnica
BA		HPK Draksenić a.d.	Kozarska Dubica			Vegetable processing		Ribarica donji
BA		ZP Komerc d.o.o.	Bijeljina			Meat processing		Lukavac
BA		doo Natura mesna ind. Teslic	Teslić			Meat processing		v. Usora
BA		Bimal d.d.	Brčko Distrikt			Vegetable processing		Sava
BA	BA_RS_VObarska	Postrojenje Velika Obarska	Bijeljina			Unknown		
BA	BA174	Prevent Leader d.o.o.	Visoko		Other activities	Plants for the tanning of hides and skins		
BA		Orao a.d.	Bijeljina			Overhaul of military equipment		Kanal
BA		Dević tekstil d.o.o.	Teslić			Textil industry		Usora
RS	RS100139344/4	JKP "Beogradske elektrane" TO Cerak	Beograd				Indirect	Sava
RS	RS100139344/6	JKP "Beogradske elektrane" TO Miljakovac	Beograd				Indirect	Sava
RS	RS100139344/1	JKP "Beogradske elektrane" TO Novi Beograd	Beograd				Direct	Sava
RS	RS100139344/3	JKP "Beogradske elektrane" TO Voždovac	Beograd	1.(c)			Indirect	Sava
RS	RS103920327/4	Javno preduzeće Elektroprivreda Srbije Ogranak TE Nikola Tesla	Beograd-Lazarevac					Kolubara
RS	RS103920327/1	Javno preduzeće Elektroprivreda Srbije Ogranak TE Nikola Tesla	Beograd-Obrenovac		Energy sector	Thermal power stations and other combustion installations		Sava

Country	Code of industrial installation	Name of industrial installation/plant	Location	Code EPER	Main production process	Main activity	Discharge to surface water	
							Direct (D) /Indirect (I)	Recipient
RS	RS103920327/2	Javno preduzeće Elektroprivreda Srbije Ogranak TE Nikola Tesla	Beograd-Obrenovac					Sava
RS	RS103920327/20	Javno preduzeće Elektroprivreda Srbije Ogranak RB Kolubara - Prerada	Lazarevac					Kolubara
RS	RS103920327/10	Javno preduzeće Elektroprivreda Srbije TO Sremska Mitrovica	Sremska Mitrovica				Direct/Indirect	Sava
RS	RS103917325/1	Metalfer Steel Mill, Topionica	Sremska Mitrovica	2.(f)	Production and processing of metals	Installations for surface treatment of metals and plastic materials using an electrolytic or chemical process	Direct	Canal
RS	RS104184255	Gorenje Tiki	Stara Pazova				Direct	Canal
RS	RS103125366/2	Železara Smederevo	Šabac-grad				Direct	Canal
RS	RS100886978	Rudnik VELIKI MAJDAN	LJubovija	3.(a)	Mineral industry	Underground mining and related operations		
RS	RS103920327/18	Ogranak RB Kolubara	Lazarevac	3.(b)		Opencast mining and quarrying		
RS	RS103920327/19	Ogranak RB Kolubara	Lazarevac					
RS	RS103920327/16	Ogranak RB Kolubara	Lazarevac					
RS	RS103920327/17	Ogranak RB Kolubara	Lazarevac					
RS	RS105384083/1	PAN-ALKO SISTEM DOO Beograd	Beograd-Čukarica	4.(a).(ii)	Chemical industry	Oxygen-containing hydrocarbons		
RS	RS106257426/1	Pogon Elixir Zorka	Šabac-grad	4.(c)		Chemical installations for the production on an industrial scale of phosphorous-, nitrogen- or potassium-based fertilisers		
RS	RS100038105	YUNIRISK	Beograd-Rakovica	5.(a)	Waste and waste water management	Installations for the recovery or disposal of hazardous waste		
RS	RS100346317	JKP Beogradski ViK	Beograd-Vračar	5.(f)		Urban waste-water treatment plants	Direct	Sava
RS	RS100003017	Umka d.o.o., Fabrika kartona	Beograd-Čukarica	6.(b)	Paper and wood production processing	Industrial plants for the production of paper and board and other primary wood products	Direct	Sava
RS	RS101216929	Dragan Marković ad, Farma svinja	Beograd-Obrenovac	7.(a)	Intensive livestock	Installations for the intensive rearing of poultry or pigs	Indirect	Sava

Country	Code of industrial installation	Name of industrial installation/plant	Location	Code EPER	Main production process	Main activity	Discharge to surface water	
							Direct (D) /Indirect (I)	Recipient
RS	RS100194684	Piljan Komerc, Farma živine	Beograd-Surčin	7.(a)	production and aquaculture		Indirect	Sava
RS	RS103921820/4	SUNOKO	Pećinci	8.(b).(ii)	Animal and vegetable products from the food and beverage sector	Treatment and processing intended for the production of food and beverage products from vegetable raw materials		
RS	RS102056739	Mlekara šabac A.D. Šabac	Šabac-grad	8.(c)		Treatment and processing of milk	Indirect	Sava
ME	MEIP_2	TE Pljevlja	Pljevlja	1	Energy sector	Unknown		
ME	MEIP_10	Fabrica Elektroda Piva	Plužine	2	Production and processing of metals	Unknown		
ME	MEIP_1	Coal mine	Pljevlja	3	Mineral industry	Unknown		
ME	MEIP_5	Mine	Pljevlja					
ME	MEIP_7	Crnogorski cement	Pljevlja	4	Chemical industry	Unknown		
ME	MEIP_11	Polipak	Bijelo Polje					
ME	MEIP_4	Vektra Jakic	Pljevlja	6	Paper and wood production processing	Unknown		
ME	MEIP_22	Boj-commerc	Andrijevica					
ME	MEIP_24	Omorika trade	Mojkovac					
ME	MEIP_25	Javor rpromet	Mojkovac					
ME	MEIP_26	Trudbenik	Mojkovac					
ME	MEIP_8	Razdolje	Pljevlja	7	Intensive livestock production and aquaculture	Unknown		
ME	MEIP_9	Ribnjak	Savnik					
ME	MEIP_13	Meso promet	Bijelo Polje			Unknown		
ME	MEIP_16	Farma Franca	Bijelo Polje			Unknown		
ME	MEIP_19	Ribnjak	Berane			Unknown		
ME	MEIP_14	Eko meso	Bijelo Polje	8	Animal and vegetable products from the food and beverage sector	Unknown		
ME	MEIP_15	Kravica	Bijelo Polje					
ME	MEIP_21	Zora	Berane					
ME	MEIP_27	Flora Pac	Mojkovac					
ME	MEIP_6	Zitoprodukt	Pljevlja	9	Other activities	Unknown		
ME	MEIP_12	Meduza	Bijelo Polje		Other activities			

Country	Code of industrial installation	Name of industrial installation/plant	Location	Code EPER	Main production process	Main activity	Discharge to surface water	
							Direct (D) /Indirect (I)	Recipient
ME	MEIP_17	Rada	Bijelo Polje		Other activities			
ME	MEIP_18	Mont Opeka	Berane		Other activities			
ME	MEIP_20	Poliex	Berane		Other activities			
ME	MEIP_23	Tara	Mojkovac		Other activities			
ME	MEIP_28	Aqua Bianca	Kolašin		Other activities			
ME	MEIP_29	Gorska	Kolašin		Other activities			

Annex 7

Overview of the Sava River Basin rivers continuity interruptions

Overview of the number of river continuity interruptions 2021 and 2027 restoration measures and exemptions according to the WFD Article 4(4) for each Sava country

Country	Barriers 2021	Passable by fish 2021	River continuity interruptions 2021	Fish passes to be constructed
SI	10	4	6	1
HR	5	1	4	0
BA	10	2	8	0
RS	8	2	6	0
ME	2	0	2	0
Total[51]	**35 (32)**	**9 (8)**	**26 (24)**	**1**
Sava	10	5	5	1

Slovenia							
Name/ Location	Barriers 2021	Passable by fish 2021	River continuity interruptions 2021	Fish passes to be constructed	River continuity interruptions by 2027	Exemptions WFD 4(4)	Measures indicated
HPP Moste*	Yes	No	Yes	No	Yes	No	Yes
HPP Mavčiče**	Yes	No	Yes	No	Yes**	No	Yes
HPP Medvode*	Yes	No	Yes	No	Yes	No	Yes
HPP Vrhovo**	Yes	No	Yes	No	Yes**	No	Yes
HPP Boštanj	Yes	No	Yes	Yes	No	No	---
HPP Blanca	Yes	Yes	No	No	No	---	---
HPP Krško ***	No	Yes	No	Yes	No	---	---
NEK Krško	Yes	Yes	No	No	No		
Vonarje	Yes	No	Yes	No			
HE Brežice	Yes	Yes	No	Yes	No		

* Combination of measures foreseen in national RBMP, based on the fact, that current assessment of ecological potential does not include fishes yet due to the lack of data
**'Fish catch and transport' measure, extent of the measure will be based on research study, as foreseen in national RBMP
*** under construction

[51] Both BA and RS include in their lists HPP Zvornik and Bajina Basta, located on the trans-boundary river Drina, and Slovenia and Croatia Vonarje on the Sotla/Sutla river.

Croatia							
Name/ Location	Barriers 2021	Passable by fish 2021	River continuity interruptions 2021	Fish passes to be constructed	River continuity interruptions by 2027	Exemptions WFD 4(4)	Measures indicated
HE Ozalj	Yes	No	Yes	No	Yes	No	No
Akumulacija Vonarje	Yes	No	Yes	No	Yes	No	No
HE Lesce	Yes	No	Yes	No	Yes	No	No
Akumulacija Bukovnik	Yes	No	Yes	No	Yes	No	No
Pregrada TE TO Zagreb	Yes	Yes	No	---	No	No	----

Bosnia and Herzegovina							
Name/ Location	Barriers 2021	Passable by fish 2021	River continuity interruptions 2021	Fish passes to be constructed	River continuity interruptions by 2027	Exemptions WFD 4(4)	Measures indicated
HE Bočac	Yes	No	Yes	No	Yes	No	No
HE Zvornik	Yes	Yes	No	---	No	---	---
HE Bajina Bašta	Yes	No	Yes	No	Yes	No	No
HE Višegrad	Yes	No	Yes	No	Yes	No	No
HE_Jajce II	Yes	No	Yes	No	Yes	No	No
HE_Jajce I	Yes	No	Yes	No	Yes	No	No
HE_Kostela	Yes	No	Yes	No	Yes	No	No
Modrac	Yes	No	Yes	No	Yes	No	No

Serbia							
Name/ Location	Barriers 2021	Passable by fish 2021	River continuity interruptions 2021	Fish passes to be constructed	River continuity interruptions by 2027	Exemptions WFD 4(4)	Measures indicated
HE Zvornik	Yes	Yes	No	---	No	---	---
Bajina Bašta	Yes	No	Yes	No	Yes	No	No
Kokin Brod	Yes	No	Yes	No	Yes	No	No
Uvac	Yes	No	Yes	No	Yes	No	No
Radoinja	Yes	No	Yes	No	Yes	No	No
Potpeć	Yes	No	Yes	No	Yes	No	No
Vodozahvat TE Veliki Crljeni	Yes	Yes	No	---	---	---	---
Ustava Bosut	Yes	No	Yes	No	Yes	No	No

Montenegro							
Name/ Location	Barriers 2021	Passable by fish 2021	River continuity interruptions 2021	Fish passes to be constructed	River continuity interruptions by 2027	Exemptions WFD 4(4)	Measures indicated
HE Piva	Yes	No	Yes	No	Yes	No	No
HE Otilovići	Yes	No	Yes	No	Yes	No	No

Annex 8

List of significant groundwater abstractions in the Sava River Basin

List of significant GW abstractions in the Sava River Basin

(> 50 l/s as annual average)

Country Code	GW abstraction location	GWB National Code	Mean annual abstraction (Mio.m3/yr)	Main Use	Safeguard protection zones established
SI	Ljubečna Celje D.D.	SI1688VT2	252.3	IND	No
SI	Ljubečna Celje D.D.		189.2	IND	No
SI	Ljubečna Celje D.D.		126.1	IND	No
SI	Goričane tovarna papirja Medvode, D.D.	SI123VT	3.30	IND	No
SI	Belinka holding, D.D.	SI1VT310	5.6	IND	No
SI	Aquasava, tekstilna industrija in trgovina, D.O.O., Kranj	SI1VT150	1.30	IND	No
SI	Iskra vzdrževanje, podjetje za izdelavo in vzdrževanje naprav, stavb in opreme D.D., Kranj		0.96	IND	No
HR	Mala Mlaka	CSGI_27	32.2	DRW	Yes
HR	Sašnjak		20.42	DRW	Yes
HR	Zapruđe		7.3	DRW	Yes
HR	Bregana		0.39	DRW	Yes
HR	Strmec		16.58	DRW	Yes
HR	Petruševac		39.14	DRW	Yes
HR	Šibice		4.81	DRW	Yes
HR	Velika gorica		10.79	DRW	Yes
HR	Ravnik	CSGI_28	0.77	DRW	Yes
HR	Sikirevci-istok	CSGI_29	9.03	DRW	In preparation
HR	Jelas		7.77	DRW	Yes
HR	Vratno	CSGN_25	0.72	DRW	Yes
HR	Švarča	CSGI_31	1.53	DRW	Yes
HR	Gaza 1		1.55	DRW	Yes
HR	Gaza3		2.39	DRW	Yes
HR	Mekušje		1.63	DRW	Yes
HR	Zapadno polje	CSGN_26	0.39	DRW	Yes
HR	Obrh	CSGI_14	0.55	DRW	Yes
HR	Žižići	CSGN_16	0.78	DRW	Yes
HR	Zagorska Mrežnica		1.83	DRW	Yes
BA	Bačevo"M"(Sarajevo)	The Bosna Catchment	37.84	DRW	Yes
BA	Konaci (Sarajevo)		14.19	DRW	Yes
BA	Sokolovići (Sarajevo)		9.46	DRW	Yes
BA	Bačevo "Am" (Sarajevo)		17.34	DRW	Yes
BA	Stup (Sarajevo)		3.15	DRW	Yes
BA	Hrasnica (Sarajevo)		1.58	DRW	Yes
BA	Kovačići (Sarajevo)		2.21	DRW	Yes
BA	Mošćanica-Vrelo (Sarajevo)		2.52	DRW	Yes
BA	Jahorinska Vrela		2.84	DRW	Yes
BA	Vrelo Bosne (Sarajevo)		6.31	DRW	Yes
BA	Kruščica (Zenica)		9.46-13.25	DRW	Yes

Country Code	GW abstraction location	GWB National Code	Mean annual abstraction (Mio.m3/yr)	Main Use	Safeguard protection zones established
BA	Izron Suha (Zavidovići)		5.05	DRW	Yes
BA	Kruščica (Vitez)		3.78-13.25	DRW	Yes
BA	Kremenik (Vitez)		2.21	DRW	Yes
BA	Buci (Visoko)		5.05	DRW	Unknown
BA	Očevlja (Vareš)		2.52-3.15	DRW	Unknown
BA	Stupari (Tuzla)		8.10	DRW	Yes
BA	Toplica (Tuzla)		6.12	DRW	Yes
BA	Sprečko Polje (Tuzla)		3.12	DRW	Yes
BA	Plava Voda (Travnik)		5.05	DRW	No
BA	Baš-Bunar (Travnik)		1.89	DRW	No
BA	Jelah (Tešanj)		1.42-1.58	DRW	No
BA	Zeleni Vir (Olovo)		1.89	DRW	Yes
BA	Bunari -Odžak		1.58	DRW	No
BA	Dusina (Novi Travnik)		1.58	DRW	No
BA	Jaglenica (Novi Travnik)		1.89	DRW	Yes
BA	Požarna (Fojnica)		2.21	DRW	Unknown
BA	Milkino Vrelo (Breza)		0.47-2.52	DRW	Unknown
BA	Studešnica (Banovići)		9.46-12.93	DRW	No
BA	Krabašnica (Banovići)		0.32-9.46	DRW	Unknown
BA	Luke (Doboj)		1.89	DRW	Yes
BA	Rudanka (Doboj)		2.05	DRW	Yes
BA	Tilava (Istočno Novo Sarajevo)		2.52	DRW	Yes
BA	Modričko Polje		3.15	DRW	No
BA	Kruščica (Bugojno)	Vrbas Catchment	7.88	DRW	Unknown
BA	Prijebljezi (Srbac)		4.10	DRW	Yes
BA	Klokot (Bihać)	The Una, the Glina and the Korana Catchment	8.20	DRW	No
BA	Privilica (Bihać)		3.15	DRW	Yes
BA	Ostrovica (Bihać)		3.15	DRW	Unknown
BA	Ada I (Bihać)		2.52	DRW	Yes
BA	Ada Ii (Bihać)		2.84	DRW	Yes
BA	Sanica (Bosanski Petrovac)		1.96	DRW	Yes
BA	Vignjevića Vrelo (Cazin)		3.15	DRW	Unknown
BA	Mutnik, Tahirovići (Cazin)		2.37	DRW	No
BA	Zdena (Sanski Most)		3.15	DRW	Yes
BA	Kvrkulja (Velika Kladuša)		3.78	DRW	No
BA	Dabravine Ii (Velika Kladuša)		1.58	DRW	Unknown
BA	Stanička Rijeka (Kladanj)	The Drina catchment	1.64	DRW	No
BA	Okanovići (Gradačac)		3.72	DRW	Unknown
BA	Kostrč (Orašje)		2.37	DRW	No
BA	Grmić (Bijeljina)		8.51	DRW	Yes
BA	Cicelj		2.52	DRW	No
BA	Lučko Vrelo		4.73	DRW	No
BA	Vrelo Prače (Pale, Trnovo)		2.37	DRW	No
BA	Vrelo Bioštice (Sokolac)		3.06	DRW	Yes
BA	Dobrun (Višegrad)		2.08	DRW	No
BA	Žeravica (Gradiška)		9.78	DRW	Yes

Country Code	GW abstraction location	GWB National Code	Mean annual abstraction (Mio.m3/yr)	Main Use	Safeguard protection zones established
BA	Izvorište vodovoda Šamac	The direct Sava Catchment	3.66	DRW	No
BA	Zelenkovac (Mrkonjić Grad)	The Una catchment	2.52	DRW	No
BA	Utvinac (Oštra Luka)		1.89	DRW	Yes
BA	Prijedorčanka (Prijedor)		1.58	DRW	Yes
BA	Mataruško Polje I (Prijedor)		7.41	DRW	Yes
BA	Novoselije (Banja Luka)		28.19	DRW	Yes
RS	Šabac-Tabanovic	RS_SA_GW_I_3	6.94	DRW	Yes
RS	Šabac-Bogatic		4.73	DRW	Yes
RS	Loznica-Zelenica i Gornje polje	RS_DR_GW_I_1	14.35	DRW	Yes
RS	Krupanj-Goricko vrelo	RS_DR_GW_P_3	6.31	DRW	
RS	Lazarevac-Peštan	RS_KOL_GW_I_1	4.73	DRW	
RS	Ub-Takovo		1.26-2.87	DRW	
RS	Lazarevac-Nepricava	RS_KOL_GW_K_1	1.26-2.87	DRW	Yes
RS	Koceljeva-Svileuva		1.42	DRW	
RS	Ljig-Vrelo	RS_KOL_GW_K_2	1.51	DRW	
RS	Valjevo-Paklje		3.78-31.54	DRW	Yes
RS	Ruma-Jarak	RS_SA_GW_I_2	4.73	DRW	Yes
RS	Sremska Mitrovica-Martinci		4.89	DRW	Yes
RS	Sabac-Mali Zabran	RS_SA_GW_I_3	1.89-2.84	DRW	Yes
RS	Beograd-Ušće	RS_SA_GW_I_4	11.67	DRW	Yes
RS	Beograd-Leva obala Save		81.99	DRW	Yes
RS	Obrenovac-Vic bare	RS_SA_GW_I_5	13.25	DRW	Yes
RS	Beograd-Desna obala Save		53.61	DRW	Yes
RS	Sid-Batrovci	RS_SA_GW_I_6	2.05	DRW	
RS	Ruma-Fiserov salas	RS_SA_GW_I_7	2.21	DRW	Yes
RS	Stara Pazova		3.78	DRW	
RS	Indjija		1.26-3.78	DRW	Yes
RS	Sjenica-Zarudine	RS_UV_GW_K_1	6.31	DRW	
ME	Vodovod Kolasin D.O.O Musovica Rijeka	ME-3_1	~3.50 (48,000PE)	DRW	Yes
ME	Vodovod Berane Merica vrelo (3 kaptaze) Dolac		~1.24 (17,000 PE)	DRW	Yes
ME	Vodovod Berane Manastirsko vrelo Lubnice		~1.24 (17,000 PE)	DRW	Yes

Main use: DRW = drinking water, IND = industry,

Annex 9

Register of protected areas in the Sava River Basin

Table 1: The register of protected areas relevant from the aspect of the nature conservation

Country	Protected area name	EU Protected Area Code *	PA Type	PA size (km²)	EU GWB Code *	EU SWB Code *
SI	Mateča voda in Bistrica	SI3000005	H	2.0	/	SI18VT31
SI	Zaplana	SI3000016	H	2.2	/	SI14VT77
SI	Ribniška dolina	SI3000026	H	4.9	/	SI18VT31
SI	Dobličica	SI3000048	H	3.8	SIGWB1011	/
SI	Temenica	SI3000049	H	1.6	/	SI18VT77
SI	Krakovski gozd	SI3000051	H	34.2	SIGWB1003	SI18VT97
SI	Brestanica	SI3000054	H	3.1	/	SI1VT913
SI	Stobe - Breg	SI3000055	H	1.0	SIGWB1011	/
SI	Vejar	SI3000056	H	2.2	/	/
SI	Mirna	SI3000059	H	5.5	/	SI1VT739
SI	Gradac	SI3000062	H	15.1	SIGWB1011	/
SI	Lahinja	SI3000075	H	8.5	SIGWB1011	/
SI	Češeniške gmajne z Rovščico	SI3000079	H	3.3	/	/
SI	Gozd Kranj - Škofja Loka	SI3000100	H	19.4	/	SI1VT150
SI	Gozd Olševek - Adergas	SI3000101	H	8.4	/	SI1VT170
SI	Ratitovec	SI3000110	H	23.3	/	/
SI	Boč - Haloze - Donačka gora	SI3000118	H	108.8	/	SI192VT1
SI	Šmarna gora	SI3000120	H	16.9	/	SI1VT170
SI	Nanoščica	SI3000126	H	7.7	/	/
SI	Rinža	SI3000129	H	2.4	SIGWB1011	/
SI	Sora Škofja Loka - jez Goričane	SI3000155	H	1.9	/	/
SI	Škocjan	SI3000160	H	1.2	/	SI18VT31
SI	Razbor	SI3000166	H	14.5	/	/
SI	Krška jama	SI3000170	H	4.3	SIGWB1011	SI18VT31
SI	Radensko polje - Viršnica	SI3000171	H	5.2	SIGWB1011	SI18VT31
SI	Bloščica	SI3000173	H	7.9	/	SI18VT31
SI	Kolpa	SI3000175	H	6.9	/	SI21VT50
SI	Kum	SI3000181	H	59.5	/	SI1VT557
SI	Ajdovska planota	SI3000188	H	24.1	SIGWB1011	SI18VT31
SI	Ajdovska jama	SI3000191	H	17.2	/	SI1VT913
SI	Radulja s pritoki	SI3000192	H	13.1	/	SI18VT97
SI	Nakelska Sava	SI3000201	H	1.2	/	SI1VT137
SI	Globočec	SI3000204	H	1.1	SIGWB1011	SI18VT31
SI	Kandrše - Drtijščica	SI3000205	H	13.6	/	SI1VT557
SI	Lubnik	SI3000206	H	12.7	SIGWB1001	/
SI	Volčeke	SI3000213	H	1.0	/	/
SI	Grad Brdo - Preddvor	SI3000219	H	5.8	/	/
SI	Huda luknja	SI3000224	H	30.2	/	/
SI	Javorniki - Snežnik	SI3000231	H	440.4	SIGWB1010	/
SI	Notranjski trikotnik	SI3000232	H	152.3	SIGWB1010	/
SI	Vrbina	SI3000234	H	2.7	/	SI1VT913
SI	Poljanska Sora Log - Škofja Loka	SI3000237	H	1.5	/	/
SI	Julijske Alpe	SI3000253	H	740.9	/	SI111VT5
SI	Trnovski gozd - Nanos	SI3000255	H	532.4	SIGWB6021	/

Country	Protected area name	EU Protected Area Code *	PA Type	PA size (km²)	EU GWB Code *	EU SWB Code *
SI	Krimsko hribovje - Menišija	SI3000256	H	203.3	/	SI18VT31
SI	Menina	SI3000261	H	41.8	/	/
SI	Sava Medvode - Kresnice	SI3000262	H	11.2	SIGWB1001	SI1VT310
SI	Kočevsko	SI3000263	H	1,067.9	SIGWB1010	SI18VT31
SI	Kamniško - Savinjske Alpe	SI3000264	H	145.7	/	SI16VT17
SI	Kamenški potok	SI3000266	H	1.3	/	/
SI	Gorjanci - Radoha	SI3000267	H	118.0	/	SI18VT77
SI	Dobrava - Jovsi	SI3000268	H	28.7	SIGWB1008	SI192VT5
SI	Pohorje	SI3000270	H	275.7	/	/
SI	Ljubljansko barje	SI3000271	H	129.6	SIGWB1007	SI14VT77
SI	Orlica	SI3000273	H	38.3	/	SI192VT5
SI	Bohor	SI3000274	H	68.3	/	SI1VT739
SI	Rašica	SI3000275	H	22.4	/	SI1VT310
SI	Pokljuška barja	SI3000278	H	8.6	/	/
SI	Karavanke	SI3000285	H	230.9	SIGWB1005	SI1VT137
SI	Dolsko	SI3000288	H	8.7	/	SI1VT519
SI	Ljubljanica - Gradaščica - Mali Graben	SI3000291	H	1.9	/	SI1VT310
SI	Mišja dolina	SI3000297	H	6.4	/	SI18VT31
SI	Sotla s pritoki	SI3000303	H	5.5	/	SI192VT5
SI	Gračnica	SI3000308	H	3.2	/	/
SI	Savinja Grušovlje - Petrovče	SI3000309	H	4.6	SIGWB1006	SI16VT17
SI	Vitanje - Oplotnica	SI3000311	H	13.0	/	/
SI	Berje - Zasip	SI3000334	H	1.7	/	SI1VT137
SI	Polhograjsko hribovje	SI3000335	H	29.7	/	/
SI	Krka s pritoki	SI3000338	H	24.5	SIGWB1011	SI18VT31
SI	Bohinjska Bistrica in Jereka	SI3000348	H	7.3	/	/
SI	Savinja Celje - Zidani Most	SI3000376	H	1.7	/	SI16VT97
SI	Krakovski gozd - Šentjernejsko polje	SI5000012	B	83.5	/	SI18VT77
SI	Ljubljansko barje	SI5000014	B	123.7	/	SI14VT77
SI	Cerkniško jezero	SI5000015	B	33.5	/	/
HR	Pokupski bazen	HR1000001	B	350.4	HRCSGI-31	HRCSRN0004_005
HR	Sava kod Hruščice	HR1000002	B	15.3	HRCSGI-27	HRCSRN0001_019
HR	Turopolje	HR1000003	B	200.5	HRCSGI-27	/
HR	Donja Posavina	HR1000004	B	1,211.2	HRCSGI-32	HRCSRN0013_001
HR	Jelas polje	HR1000005	B	388.4	HRCSGI-28	HRCSRI0001_004
HR	Spačvanski bazen	HR1000006	B	434.9	HRCSGI-29	HRCSRN0011_005
HR	Bilogora i Kalničko gorje	HR1000008	B	949.6	HRCSGN-25	HRCSRN0028_002
HR	Ribnjaci uz Česmu	HR1000009	B	231.1	HRCSGN-25	HRCSRN0010_003
HR	Poilovlje s ribnjacima	HR1000010	B	135.1	HRCSGN-25	HRCSRN0022_005
HR	Gorski kotar i sjeverna Lika	HR1000019	B	2,236.6	HRCSGI-17	HRCSRI0004_017
HR	NP Plitvička jezera	HR1000020	B	296.9	HRCSGI-17	HRCSRN0012_008
HR	Plitvička jezera	HR1054	O	296.2	HRCSGI-18	HRCSRN0012_008
HR	Gajna	HR146754	O	3.9	HRCSGI-29	/
HR	Jelas polje	HR146755	O	195.3	HRCSGI-28	HRCSRI0001_007

Country	Protected area name	EU Protected Area Code *	PA Type	PA size (km²)	EU GWB Code *	EU SWB Code *
HR	Bara Dvorina	HR146758	O	7.4	HRCSGI-29	/
HR	Jelas ribnjaci - dio	HR146763	O	1.3	HRCSGI-29	/
HR	Medvednica	HR15614	O	179.4	HRCSGI-27	HRCSRN0019_001
HR	Bijele i Samarske stijene	HR15615	O	11.2	HRCSGN-16	/
HR	Crna mlaka	HR15618	O	6.9	HRCSGI-31	/
HR	Vražji prolaz i Zeleni vir	HR15714	O	2.5	HRCSGI-14	/
HR	Trbušnjak - Rastik	HR2000174	H	20.0	HRCSGN-25	/
HR	Odransko polje	HR2000415	H	136.8	HRCSGI-28	/
HR	Lonjsko polje	HR2000416	H	511.3	HRCSGI-28	HRCSRN0001_013
HR	Sunjsko polje	HR2000420	H	195.7	HRCSGI-32	HRCSRN0001_012
HR	Dvorina	HR2000426	H	14.8	HRCSGI-29	/
HR	Gajna	HR2000427	H	4.2	HRCSGI-29	/
HR	Ribnjaci Končanica	HR2000437	H	12.8	HRCSGN-25	HRCSRN0022_004
HR	Ribnjaci Poljana	HR2000438	H	16.0	HRCSGN-25	HRCSRN0022_002
HR	Ribnjaci Siščani i Blatnica	HR2000440	H	7.6	HRCSGN-25	HRCSRN0010_003
HR	Ribnjaci Narta	HR2000441	H	6.2	HRCSGN-25	HRCSRN0010_004
HR	Varoški Lug	HR2000444	H	8.4	HRCSGN-25	HRCSRN0018_001
HR	Nacionalni park Risnjak	HR2000447	H	63.5	HRCSGI-14	HRCSRN0004_018
HR	Ribnjaci Crna Mlaka	HR2000449	H	6.9	HRCSGI-31	/
HR	Ribnjaci Draganići	HR2000450	H	3.9	HRCSGI-31	/
HR	Ribnjaci Pisarovina	HR2000451	H	3.6	HRCSGI-31	/
HR	Petrinjčica	HR2000459	H	8.4	HRCSGI-31	/
HR	Dolina Une	HR2000463	H	43.0	HRCSGI-32	HRCSRI0005_001
HR	Žutica	HR2000465	H	47.0	HRCSGI-28	/
HR	Medvednica	HR2000583	H	185.3	HRCSGI-24	HRCSRN0019_001
HR	Žumberak Samoborsko gorje	HR2000586	H	341.2	HRCSGI-31	HRCSRN0004_011
HR	Stupnički lug	HR2000589	H	7.5	HRCSGI-27	/
HR	Klek	HR2000591	H	8.5	HRCSGN-15	/
HR	Ogulinsko-plaščansko područje	HR2000592	H	330.6	HRCSGN-16	HRCSRN0040_003
HR	Mrežnica - Tounjčica	HR2000593	H	10.6	HRCSGI-31	HRCSRN0012_002
HR	Povremeno jezero Blata	HR2000594	H	8.2	HRCSGI-17	/
HR	Slunjčica	HR2000596	H	1.3	HRCSGI-17	HRCSRN0012_005
HR	Dolina Dretulje	HR2000609	H	5.8	HRCSGN-16	/
HR	Šume na Dilj gori	HR2000623	H	150.0	HRCSGI-29	/
HR	Krbavsko polje	HR2000632	H	134.9	HRCSGI-18	/
HR	Crnačko polje	HR2000633	H	2.5	HRCSGN-16	/
HR	Stajničko polje	HR2000634	H	5.0	HRCSGN-16	/
HR	Kupa	HR2000642	H	51.8	HRCSGI-14	HRCSRI0004_017
HR	Polje Lug	HR2000646	H	7.2	HRCSGN-16	/
HR	Drežničko polje	HR2000648	H	3.3	HRCSGN-16	/
HR	Jasenačko polje	HR2000652	H	3.2	HRCSGN-16	/
HR	Ličke Jesenice	HR2000654	H	4.6	HRCSGI-17	/
HR	Lapačko polje	HR2000879	H	22.1	HRCSGI-18	/
HR	Matić poljana	HR2001025	H	2.3	HRCSGI-14	/
HR	Krbavica	HR2001049	H	4.2	HRCSGI-18	/
HR	Kanjon Une	HR2001069	H	8.2	HRCSGI-18	HRCSRN0005_007
HR	Sutla	HR2001070	H	1.9	HRCSGI-24	HRCSRI0029_003
HR	Strahinjčica	HR2001115	H	13.7	HRCSGI-24	/

Country	Protected area name	EU Protected Area Code *	PA Type	PA size (km²)	EU GWB Code *	EU SWB Code *
HR	Ilova	HR2001216	H	8.0	HRCSGI-28	HRCSRN0022_005
HR	Rijeka Česma	HR2001243	H	1.4	HRCSGN-25	HRCSRN0010_008
HR	Bulji	HR2001255	H	2.0	HRCSGI-18	/
HR	Dio Kupe	HR2001282	H	4.4	HRCSGI-14	HRCSRI0004_017
HR	Orljavac	HR2001286	H	4.0	HRCSGN-26	HRCSRN0015_005
HR	Pričac - Lužani	HR2001288	H	2.0	HRCSGI-28	HRCSRI0001_008
HR	Livade kod Čaglina	HR2001292	H	2.0	HRCSGN-26	/
HR	Livade kod Grubišnog Polja	HR2001293	H	29.7	HRCSGN-25	HRCSRN0022_004
HR	Vejalnica i Krč	HR2001298	H	1.4	HRCSGI-27	/
HR	Sava nizvodno od Hrušćice	HR2001311	H	129.6	HRCSGI-27	HRCSRI0001_008
HR	Česma - šume	HR2001323	H	1.2	HRCSGN-25	HRCSRN0010_002
HR	Bjelopolje	HR2001324	H	9.6	HRCSGI-18	/
HR	Jelas polje s ribnjacima	HR2001326	H	47.6	HRCSGI-29	/
HR	Ribnjak Dubrava	HR2001327	H	3.5	HRCSGN-25	HRCSRN0010_002
HR	Lonđa; Glogovica i Breznica	HR2001328	H	1.2	HRCSGI-29	/
HR	Jastrebarski lugovi	HR2001335	H	37.8	HRCSGI-31	/
HR	Područje oko Matešića pećine	HR2001336	H	2.9	HRCSGI-17	HRCSRN0012_005
HR	Područje oko Jopića špilje	HR2001339	H	2.2	HRCSGI-17	/
HR	Područje oko Kuštrovke	HR2001340	H	32.5	HRCSGI-14	HRCSRN0040_003
HR	Područje oko špilje Gradusa	HR2001342	H	18.0	HRCSGI-28	/
HR	Područje oko Kupice	HR2001351	H	25.0	HRCSGI-14	HRCSRI0004_016
HR	Lokve-Sunger-Fužine	HR2001353	H	114.9	HRCSGI-14	/
HR	Psunj	HR2001355	H	100.5	HRCSGI-28	HRCSRN0015_006
HR	Zrinska gora	HR2001356	H	307.6	HRCSGI-28	HRCSRI0005_002
HR	Lisac	HR2001373	H	91.9	HRCSGI-18	/
HR	Vlakanac-Radinje	HR2001379	H	29.2	HRCSGI-28	/
HR	Orljava	HR2001385	H	1.3	HRCSGN-26	HRCSRN0015_003
HR	Područje uz Maju i Brućinu	HR2001387	H	9.7	HRCSGI-31	/
HR	Spačvanski bazen	HR2001414	H	381.6	HRCSGI-29	HRCSRN0011_006
HR	Spačva JZ	HR2001415	H	53.3	HRCSGI-29	/
HR	Risnjak	HR2518	O	63.5	HRCSGI-14	HRCSRN0004_018
HR	Žumberak - Samoborsko gorje	HR377853	O	342.4	HRCSGI-31	HRCSRN0004_011
HR	Petrova gora	HR377873	O	27.3	HRCSGI-31	/
HR	Turopoljski lug	HR377920	O	33.4	HRCSGI-28	/
HR	Odransko polje	HR378013	O	94.0	HRCSGI-27	/
HR	Pašnjak Iva	HR390436	O	2.7	HRCSGI-28	/
HR	Gorski kotar i sjeverna Lika	HR5000019	H	2,173.2	HRCSGI-14	HRCSRN0040_003
HR	Nacionalni park Plitvička jezera	HR5000020	H	297.8	HRCSGI-17	HRCSRN0012_008
HR	Moslavačka gora	HR555515239	O	151.1	HRCSGN-25	/
HR	Zelenjak - Risvička i Cesarska gora	HR555515241	O	2.9	HRCSGI-24	HRCSRI0029_003
HR	Sunjsko polje	HR555558908	O	203.2	HRCSGI-32	HRCSRN0001_013
HR	Lonjsko polje	HR63666	O	511.3	HRCSGI-28	HRCSRN0013_002

Country	Protected area name	EU Protected Area Code *	PA Type	PA size (km²)	EU GWB Code *	EU SWB Code *
HR	Sava - Strmec	HR81105	O	2.7	HRCSGI-27	HRCSRN0001_020
HR	Rakita	HR81109	O	1.5	HRCSGI-28	HRCSRN0007_001
HR	Varoški lug	HR81116	O	9.0	HRCSGN-25	HRCSRN0018_001
HR	Lože	HR81138	O	1.1	HRCSGI-29	/
HR	Slunjčica	HR81161	O	1.5	HRCSGI-17	HRCSRN0012_005
HR	Slapnica	HR81162	O	2.6	HRCSGI-30	/
BA	Zaštićeni pejsaž Bijambare	BA_Bijambare	O	3.7	/	/
BA	Zaštićeno stanište Gromiželj	BA_Gromizeljbara	O	9.0	BA_RS_SA_20	BA_RS_SA_1A
BA	Strogi prirodni rezervat "Prašuma Janj"	BA_Janj	O	3.0	BA_RS_SA_8	BA_RS_Vrb_PLI_3
BA	Zaštićeni pejsaž Konjuh	BA_Konjuh	O	91.2	/	BA_DR_DRNJ_6
BA	Nacionalni park Kozara	BA_Kozara	O	39.0	/	BA_RS_Una_SAN_1
BA	Strogi prirodni rezervat "Prašuma Lom"	BA_Lom	O	3.0	BA_RS_SA_7	BA_RS_Una_SAN_4C
BA	Spomenik prirode Prokoško jezero	BA_Prokosko jezero	O	22.3	BA_SA_8	/
BA	Spomenik prirode Skakavac	BA_Skakavac	O	14.3	/	/
BA	Nacionalni park Sutjeska	BA_Sutjeska	O	160.0	/	BA_RS_DR_8
BA	Spomenik prirode Tajan	BA_Tajan	O	31.8	/	/
BA	Zaštićeni pejsaž Trebević	BA_Trebević	O	4.2	/	/
BA	Nacionalni park Una	BA_Una	O	233.4	BA_SA_5	BA_UNA_3
BA	Park prirode "Una"	BA_PPUna	O	27.8	BA_RS_SA_4	BA_RS_Una_SAN_1, BA_RS_UNA_2A, BA_RS_UNA_1, BA_RS_UNA_2B
BA	Spomenik prirode Vrelo Bosne	BA_Vrelo Bosne	O	5.5	/	BA_BOS_7
BA	Park prirode "Prača"	BA_PPPraca	O	40.7	BA_RS_SA_22	BA_RS_Dr_PR_2C , BA_RS_Dr_PR_2B
BA	Spomenik prirode "Vrela Sane"	BA_SPVrela_Sane	O	3.2	/	BA_RS_Una_SAN_5
BA	Spomenik prirode "Pećina Mokranjska Miljacka"	BA_SPMokranjska_ Miljacka	O	1.9	/	/
BA	Zaštićeno stanište „Gostilj"	BA_ZSGostilj	O	1.3	/	/
BA	Nacionalni part Drina	BA_NPDrina	O	63.2	BA_RS_SA_22	BA_RS_DR_4A, BA_RS_DR_4B, BA_RS_DR_3B
BA	Zaštićeno stanište „Tišina"	BA_ZSTisina	O	2.0	BA_RS_SA_19	/
BA	Park prirode „Cicelj"	BA_PPCicelj	O	3.3	/	/
BA	Bardača*	BA_Bardača	O	0.66	/	/
RS	Pestersko polje	RS121	O	31.1	/	RSSA_5
RS	PIO Ozren-Jadovnik	RS156	O	102.8	/	/
RS	PP Šargan-Mokra Gora	RS197	O	108.1	/	/

Country	Protected area name	EU Protected Area Code *	PA Type	PA size (km²)	EU GWB Code *	EU SWB Code *
RS	SRP Uvac	RS352	O	77.6	/	RSLIM_4_C
RS	PIO Veliko Ratno Ostrvo	RS470	O	1.7	/	RSDR_4
RS	SRP Obedska bara	RS50	O	99.0	/	RSSA_3
RS	PP Zlatibor	RS517	O	419.8	/	RSKOL_6
RS	NP Tara	RS595	O	249.8	/	RSUV_3
RS	PIO Kulturni predeo Trščić-Tronoša	RS596	O	18.0	/	RSDR_3_B
RS	ZS Bara Trskovača	RS599	O	1.7	/	RSSA_5
RS	Klisura reke Mileševke	RS659	O	12.4	/	RSSA_1
RS	PIO Kamena gora	RS661	O	77.8	/	/
RS	NP Fruška gora	RS662	O	266.5	/	RSLIM_4_C
RS	PIO Klisura reke Gradac	RS724	O	12.3	/	RSLIM_4_C
RS	SRP Klisura reke Trešnjice	RS728	O	6.3	/	RSLIM_4_D
RS	SRP Zasavica	RS738	O	11.2	/	/
RS	SP Slapovi Sopotnice	RS744	O	2.0	/	RSUV_1
RS	Morovicko-Bosutske sume	RS99998	O	259.3	/	RSSA_7
ME	Durmitor	4	O	/	/	/
ME	Prokletije	8	O	/	/	/
ME	Komovi	10	O		/	/
ME	Piva	11	O	/	/	/
ME	Dragišnica i Komarnica	12	O	/	/	/
ME	Botanical garden	27	O	/	/	/
ME	Canyon of River Piva and Komarnica	28	O	/	/	/
ME	Lalovića gorge	50	O	/	/	/
ME	Novakovića cave	53	O	/	/	/
ME	National park"Biogradska gora"	7	O	/	/	/

LEGEND

EU PA Code-unique identifier of a protected area

EU SWB Code - unique identifier of surface water body

EU GWB Code-unique identifier of groundwater body

Type PA- Type of protected area

H - areas protected in accordance with the Directive on the Conservation of Natural Habitats and Wild Fauna and Flora (92/43 / EEC) - Habitats Directive

B - protected areas under the Birds Directive (2009/147 / EC).

O-protected areas in accordance with other directives, national or international legislation

**Wetland complex Bardača (Municipality Srbac) although do not have a status of the protected area in accordance to the Law of Nature Protection of the Republika Srpska („Sl. Glasnik Republike Srpske", br.20/14) is protected on the international level (basis for protection international agreements, conventions and membership in international institutions) as Ramsar site (number:1658)*

Table 2: List of the protected areas according to the Article 7 Abstraction for drinking water in connection with relevant ground water body;

Country Code	Protected area name	EU Protected area Code	Protected area size (km²)	EU GWB Code
SI	Li-2/94 (Liboje)	SIDRZ10040	1.1	SIGWB1009
SI	Švarc 1	SIDRZ10041	1.1	SIGWB1009
SI	VG-1/94 (Matijevec)	SIDRZ10048	2.1	SIGWB1008
SI	ČPod-1/00(Podlog)	SIDRZ10051	2.4	SIGWB1009
SI	Smolška raven (Suhi dol)	SIDRZ1028	21.0	SIGWB1006
SI	Predor Karavanke, 2875	SIDRZ2017	3.0	SIGWB1005
SI	Zabukovje	SIDRZ2344	1.4	SIGWB1005
SI	Pod smreko (Medji dol)	SIDRZ2353	2.9	SIGWB1005
SI	Anclovo	SIDRZ2380	11.0	SIGWB1005
SI	Koničev stan	SIDRZ2453	1.5	SIGWB1005
SI	VB-5 Borovniški vršaj	SIDRZ4176	20.2	SIGWB1001
SI	VD Brezova noga 2	SIDRZ4253	6.2	SIGWB1001
SI	B-1/89	SIDRZ4319	2.7	SIGWB1008
SI	Hrastje	SIDRZ4412	7.0	SIGWB1001
SI	Kleče	SIDRZ4425	11.9	SIGWB1001
SI	Ljubljansko polje	SIDRZ4488	53.2	SIGWB1001
SI	VZ Šumnik	SIDRZ4637	2.0	SIGWB1010
SI	Krvavica	SIDRZ4647	3.2	SIGWB1010
SI	VV-1/86, Virje	SIDRZ4648	6.2	SIGWB1001
SI	VD Brest-1	SIDRZ4669	163.2	SIGWB1001
SI	PO-1 Pokojišče	SIDRZ4972	1.8	SIGWB1010
SI	VV-1 (Vrbje)	SIDRZ8151	1.2	SIGWB1002
SI	Šmartno ob Paki	SIDRZ8235	1.3	SIGWB1009
SI	Vodnjak G (Medlog)	SIDRZ8408	6.9	SIGWB1002
SI	Cimerman	SIOBC1022	18.6	SIGWB1009
SI	Zreče	SIOBC1073	52.0	SIGWB1009
SI	Zagmajnica	SIOBC2005	1.2	SIGWB1004
SI	Črna voda	SIOBC2007	1.4	SIGWB1004
SI	Vrtine Jurež	SIOBC2011	3.2	SIGWB1005
SI	Beli potok	SIOBC2012	1.1	SIGWB1004
SI	Dolina Mala Pišnica	SIOBC2015	1.8	SIGWB1004
SI	Peričnik	SIOBC2020	152.7	SIGWB1004
SI	Vrtina Kamne	SIOBC2026	1.7	SIGWB1004
SI	Ajdna II	SIOBC2041	1.6	SIGWB1005
SI	Završnica	SIOBC2047	10.4	SIGWB1005
SI	Črni gozd	SIOBC2053	17.4	SIGWB1005
SI	Žegnani studenec	SIOBC2054	3.8	SIGWB1005
SI	Jelendol	SIOBC2065	2.2	SIGWB1005
SI	Radovna	SIOBC2070	14.4	SIGWB1004
SI	Na pečeh-Dražgoše	SIOBC2101	1.4	SIGWB1004
SI	Sorica 2	SIOBC2107	9.0	SIGWB1004
SI	Robidnica-Laze-Lajše-Krnica	SIOBC2110	8.1	SIGWB1007
SI	Golica-Selca	SIOBC2114	1.2	SIGWB1007

Country Code	Protected area name	EU Protected area Code	Protected area size (km²)	EU GWB Code
SI	Plenšak	SIOBC2124	1.4	SIGWB1007
SI	Jakaponec-Trebija	SIOBC2152	15.2	SIGWB1007
SI	Hotovlje	SIOBC2223	4.0	SIGWB1007
SI	pod Klanom	SIOBC2250	1.2	SIGWB1007
SI	Rorček	SIOBC23	3.5	SIGWB1010
SI	Bistrica	SIOBC2300	7.1	SIGWB1004
SI	Voje	SIOBC2301	14.5	SIGWB1004
SI	Draga	SIOBC2395	12.0	SIGWB1005
SI	Bašelj staro zajetje	SIOBC2446	24.4	SIGWB1006
SI	Korentan	SIOBC28	6.3	SIGWB1010
SI	Literberg	SIOBC30	4.7	SIGWB1010
SI	Zadlaščica-Tolmin	SIOBC3030	16.2	SIGWB1004
SI	Podlipa	SIOBC3038	61.6	SIGWB1010
SI	Čeplez-Cerkno	SIOBC3069	1.9	SIGWB1007
SI	Ledine	SIOBC3071	1.4	SIGWB1007
SI	Zavratec	SIOBC3092	1.2	SIGWB1007
SI	Globočec	SIOBC4021	24.1	SIGWB1011
SI	Ambrož pod Krvavcem	SIOBC4046	3.5	SIGWB1006
SI	Krvavec	SIOBC4051	2.1	SIGWB1006
SI	K-2/97	SIOBC4055	1.0	SIGWB1010
SI	Spodnji potok	SIOBC4074	1.3	SIGWB1011
SI	VO I	SIOBC4093	2.5	SIGWB1001
SI	Obrh	SIOBC4094	39.4	SIGWB1010
SI	B-1/95	SIOBC4097	1.2	SIGWB1010
SI	B-1/86 Blate	SIOBC4107	73.8	SIGWB1011
SI	Grčarice	SIOBC4110	1.9	SIGWB1011
SI	VS-2	SIOBC4113	23.4	SIGWB1011
SI	Rožni studenec	SIOBC4117	3.4	SIGWB1011
SI	Mokri potok 1	SIOBC4125	3.8	SIGWB1011
SI	Novi Lazi	SIOBC4127	1.7	SIGWB1011
SI	Livold	SIOBC4130	1.7	SIGWB1011
SI	Mrzli studenec 1	SIOBC4132	2.6	SIGWB1011
SI	Podgora	SIOBC4153	1.9	SIGWB1011
SI	Sevnik	SIOBC4158	1.5	SIGWB1010
SI	Medvedica	SIOBC4159	1.5	SIGWB1010
SI	VP-3/87 (Črna Dolina)	SIOBC4165	1.2	SIGWB1008
SI	Marklovc	SIOBC4192	1.7	SIGWB1008
SI	V-1/95	SIOBC4193	1.3	SIGWB1008
SI	pod Krulcem	SIOBC4201	1.1	SIGWB1008
SI	CG-1	SIOBC4213	15.7	SIGWB1010
SI	VŠ-12-V11124 Blate	SIOBC4220	2.5	SIGWB1008
SI	Stiški potok	SIOBC4234	6.5	SIGWB1008
SI	Domžale 1	SIOBC4241	2.3	SIGWB1001
SI	Nožice	SIOBC4242	1.0	SIGWB1001
SI	VK-4	SIOBC4245	5.3	SIGWB1008
SI	VK-1	SIOBC4247	1.3	SIGWB1008

Country Code	Protected area name	EU Protected area Code	Protected area size (km²)	EU GWB Code
SI	Brdo nad Ihanom	SIOBC4249	1.6	SIGWB1008
SI	R-2/88, Rob	SIOBC4260	2.6	SIGWB1010
SI	Zviršče	SIOBC4264	2.6	SIGWB1010
SI	Uzmani	SIOBC4265	1.0	SIGWB1010
SI	Žlebe - Planina - Jetrbenk	SIOBC4330	2.6	SIGWB1007
SI	Trnovec - Ločnica	SIOBC4345	2.4	SIGWB1007
SI	SČ-1	SIOBC4351	2.5	SIGWB1001
SI	Stržakov studenec	SIOBC4354	1.4	SIGWB1001
SI	Dol 1	SIOBC4373	19.3	SIGWB1011
SI	Domžale 2	SIOBC4454	27.5	SIGWB1001
SI	Vodovod Loški potok	SIOBC4467	16.5	SIGWB1011
SI	Andrejčje	SIOBC4501	3.3	SIGWB1010
SI	Dolina reke	SIOBC4531	1.1	SIGWB1006
SI	Grad pri Cerklah	SIOBC4536	1.5	SIGWB1006
SI	Topol (pri Bergunjah)	SIOBC4551	37	SIGWB1010
SI	Smeškar, Žerovnik	SIOBC4584	1.1	SIGWB1007
SI	V Vrzdencu	SIOBC4605	1.7	SIGWB1007
SI	Rakovec	SIOBC4617	5.2	SIGWB1008
SI	Iverje	SIOBC4700	62.8	SIGWB1006
SI	Jesenov vrt	SIOBC4704	9.0	SIGWB1011
SI	Jakšiči 1	SIOBC4713	1.3	SIGWB1011
SI	Jevnica 3	SIOBC4718	6.2	SIGWB1008
SI	Jesenje 1	SIOBC4726	1.1	SIGWB1008
SI	Sp. Hotič 3	SIOBC4728	1.4	SIGWB1008
SI	VG-6-V11074 Velika Kostrevnica	SIOBC4755	1.6	SIGWB1008
SI	Belca	SIOBC4794	9.3	SIGWB1011
SI	Ribjek I,II	SIOBC4802	5.3	SIGWB1011
SI	Lazar	SIOBC4809	3.5	SIGWB1011
SI	Kajtna III	SIOBC4831	1.0	SIGWB1008
SI	Mitovški slap	SIOBC4835	1.3	SIGWB1008
SI	Petek	SIOBC4847	2.1	SIGWB1008
SI	Brlog	SIOBC4856	1.7	SIGWB1008
SI	Sušet 1, 2	SIOBC49	3.0	SIGWB1010
SI	Podslivnica II	SIOBC4924	1.9	SIGWB1010
SI	Martinjak	SIOBC4926	1.1	SIGWB1010
SI	Grahovo	SIOBC4927	3.9	SIGWB1010
SI	Gabernica	SIOBC5000	3.3	SIGWB1008
SI	Pečice	SIOBC5002	7.1	SIGWB1008
SI	Glogov Brod-Brezina	SIOBC5003	11.2	SIGWB1003
SI	Aquaductus Romanus	SIOBC5011	27.1	SIGWB1003
SI	S-2/89	SIOBC5031	3.9	SIGWB1008
SI	Brestanica	SIOBC5033	6.6	SIGWB1008
SI	Štegina	SIOBC5034	8.3	SIGWB1008
SI	R-3/87	SIOBC5036	7.3	SIGWB1008
SI	Črna mlaka in Čele	SIOBC5040	3.9	SIGWB1008
SI	Podbočje	SIOBC5044	7.2	SIGWB1011

Country Code	Protected area name	EU Protected area Code	Protected area size (km²)	EU GWB Code
SI	Črneča vas	SIOBC5045	4.4	SIGWB1011
SI	O-4/94	SIOBC5049	4.8	SIGWB1011
SI	Drnovo	SIOBC5050	7.0	SIGWB1003
SI	Ra-2/85	SIOBC5052	2.2	SIGWB1011
SI	Ščetar	SIOBC5064	1.4	SIGWB1011
SI	Bačji potok	SIOBC5201	2.1	SIGWB1008
SI	Zaloka	SIOBC5222	1.1	SIGWB1008
SI	Benjde	SIOBC5300	8.7	SIGWB1011
SI	Težka voda	SIOBC5301	2.5	SIGWB1011
SI	Jezero	SIOBC5308	4.1	SIGWB1011
SI	K-1/93	SIOBC5309	1.9	SIGWB1011
SI	Sompot	SIOBC5318	2.0	SIGWB1011
SI	Galaviški potok - Stajngrob	SIOBC5438	1.6	SIGWB1008
SI	K-2/86	SIOBC5508	5.1	SIGWB1011
SI	Peteršiljka	SIOBC5510	3.2	SIGWB1011
SI	Obrh	SIOBC5600	14.2	SIGWB1011
SI	Ra-2/91 Gornji Suhor	SIOBC5601	10.2	SIGWB1011
SI	Gk-1/93	SIOBC5649	2.0	SIGWB1011
SI	Radeščice	SIOBC5654	6.7	SIGWB1011
SI	Dobličica	SIOBC5700	1.3	SIGWB1011
SI	Vumole	SIOBC5701	3.0	SIGWB1011
SI	Guče	SIOBC5750	34.4	SIGWB1011
SI	Pivka	SIOBC59	2.8	SIGWB1010
SI	Malni	SIOBC72	21.7	SIGWB1010
SI	Studenec	SIOBC8002	4.2	SIGWB1006
SI	Lenše 2	SIOBC8003	7.3	SIGWB1006
SI	Mazej	SIOBC8015	9.0	SIGWB1009
SI	Bele vode 2	SIOBC8021	1.0	SIGWB1009
SI	Lampret	SIOBC8031	1.3	SIGWB1009
SI	Merince 2	SIOBC8072	1.4	SIGWB1006
SI	Rečica-Žegnani studenec	SIOBC8100	1.1	SIGWB1006
SI	VF-3	SIOBC8102	11.1	SIGWB1009
SI	Letošč	SIOBC8105	2.0	SIGWB1006
SI	Hudinja	SIOBC8110	16.5	SIGWB1009
SI	Jelševa loka	SIOBC8111	6.0	SIGWB1009
SI	Stenica	SIOBC8112	1.1	SIGWB1009
SI	Hrastje	SIOBC8200	3.2	SIGWB1008
SI	Kozarica	SIOBC8204	2.1	SIGWB1009
SI	Loka pri Žusmu, vrtina VL-1/81	SIOBC8220	1.5	SIGWB1009
SI	Vrtina Hg-1	SIOBC8250	14.5	SIGWB1009
SI	Podmevškov graben	SIOBC8310	2.1	SIGWB1008
SI	Govce	SIOBC8319	1.5	SIGWB1009
SI	Jepihovec 9-10-11	SIOBC8342	2.5	SIGWB1008
SI	Borovke 3	SIOBC8352	1.2	SIGWB1009
SI	K-3	SIOBC8454	12.0	SIGWB1009
SI	Prevorje-Žlof	SIOBC8455	1.2	SIGWB1008

Country Code	Protected area name	EU Protected area Code	Protected area size (km²)	EU GWB Code
SI	V-1G/71	SIOBC8474	6.7	SIGWB1009
SI	VT-1/83 Tinsko	SIOBC8491	1.1	SIGWB1009
SI	Dobovce 2	SIOBC8506	5.7	SIGWB1009
SI	VŠO-1/84	SIOBC8532	4.4	SIGWB1008
HR	Donji Andrijevci	HR14000030	13.7	HRCSGI-29
HR	Stari Prekovci	HR14000031	12.6	HRCSGI-29
HR	Đurđanci	HR14000032	37.7	HRCSGI-29
HR	Gorjani	HR14000033	1.6	HRCSGI-29
HR	KANOVCI	HR14000034	15.6	HRCSGI-29
HR	Sojara-Vrbanja	HR14000035	3.0	HRCSGI-29
HR	Grac-Ivankovo	HR14000036	1.8	HRCSGI-29
HR	Ekonomija-Mirkovci	HR14000037	1.5	HRCSGI-29
HR	Topolik-Privlaka	HR14000038	1.4	HRCSGI-29
HR	Skorotinci-Otok	HR14000040	1.9	HRCSGI-29
HR	Gunja	HR14000041	1.5	HRCSGI-29
HR	Viganj-2 - Slakovci	HR14000042	1.2	HRCSGI-29
HR	Veliki kraj-Stari Jankovci	HR14000043	1.4	HRCSGI-29
HR	Stara ciglana-Nijemci	HR14000044	1.4	HRCSGI-29
HR	Ilača	HR14000045	1.7	HRCSGI-29
HR	Banovina-Tovarnik	HR14000046	1.8	HRCSGI-29
HR	Berava-Babina Greda	HR14000048	1.8	HRCSGI-29
HR	Barbine-Lipovac	HR14000049	1.1	HRCSGI-29
HR	Trslana	HR14000050	3.7	HRCSGI-29
HR	Pašin bunar i kod bazena	HR14000051	2.9	HRCSGI-29
HR	Bošnjaci	HR14000053	4.4	HRCSGI-29
HR	Škola-Andrijaševci	HR14000055	1.6	HRCSGI-29
HR	Brodski zdenci	HR14000056	4.2	HRCSGI-29
HR	Vrpolje	HR14000057	3.9	HRCSGI-29
HR	Drenovci	HR14000060	1.4	HRCSGI-29
HR	Krajačići	HR14000063	2.9	HRCSGI-29
HR	Slavonski Šamac	HR14000064	47.7	HRCSGI-29
HR	Jelas	HR14000066	214.1	HRCSGI-29
HR	Brodski stupnik	HR14000067	2.7	HRCSGI-29
HR	Staro selo-paka	HR14000068	1.2	HRCSGN-26
HR	Brodski brđani - bara	HR14000069	2.2	HRCSGN-26
HR	Zagrađe	HR14000070	2.5	HRCSGN-26
HR	Bučje	HR14000071	1.8	HRCSGN-26
HR	Pleternica	HR14000072	87.4	HRCSGN-26
HR	Djedina rijeka	HR14000073	2.8	HRCSGN-26
HR	Izvorišta kutjeva	HR14000074	9.6	HRCSGN-26
HR	Volovčica-sovski dol	HR14000075	2.1	HRCSGN-26
HR	Luke, Vidov, Orlja,Zap.Polje, St.Lipa I Pljašt	HR14000076	438.2	HRCSGN-26
HR	Prerovec	HR14000077	1.3	HRCSGI-28
HR	Luke, Vidov, Orlja,Zap.Polje, St.Lipa I Pljašt	HR14000078	6.4	HRCSGI-28

Country Code	Protected area name	EU Protected area Code	Protected area size (km²)	EU GWB Code
HR	Drenov Bok	HR14000079	16.8	HRCSGI-28
HR	Pašino vrelo	HR14000080	5.0	HRCSGI-28
HR	Stara gradiška	HR14000081	41.0	HRCSGI-28
HR	Davor	HR14000082	11.6	HRCSGI-28
HR	Ravnik	HR14000083	28.7	HRCSGI-28
HR	Milaševci	HR14000085	7.7	HRCSGN-25
HR	Blanje	HR14000087	3.1	HRCSGN-25
HR	Trstenik	HR14000088	3.2	HRCSGN-25
HR	Vrtlinska	HR14000089	20.0	HRCSGN-25
HR	Garesnica	HR14000090	4.0	HRCSGN-25
HR	Vratno	HR14000091	6.6	HRCSGN-25
HR	Čret	HR14000092	5.5	HRCSGN-25
HR	Veliki i Mali Zdenci	HR14000093	4.1	HRCSGN-25
HR	Grubušno Polje	HR14000094	4.1	HRCSGN-25
HR	Velika i Mala Reka	HR14000095	9.0	HRCSGN-25
HR	Podgora, Strahinje, Grobotek, Jazvinšak	HR14000100	4.5	HRCSGI-24
HR	Belečka selnica	HR14000103	4.0	HRCSGI-24
HR	Pregrada	HR14000104	4.1	HRCSGI-24
HR	Krapinske Toplice	HR14000105	7.0	HRCSGI-24
HR	Harina Zlaka	HR14000107	1.4	HRCSGI-24
HR	Bregana, Šibice i Strmec	HR14000108	8.7	HRCSGI-24
HR	Lobor	HR14000109	14.0	HRCSGI-24
HR	Jelas	HR14000110	38.9	HRCSGI-28
HR	Bregana, Šibice i Strmec	HR14000111	42.8	HRCSGI-27
HR	S. Loza sašnj,žitnj, i.reka, petruš,zaprđ,m.mlaka	HR14000112	327.5	HRCSGI-27
HR	Sopote	HR14000113	1.2	HRCSGI-30
HR	Prodin dol	HR14000114	1.2	HRCSGI-30
HR	Popov dol i gonjeva	HR14000115	1.5	HRCSGI-30
HR	Drage I Perić Mlin	HR14000116	7.9	HRCSGI-30
HR	Vrelo utinja	HR14000118	33.5	HRCSGI-31
HR	Crna draga	HR14000120	9.3	HRCSGI-31
HR	Prezdan	HR14000122	69.1	HRCSGI-31
HR	Križ hrastovački	HR14000123	3.6	HRCSGI-31
HR	Stari zdenac-kupinec	HR14000124	2.2	HRCSGI-31
HR	Pecki i Hrastovica	HR14000125	6.8	HRCSGI-31
HR	Pecki-B-10	HR14000126	2.0	HRCSGI-31
HR	Pecki-dumbovića vrelo-galerija	HR14000127	1.2	HRCSGI-31
HR	Perna	HR14000128	83.1	HRCSGI-31
HR	Mekušje	HR14000129	1.2	HRCSGI-31
HR	Petak	HR14000131	2.1	HRCSGI-17
HR	Izvorišta gacke	HR14000133	8.4	HRCSGI-17
HR	Slunjčica	HR14000134	382	HRCSGI-17
HR	Izvorišta Gacke	HR14000135	10.6	HRCSGI-18
HR	Kraljevec i Bukovec	HR14000136	10.7	HRCSGI-18
HR	Vrelo, Zagorska Mrežnica, Kosanović vrelo	HR14000137	624.6	HRCSGN-16

Country Code	Protected area name	EU Protected area Code	Protected area size (km²)	EU GWB Code
HR	Slunjčica	HR14000138	3.7	HRCSGN-16
HR	Popošćak	HR14000139	3.0	HRCSGN-15
HR	Opara	HR14000140	4.7	HRCSGN-15
HR	Topli potok	HR14000142	3.6	HRCSGN-15
HR	Zdiška	HR14000143	33.2	HRCSGN-15
HR	Izvorišta gornjeg toka Dobre	HR14000144	138.9	HRCSGN-15
HR	Izvorišta gornjeg toka Dobre	HR14000145	2.3	HRCSGN-15
HR	Obrh	HR14000146	16.0	HRCSGI-14
HR	Izvorište Kupice i Zelenog vira	HR14000150	262.6	HRCSGI-14
HR	Izvorišta čabranke	HR14000152	26.7	HRCSGI-14
HR	Izvorišta gacke	HR14000155	354.5	HRCSGI-18
HR	Pakra (bijela)	HR14000203	83.1	HRCSGN-25
HR	Ivanovci kuševac	HR14000208	10.5	HRCSGI-29
HR	Vodenice-stari mikanovci	HR14000209	2.0	HRCSGI-29
HR	Viškovci	HR14000210	20.7	HRCSGI-29
HR	Gorjani	HR14000211	22.8	HRCSGI-29
HR	Ruševo	HR14000212	2.5	HRCSGN-26
HR	Radaškovci i Gložje	HR14000213	1.7	HRCSGN-26
HR	Stražemanke	HR14000214	5.9	HRCSGN-26
HR	Veličanka i božji zdenac	HR14000215	8.4	HRCSGN-26
HR	Bistra kaptol	HR14000216	6.9	HRCSGN-26
HR	Mlačine grabari	HR14000217	2.0	HRCSGI-24
HR	Velika gorica	HR14000218	18.1	HRCSGI-27
HR	Kosnica	HR14000219	7.1	HRCSGI-27
HR	Hrašće	HR14000220	6.2	HRCSGI-30
HR	Gaza i,ii	HR14000221	1.5	HRCSGI-31
HR	Donji Žagari i Mandli	HR14000224	5.2	HRCSGI-14
HR	Sokoli I i Sokoli II	HR14000225	5.9	HRCSGI-14
HR	Izvorišta Cerkniškog polja	HR14000226	8.4	HRCSGI-14
HR	Izvorišta Velike i Male Belice	HR14000227	85.0	HRCSGI-14
HR	Vodoopskrbni rezervat izvora Kupe	HR14000228	109.3	HRCSGI-14
BA	Žeravica (Gradiška)			Direct Sava Catchment
BA	Bačevo"m" (sarajevo)			The Bosna Catchment
BA	Sarajevo KONACI			
BA	Sokolovići(sarajevo)			
BA	Bačevo "am"(sarajevo)			
BA	Stup(sarajevo)			
BA	Hrasnica(sarajevo)			
BA	Nahorevo (sarajevo)			
BA	Sedrenik (sarajevo)			
BA	Crnil (sarajevo)			
BA	Mošćanica-vrelo (sarajevo)			
BA	Jahorinska vrela (sarajevo)			
BA	Tilava (Sarajevo)			
BA	Kruščica (Zenica)			

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BA	Strmešnjak(Zenica)			
BA	Izron Suha (Zavidovići)			
BA	Kruščica(Vitez)			
BA	Kremenik (Vitez)			
BA	Jačnički-Saški (Vareš)			
BA	Stupari (Tuzla)			
BA	Toplica(Tuzla)			
BA	Sprečko Polje(Tuzla)			
BA	Kraševo (Tešanj)			
BA	Zeleni Vir (Olovo)			
BA	Jaglenica (Novi Travnik)			
BA	Luke (Doboj)			
BA	Rudanka (Doboj)			
BA	Tilava (Istočno Novo Sarajevo)			
BA	Grabski Mlin (Trnovo)			
BA	Ljuštra (Trnovo)			
BA	Duparnica (Bihać)			Una, Glina and Korana Catchment
BA	Luke Ii (Bosanska Krupa)			
BA	Ada I (Bosanska Krupa)			
BA	Ada Ii (Bosanska Krupa)			
BA	Zidine (Bosanska Krupa)			
BA	Sanica (Bosanski Petrovac)			
BA	Kamenica (Bužim)			
BA	Zdena (Sanski Most)			
BA	Grmić (Bijeljina)			The Drina Catchment
BA	Ziličina (Rogatica)			
BA	Vrelo Bioštice (Sokolac)			
BA	Geruša (Sokolac)			
BA	Tišča (Vlasenica)			
BA	Branjevo (Zvornik)			
BA	Kozluk (Zvornik)			
BA	Tilić Ada (Zvornik)			
BA	Đevanje (Zvornik)			
BA	Zelinje (Zvornik)			
BA	Sopotnik (Zvornik/Bratunac)			
BA	Mraovo Polje (Kostajnica/ Kozarska Dubica)			The Una Catchment
BA	Donje Mlakave (Novi Grad)			
BA	Utvinac (Oštra Luka)			
BA	Ograđenica I Mudinovac (Bosanski Petrovac/Petrovac)			
BA	Prijedorčanka (Prijedor)			
BA	Mataruško polje II (Prijedor)			
BA	Mataruško Polje I (Prijedor)			
BA	Tukovi (Prijedor)			
BA	Novoselije (Banja Luka)			

Country Code	Protected area name	EU Protected area Code	Protected area size (km²)	EU GWB Code
BA	Povelić (Prnjavor)			The Vrbas Catchment
BA	Prijebljezi (Srbac)			
RS	Lozničko Polje		243.9	DR_GW_I_1
RS	Jadar		208.5	DR_GW_I_2
RS	Gučevo		173.0	DR_GW_K_1
RS	Povlen		322.4	DR_GW_K_2
RS	Tara		299.6	DR_GW_K_3
RS	Cer		110.8	DR_GW_P_1
RS	Osecina		320.3	DR_GW_P_2
RS	Krupanj		384.9	DR_GW_P_3
RS	Boranja		68.2	DR_GW_P_4
RS	Ljubovija		619.5	DR_GW_P_5
RS	Zlatibor - zapad		522.3	DR_GW_P_6
RS	Kolubara - neogen		656.6	KOL_GW_I_1
RS	Kolubara - istok		424.8	KOL_GW_I_2
RS	Tamnava		276.8	KOL_GW_I_3
RS	Nepricava - karst		609.2	KOL_GW_K_1
RS	Lelic - karst		306.8	KOL_GW_K_2
RS	Ljig		565.8	KOL_GW_P_1
RS	Pestan		286.4	KOL_GW_P_2
RS	Kolubara - zapad		502.3	KOL_GW_P_3
RS	Valjevo		542.8	KOL_GW_S_1
RS	Zlatar		112.4	LIM_GW_K_1
RS	Jadovnik		107.3	LIM_GW_K_2
RS	Bucje		147.4	LIM_GW_K_3
RS	Javorje		217.7	LIM_GW_P_1
RS	Pobijenik		559.3	LIM_GW_P_2
RS	Komaran		426.3	LIM_GW_P_3
RS	Zapadni Srem - OVK		450.0	SA_GW_I_1
RS	Istocni Srem - OVK		1,593.6	SA_GW_I_2
RS	Mačva - OVK		763.4	SA_GW_I_3
RS	Beograd - leva obala Save		283.1	SA_GW_I_4
RS	Beograd - desna obala Save		179.7	SA_GW_I_5
RS	Zapadni Srem - pliocen		1,172.9	SA_GW_I_6
RS	Istočni Srem - pliocen		2,249.0	SA_GW_I_7
RS	Mačva - pliocen		1,577.5	SA_GW_I_8
RS	Beograd - krecnjak		60.6	SA_GW_K_1
RS	Fruska gora		735.6	SA_GW_S_1
RS	Beograd - jug		365.3	SA_GW_S_2
RS	Sjenica		142.5	UV_GW_I_1
RS	Zarudine		66.7	UV_GW_K_1
RS	Vapa i Pester		562.4	UV_GW_K_2
RS	Radoinja		71.4	UV_GW_K_3
RS	Javor - zapad		259.5	UV_GW_K_4
RS	Nova Varoš		128.8	UV_GW_P_1
RS	Stari Vlah - jug		172.2	UV_GW_P_2

Country Code	Protected area name	EU Protected area Code	Protected area size (km²)	EU GWB Code
ME	Savnicka Glava			ME-1_1
ME	Sutulija			ME-1_3
ME	Bezdan-Breznica			ME-2_1
ME	Jugoštica			ME-2_1
ME	Bezarsko Vrelo			ME-2_2
ME	Musovića Rijeka			ME-3_1
ME	Manastirsko vrelo			ME-3_1
ME	Merića vrelo (3 kaptaze)			ME-3_1
ME	Water source (Njegovudja)			ME-4_3
ME	Water source (Zminje jezero)			ME-4_3

LEGEND:
EU_PA_Code - unique identifier of the protected area
EU GWB Code-unique identifier of the groundwater body

Annex 10

Water uses in the Sava River Basin – overview tables

Water uses in the Sava River Basin – overview tables

Table 1: Territory and population in the Sava River Basin per country (2016)

	SI	HR	BA	RS*	ME	Total
Total country area (km²)	20,273	56,542	51,129	88,361	13,886	**230,191**
Share of national territory in SRB	57.90%	44.90%	75.00%	17.10%	46.70%	**42.18%**
Area of the country in SRB (km²)	11,735	25,374	38,349	15,147	6,489	**97,093**
Share of the international Sava RB	12.09%	26.13%	39.50%	15.60%	6.68%	**100.00%**
Total country population (in million)	2.064	4.174	3.386	7.058	0.622	**17.304**
Population of the country in the Sava RB (in million)	1.073	2.087	2.946	1.835	0.193	**8.134**
Share of the country population living in the SRB	52%	50%	87%	26%	31%	**47.00%**
Share of the population by country in total SRB population	13.19%	25.66%	36.22%	22.56%	2.37%	**100%**

**RS data without Kosovo.

Table 2: Employees in the Sava River Basin per country (2016)

Employees	SI	HR	BA	RS	ME	Total
Employees in the country (thousand persons)	915	1,360	740	2,719	224	5,958
Employees in SRB (thousand persons)	563	710	725	522	56	2,576
Employees in total population in the country (%)	44%	33%	22%	39%	36%	34%
Employees in total population in SRB (%)	52%	34%	25%	28%	29%	32%
Employment rate in the country (%)	92%	85%	75%	84%	82%	81%

Table 3: GDP and GPD per capita for the Sava River Basin by countries (2016)

GDP	SI	HR	BA	RS	ME	Total
Country GDP (million EUR, current prices)	40,443	46,619	15,290	36,779	3,954	143,086
SRB GDP (million EUR, current prices)	23,861	25,641	11,467	9,195	1,068	71,232
SRB Share of total country GDP (%)	59%	55%	75%	25%	27%	50%
Country GDP per capita (EUR)	18,550	11,100	4,514	4,820	5,660	7,943
SRB GDP per capita (EUR)	21,188	12,252	3,829	4,589	4,823	8,476

Table 4: Number of employees in the Sava River Basin by economic sectors and countries (2016)

Number of employees (000 persons)	SI	HR	BA	RS	ME	Total	Share of sectors
Agriculture	50	88	114	14	12	**279**	**11%**
Industry	141	143	171	183	12	**649**	**25%**
Energy	5	12	5	16	1	**38**	**1%**
Other activities	251	325	165	155	14	**911**	**35%**
Public services	116	142	271	154	17	**699**	**27%**
Total number of employees in the Sava RB	563	710	725	522	56	**2,576**	**100%**
Share of country in the total Sava RB employment (%)	22%	28%	28%	20%	2%	**100%**	

Table 5: GVA by sectors and countries in the Sava River Basin (2016)

GVA (million EUR)	SI	HR	BA	RS	ME	Total	Share of sectors
Agriculture	472	799	714	624	80	**2,690**	**5%**
Industry	4,812	3,359	1,387	1,353	40	**10,952**	**18%**
Energy	788	654	439	366	38	**2,286**	**4%**
Other activities	11,169	13,203	4,794	4,337	560	**34,063**	**57%**
Public services	3,425	3,269	1,915	932	165	**9,707**	**16%**
Total GVA in SRB countries	20,667	21,285	9,249	7,613	883	**59,697**	**100%**
Share of country in total SRB GVA (%)	35%	36%	15%	13%	1%	**100%**	

Table 6: Water abstraction – national level (2016)

Water abstracted (million m³)	SI	HR	BA	RS	ME	Total
Total water abstracted	162	524	326	634	119	**1,765**
Total water losses	45	216	173	227	65	**726**
Total water losses (% of total water abstracted)	27.8%	41.2%	53.1%	35.8%	54.6%	**41.13%**

Table 6a: Water use – national level (2016)

Water use (million m³)	SI	HR	BA	RS	ME	Total	Share
Public Water Supply	117	251	113	307	48	836	14.5%
Industry	195	94	12	119	1	421	7.3%
Electricity, gas, steam, air conditioning supply	685	210	0	3,298	4	4,197	72.9%
Irrigation	3	20	0	44	0	67	1.2%
Other agricultural	0	0	2	28	0	30	0.5%
Other (mining…)	33	57	23	94	1	208	3.6%
Total water use	1,033	632	150	3,890	54	5,759	100.0%
Per Capita Use - Public Water Supply	155	165	91	119	211	132	

Table 6b: Water use – SRB level (2016)

Water use (million m³)	SI	HR	BA	RS	ME	Total	Share
Public Water Supply	61	126	98	80	15	379	22.0%
Industry	113	42	9	20	0	185	10.7%
Electricity, gas, steam, air conditioning supply	397	92	0	564	2	1,054	61.2%
Irrigation	2	9	0	8	0	18	1.1%
Other agricultural	0	0	2	5	0	6	0.4%
Other	19	26	17	16	0	78	4.6%
Total water use	591	294	126	693	18	1,722	100.0%
Per Capita Use - Public Water Supply	155	165	91	119	211	128	

Table 7: Basic data on hydropower plants in the Sava River Basin (2016) and scenario for the 2027 (no expected changes)

Country	Name of the HPP	River	Capacity installed (MW)	Discharge (m^3/s)	Average yearly production (GWh/year)	Countries share	
						in average total production	in installed capacity
SI	Moste/ Završnica	Sava	21	35	64	9%	8%
	Mavčiče	Sava	38	260	62		
	Medvode	Sava	26.4	150	77		
	Vrhovo	Sava	34	501	116		
	Boštanj	Sava	33	500	115		
	Blanca	Sava	43	500	160		
HR	Gojak	Donja Dobra	55.5	57	213.5	4%	4%
	Lešće	Dobra	42	122,7	102		
BA	Bočac	Vrbas	110	240	308	29%	21%
	Višegrad	Drina	315	800	1,120		
	Jajce I	Pliva	60	74	259		
	Jajce II	Vrbas	30	80	181		
RS	Zvornik	Drina	96	620	515	46%	52%
	Uvac	Uvac	36	43	72		
	Kokin Brod	Uvac	21	37	60		
	Bistrica	Uvac	103	36	370		
	Bajina Bašta	Drina	360	644	1,691		
	Potpeć	Lim	51	165	201		
	RHE Bajina Bašta*	Drina	614	129	n/a		
ME	Piva	Piva	360	240	788	12%	15%
		Total	**2,449**		**6,445**	100%	100%

Table 8a: Water demand at national level (scenario for 2027)

Water use	SI	HR	BA	RS	ME	Total SRB	Share
Public Water Supply	117	248	110	300	54	828	13.1%
Industry	235	113	14	170	1	534	8.4%
Thermal and nuclear plant	748	227	0	3,654	4	4,634	73.2%
Irrigation	3	22	0	48	0	73	1.2%
Other agricultural	0	0	2	31	0	33	0.5%
Other	36	61	25	103	1	226	3.6%
Total water use	1,139	671	151	4,306	61	6,328	100.0%
Per Capita Use - Public Water Supply	155	165	91	119	211	132	

Table 8b: Water demand in the Sava River Basin (scenario for 2027)

Water use	SI	HR	BA	RS	ME	Total SRB	Share
Public Water Supply	61	124	95	78	17	375	20%
Industry	136	51	11	29	1	227	12%
Thermal and nuclear plant	433	102	0	625	2	1,162	62%
Irrigation	2	10	0	8	0	20	1%
Other agricultural	0	0	2	5	0	7	0%
Other	21	28	18	18	1	85	5%
Total water use	653	314	126	763	20	1,876	100%
Per Capita Use - Public Water Supply	155	165	91	119	211	128	

MAPS

MAP 1: Sava River Basin Overview

INTERNATIONAL SAVA RIVER BASIN COMMISSION

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2ND SAVA RIVER BASIN MANAGEMENT PLAN
Processed and compiled by the Secretariat of the ISRBC, March 2022

MAP 2: Land Cover

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MAP 3: Ecoregions

LEGEND

Ecoregions
- Alps
- Dinaric western Balkan
- Hellenic western Balkan
- Hungarian lowlands

- Sava River Basin
- Sava River
- Tributary (with catchment area > 1.000 km² and other of the basin wide importance)
- State border

City
- 50,001 - 100,000
- 100,001 - 250,000
- 250,001 - 500,000
- 500,001 - 1,000,000
- > 1,000,000
- Capital

N W E S

Scale: 1:1.750.000

0 25 50 100 Km

in A3 landscape paper format

Co-ordinate system: ETRS 1989 LAEA

Projection: Lambert Azimuthal Equal Area

Sources: Esri, USGS, NOAA

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MAP 4: Location and boundaries of surface water bodies

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MAP 5: Heavily modified surface water bodies

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MAP 6: Location and boundaries of ground water bodies

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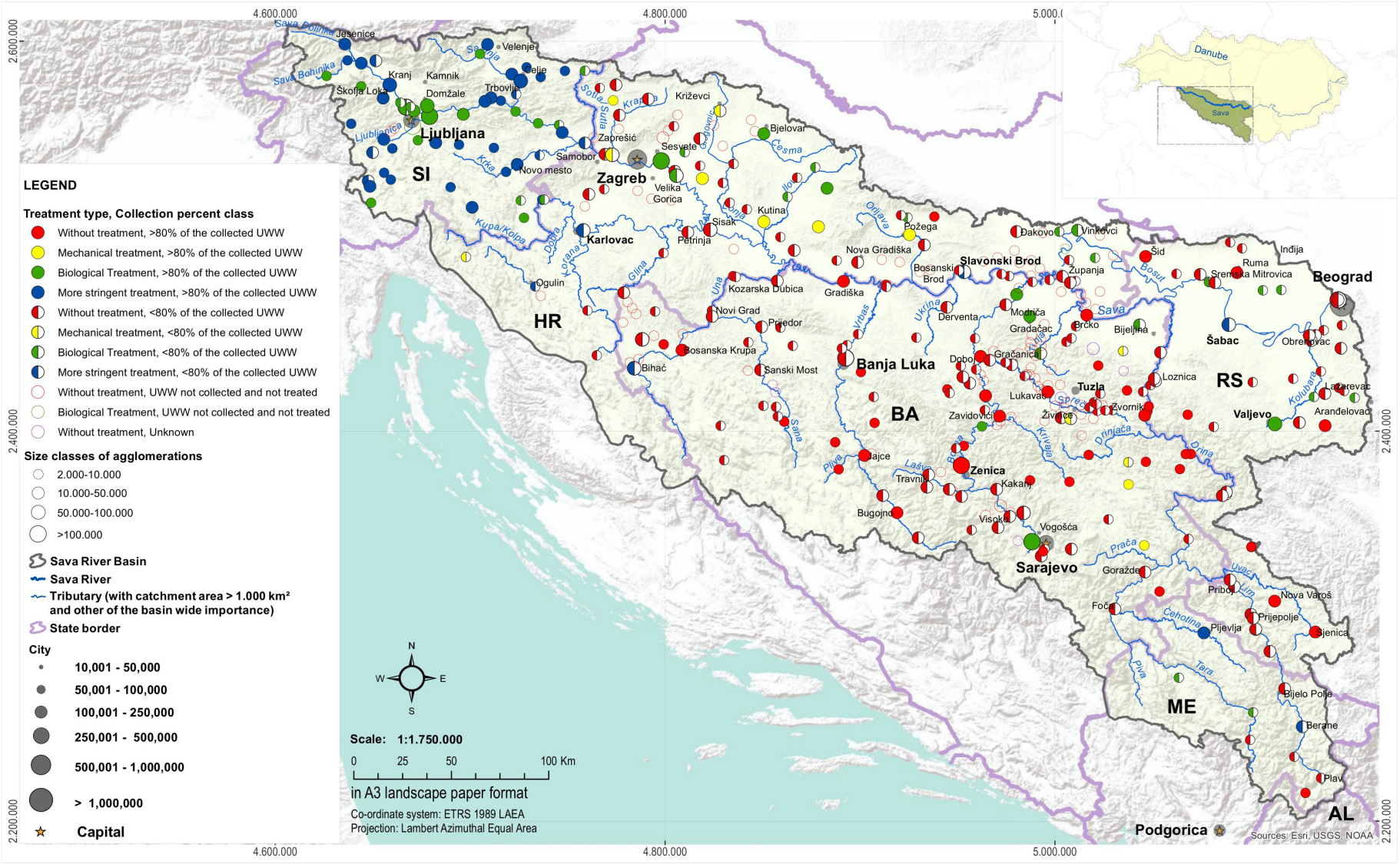
MAP 7: Urban wastewater discharges – Reference year 2016



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MAP 8: Significant industrial pollution sources

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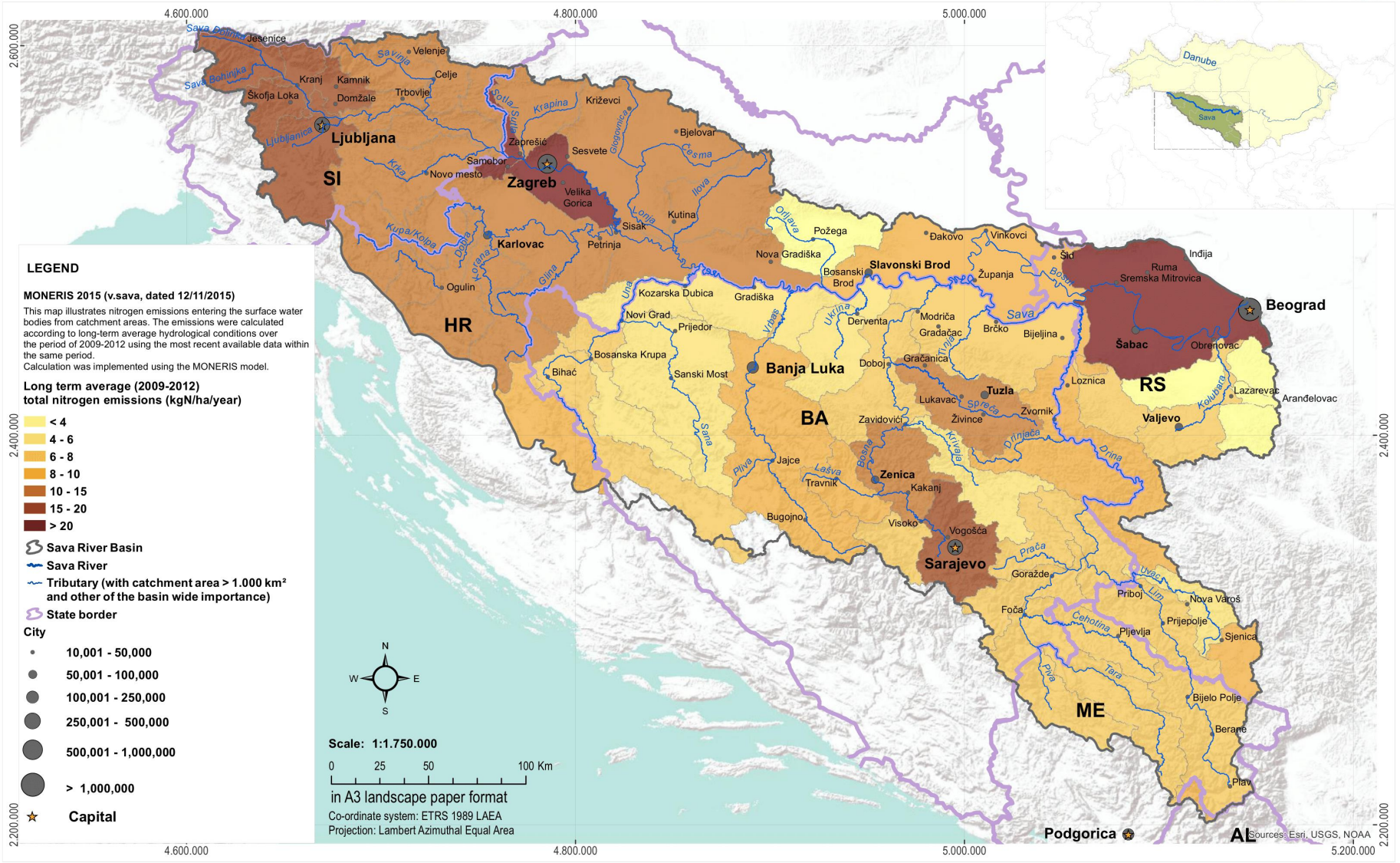
MAP 9: Nutrient Pollution from point and diffuse sources – Nitrogen



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MAP 10: Nutrient Pollution from point and diffuse sources – Phosphorus

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MAP 11: Hydrological alterations - impoundments, water abstraction and hydropeaking

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MAP 12: River and habitat continuity interruptions

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LEGEND

River and habitat continuity interruptions
- Barrier passable for fish
- Barrier limited passable for fish
- Barrier not passable for fish

Sava River Basin

Sava River

Tributary (with catchment area > 1.000 km² and other of the basin wide importance)

State border

City
- 10,001 - 50,000
- 50,001 - 100,000
- 100,001 - 250,000
- 250,001 - 500,000
- 500,001 - 1,000,000
- > 1,000,000

Capital

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MAP 13: Morphological alterations of surface water bodies

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MAP 14: Hydro-morphological risk assessment of surface water bodies

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MAP 15: Existing infrastructure in the Sava River Basin

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MAP 16: Future infrastructure projects

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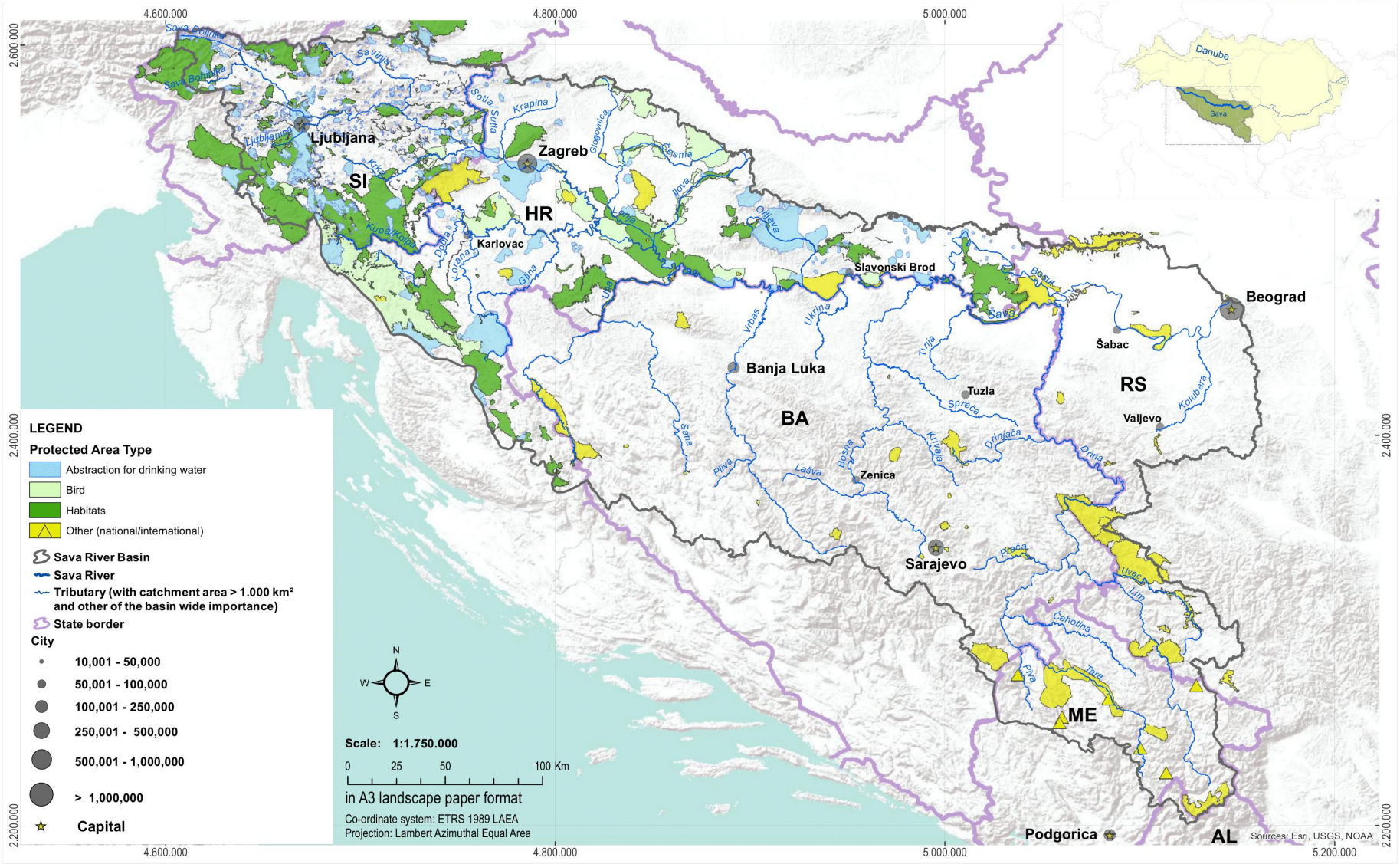
MAP 17: Protected areas



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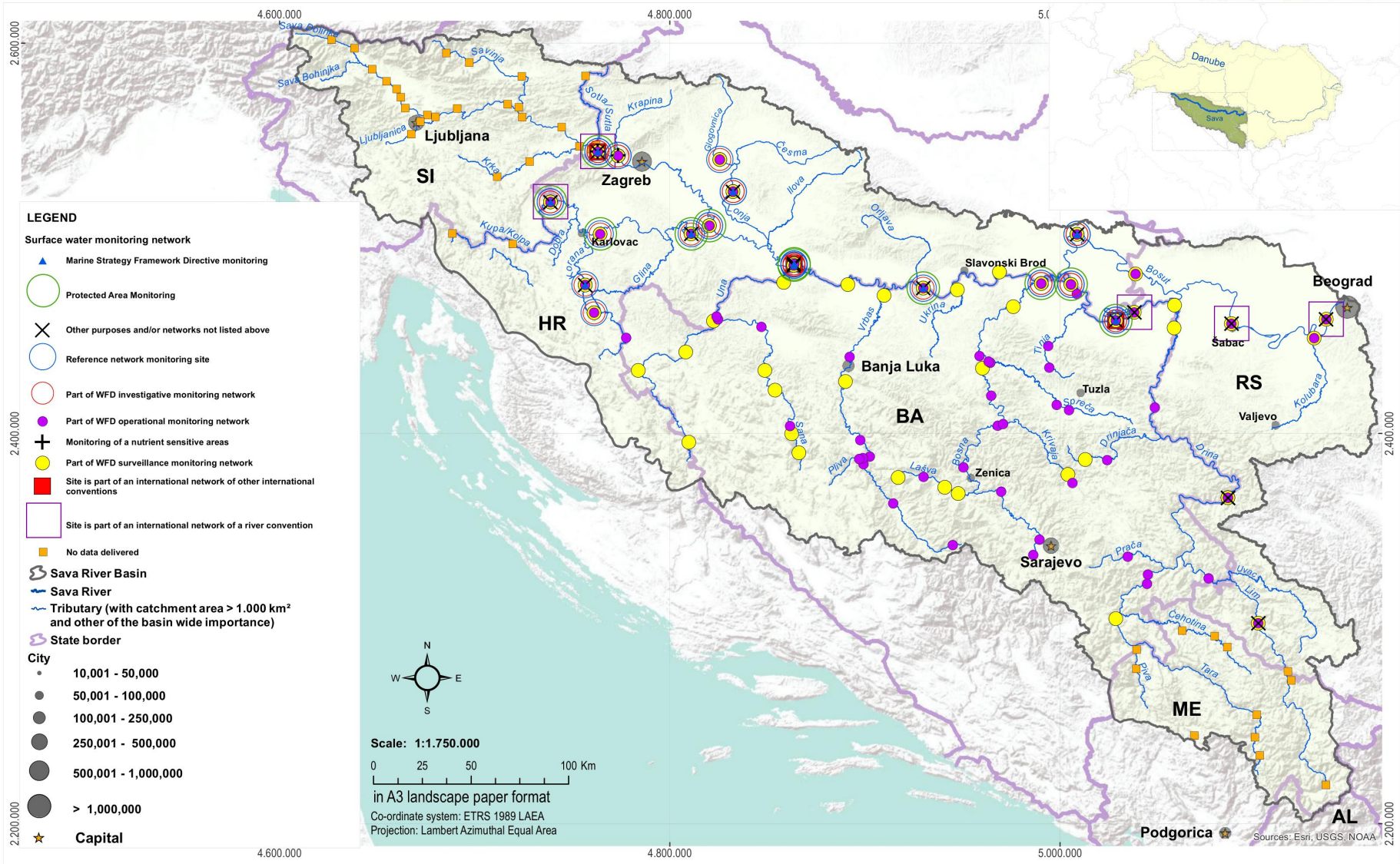
MAP 18: Surface water quality monitoring network



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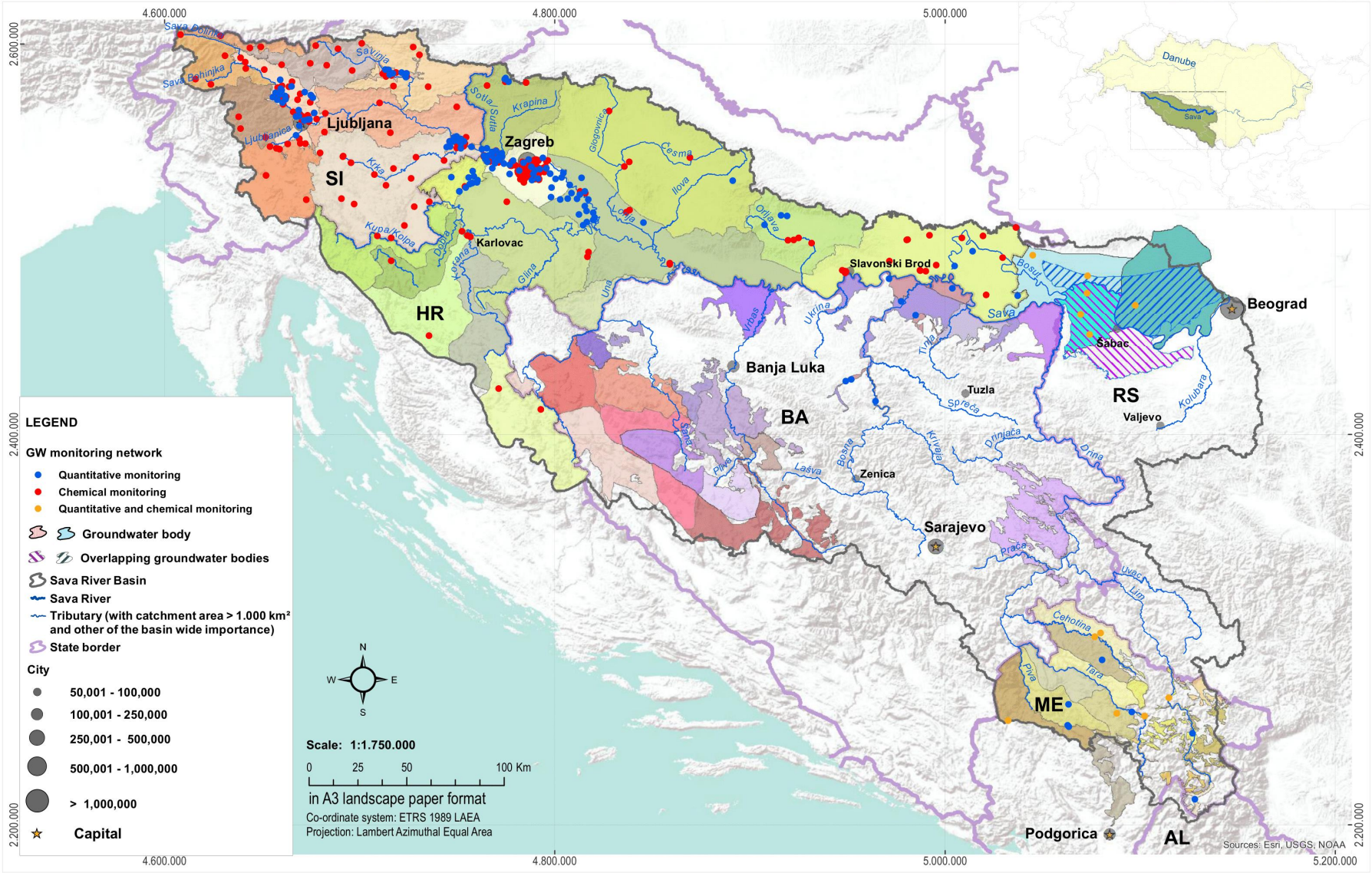
MAP 19: Groundwater monitoring network

INTERNATIONAL SAVA RIVER BASIN COMMISSION



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MAP 20: Ecological status or potential of the surface water bodies

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MAP 21: Chemical status of surface water bodies

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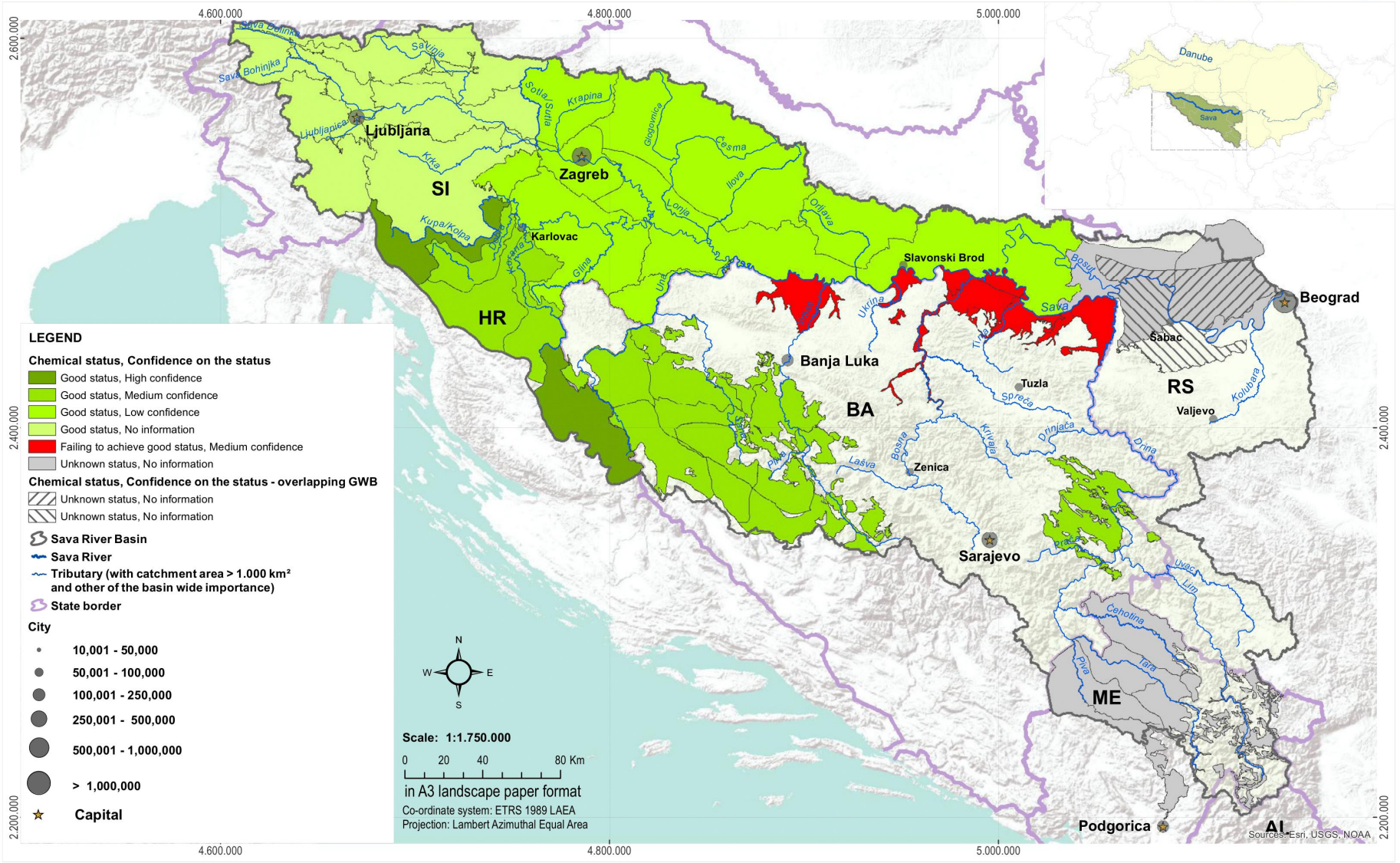
INTERNATIONAL SAVA RIVER BASIN COMMISSION

MAP 22: Chemical status of groundwater bodies



This product is based on national information provided by the Parties to the FASRB (SI, HR, BA, RS) and ME.
The borders between the countries cooperating in preparation of the Sava River Basin Analysis have not been finally determined.
The content and maps of this report do not prejudice the determination or demarcation of the borders in any way.

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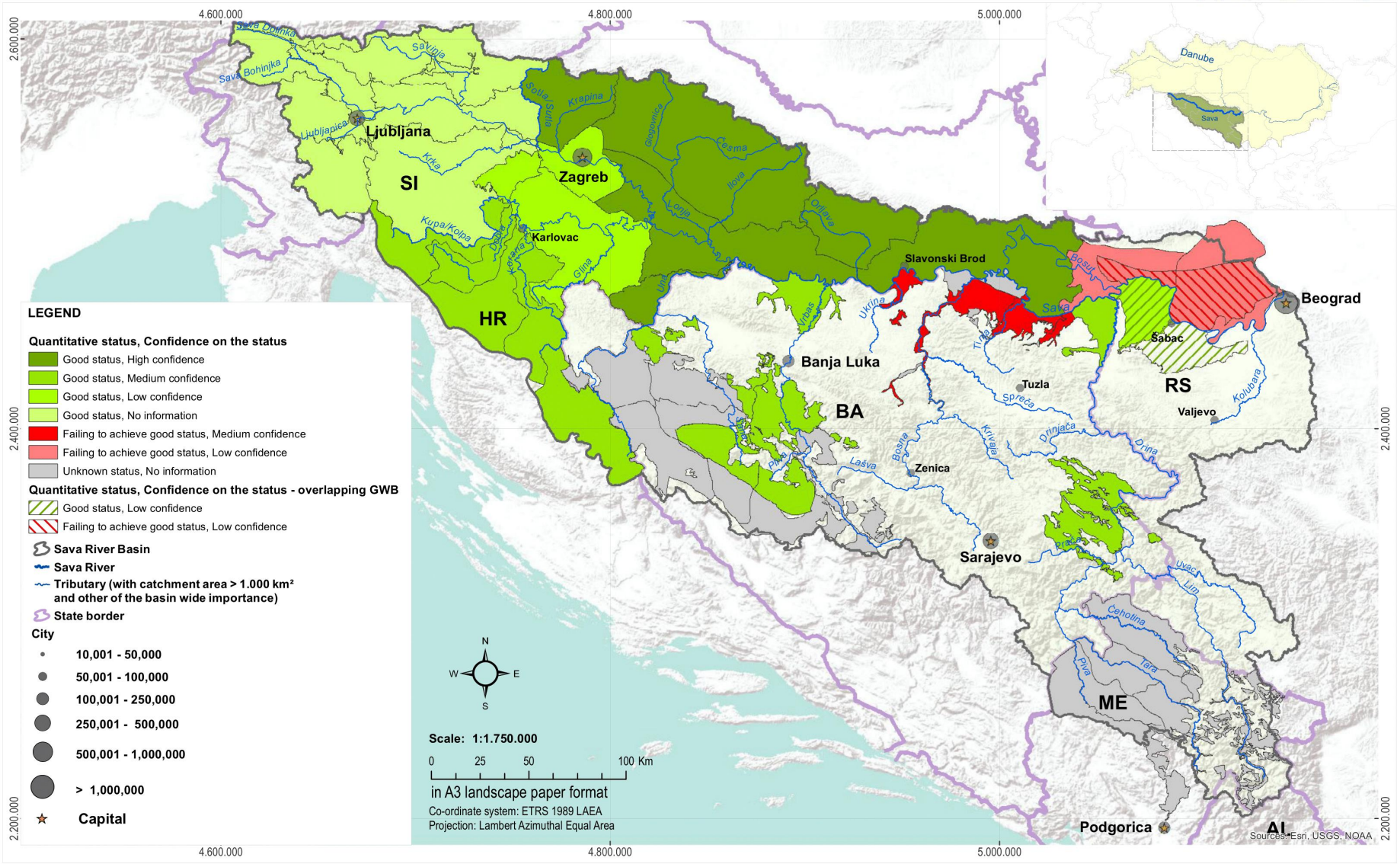
MAP 23: Quantitative status of groundwater bodies



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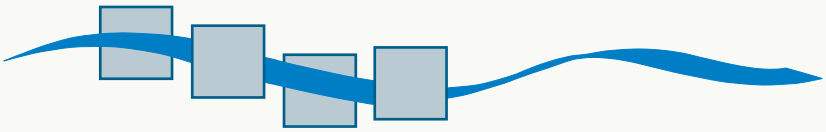

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