INTERNATIONAL SAVA RIVER BASIN COMMISSION

SAVA RIVER BASIN MANAGEMENT PLAN

Supported by the European Commission

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 Fifth Meeting of the Parties held in Zagreb (Republic of Croatia) on December 2, 2014.

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Publisher: International Sava River Basin Commission
Kneza Branimira 29
10 000 Zagreb
Republic of Croatia

Tel.: +385 1 4886 960

E-mail: isrbc@savacommission.org

Web : www.savacommission.org

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Disclaimer

The Sava RBMP is based on data delivered by the Sava countries. Where needed, other data sources have been used. Sources other than the competent authorities have been clearly identified in the Plan.

A more detailed level of information is presented in the national RBMP of Slovenia and in the draft national RBMP of Croatia as a European Union Member State and Accession Country, respectively, at the time of preparing this document. The Sava RBMP should therefore be read and interpreted in conjunction with the national RBMPs. Where inconsistencies may have occurred, the national RBMPs are likely to provide the more accurate information.

An overall contribution to the Sava RBMP development and data were provided by the experts from institutions listed below:

Slovenia: Ministry of Agriculture and the Environment, Institute for Water of the Republic of Slovenia, Environmental Agency of Slovenia, Geological Survey of Slovenia, Institute for Nature Conservation of the Republic of Slovenia.

Croatia: Ministry of Agriculture, Ministry of Maritime Affairs, 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: Ministry of Foreign Trade and Economic Relations of BiH, Federal Ministry of Agriculture, Forestry and Water Management, Ministry of Agriculture, Forestry and Water Management of Republika Srpska, Sava River Watershed Agency Sarajevo, Water Agency for Sava River District– Bijeljina, Survey for Geological Researches of Republika Srpska.

Serbia: Ministry of Agriculture, Forestry and Water Management – Directorate for Water, Ministry of Energy, Development and Environmental Protection, Institute for the Development of Water Resources "Jaroslav Černi", Republic Hydrometeorological Service of Serbia, Institute for Biological Research "Siniša Stanković", Serbian Environmental Protection Agency, Institute for Health of Serbia, and Institute for Nature Conservation of Serbia.

Montenegro: Ministry of Agriculture and Rural Development – Directorate for Water, Hydrological and Meteorological Service of Montenegro.

Some countries were not able to provide all the information needed for this Plan and these gaps are noted in the text. Where data has been made available, it has been examined and is presented to the best of available knowledge. Nevertheless inconsistencies cannot be ruled out.

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AEWS	Accident Emergency Warning System
AL	Republic of Albania
ARSs	Accident Risk Spots
AWB	Artificial Water Body
BA	Bosnia and Herzegovina
BAT	Best Available Techniques
BEP	Best Environmental Practices
BOD	Biochemical Oxygen Demand
CBA	Cost Benefit Analysis
CIS	Common Implementation Strategy for the Water Framework Directive
CORINE	Corine Land Cover (CLC 2000)
COD	Chemical Oxygen Demand
DRPC	Danube River Protection Convention (Convention on Cooperation for the Protection and Sustainable Use of the Danube River)
EC	European Commission
EEA	European Environment Agency
EIA	Environmental Impact Assessment
EPER	European Pollution Emission Registry
Espoo Convention	Convention on Environmental Impact Assessment in a Trans-boundary Context
EU	European Union
EU CAP	EU Common Agricultural Policy
FAO	Food and Agriculture Organization of the United Nations
FASRB	Framework Agreement on the Sava River Basin
FD	Flood Directive
FIPs	Future Infrastructure Projects
GDP	Gross Domestic Product
GIS	Geographic Information System
GVA	Gross Value Added
GW	Groundwater
GWB	Groundwater Body
HMWB	Heavily Modified Water Body
HR	Republic of Croatia
HPP	Hydro-Power Plant
HYMO	Hydromorphological

IAS	Invasive Aquatic Species
ICPDR	International Commission for the Protection of the Danube River
IPPC	Integrated Pollution Prevention and Control
ISRBC	International Sava River Basin Commission
JDS	Joint Danube Survey
ME	Montenegro
NGO	Non-Governmental Organization
PA	Protected Area
PAH	Polycyclic Aromatic Hydrocarbons
PE	Population Equivalent
PEG RBM	Permanent Expert Group for River Basin Management
PIACs	Principal International Alert Centers
PoM	Programme of Measures
PRTR	Pollutant Release and Transfer Registers
Ramsar Convention	Convention on Wetlands of International Importance especially as Waterfowl Habitat
RB	River Basin
RBMP	River Basin Management Plan
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RIS	River Information Service
RS	Republic of Serbia
SEA	Strategic Environmental Assessment
SI	Republic of Slovenia
SRBA	Sava River Basin Analysis Report, 2009
SRBMP	Sava River Basin Management Plan
SS	Suspended Solids
SWMIs	Significant Water Management Issues
TNMN	Transnational Monitoring Network
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNESCO	United Nations Educational, Scientific and Cultural Organization
UWWT Directive	Council Directive 91/271/EEC concerning Urban Waste Water Treatment
UXO	Unexploded Ordnance
WB	Water Body
WFD	EU Water Framework Directive
WWTP	Waste Water Treatment Plant

1 Introduction and background

1.1 Introduction

The Sava River Basin Management Plan (RBMP) has been developed according to the requirements of the EU Water Framework Directive (WFD)[1] which establishes a legal framework to protect and enhance the status of all waters and protected areas including water dependent ecosystems, prevent their deterioration and ensure long-term, sustainable use of water resources.

The Framework Agreement for the Sava River Basin (FASRB) coordinated by the International Sava River Basin Commission (ISRBC) has created the conditions for the preparation of the Sava RBMP according to the WFD. As the first step of this process the Sava River Basin Analysis (SRBA) was developed and published in 2009. The analysis addressed the requirements pursuant to WFD Article 5 and Article 6.

1.2 Cooperation in the Sava River Basin

In 2001 the four riparian countries of the Sava River Basin (Slovenia, Croatia, Bosnia and Herzegovina and Yugoslavia (subsequently Serbia & Montenegro and then Serbia)) entered into a process of negotiation, which led to the FASRB. The FASRB was signed in 2002, ratified by the Parties in subsequent years and finally entered into force at the end of 2004.

It was a unique international agreement which integrated many aspects of water resources management and established the ISRBC for the implementation of the FASRB, with the legal status of an international organisation.

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 within one institution. This provides the ISRBC with the broadest scope of responsibilities among river commissions. The ISRBC has capacity for making decisions with regard to navigation and making recommendations on all other issues. The executive body of the ISRBC is the permanent Secretariat.

According to the FASRB, Article 12, “The Parties agree to develop the joint and/or integrated Plan on the management of the water resources of the Sava River Basin and to cooperate on its preparatory activities”. The ISRBC serves as the platform for coordination for the implementation of the WFD in the Sava River Basin on issues of basin-wide importance. The national institutions responsible for the FASRB implementation are listed in Annex 1.

In addition to the FASRB, multilateral and bilateral agreements between the Sava countries have been established in the Sava RB. A review of the Signatories and Parties to the multilateral treaties and bilateral agreements relevant to the Sava River Basin is given in Annex 2.

[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

1.3 Structure of the Sava River Basin Management Plan

This RBMP has been elaborated within the framework of the first River Basin Management (RBM) cycle according to the WFD, which will last until 2015. The first cycle will be followed by two more RBM cycles that will be completed by 2021 and 2027, respectively. It establishes several integrative principles for water management, including the integration of economic approaches, and also aims for the integration of water protection into other policy areas.

According to the WFD, the first RBM cycle has four phases, each with defined tasks:

PHASE I: Definition of river basin districts; definition of the institutional framework and mechanisms for coordination.

PHASE II: Analyses of river basin characteristics, pressures and impacts and economic analysis; establishment of the register of protected areas.

PHASE III: Development of monitoring networks and programmes.

PHASE IV: Development of the River Basin Management Plan including the Programme of Measures (PoM).

The Sava RBMP follows the methodology and processes applied at the Danube River Basin level, which were developed and agreed upon by the Danube River Basin countries. The processes with regard to the Sava RB went beyond the elaboration of existing information and included the possibility of collecting the missing data, filling in gaps and collating the latest information and statistics, which allowed for a better analysis of the pressures and impacts and a proposal of measures. Four Significant Water Management Issues (SWMIs) as agreed upon at the Danube River Basin level (organic, nutrient, hazardous substances pollution and hydromorphological alterations), and issues regarding groundwater were found to be of basin-wide concern.

Water management issues in the Sava RBMP are discussed at a more detailed scale than for the Danube RBMP; the following criteria were applied regarding the selection of water bodies:

- The Sava River and its tributaries with a catchment size of >1,000 km^2 and rivers of a basin-wide importance (Sotla/Sutla, Lašva and Tinja; area <1,000 km^2);
- Trans-boundary and national GWBs which are important due to the size of the groundwater body (area >1,000 km^2), or for those < 1,000 km^2 trans-boundary GWBs which are important due to various other criteria, e.g. socio-economic importance; uses, impacts, pressures, interaction with aquatic eco-system.

The chapters of the Sava RBMP follow the logic and requirements of the WFD and their structure is determined by the SWMIs.

Chapter 1 contains background information on the Sava RB. General characteristics of the Sava RB including climate conditions, relief and topography, as well as a description of surface water and groundwater are presented in Chapter 2. Chapter 3 describes existing pressures for each SWMI, important trans-boundary groundwater bodies and other issues (sediment quality/quantity, invasive species). An inventory of protected areas is provided in Chapter 4 and the monitoring networks in the Sava RB are described in Chapter 5. The results of the basin-wide water status assessment and the designation of Heavily Modified Water Bodies (HMWBs) and Artificial Water Bodies

(AWBs) are given in Chapter 6. The WFD environmental objectives, visions and managements objectives for the Sava RB as well as the exemptions according to WFD Articles 4(4), 4(5) and 4(7) are outlined in Chapter 7. Chapter 8 contains an economic analysis of water uses. Chapter 9 gives an overview of measures to be implemented on a basin-wide scale for each SWMI and other water management issue. This chapter also includes key conclusions regarding the Programme of Measures, which are of key importance for future river basin management in the Sava RB. Chapter 10 elaborates the issue of integration of water protection elements in developments in the Sava RB, focusing on floods, navigation, hydropower and agriculture. Chapter 11 addresses climate change. The public information and consultations activities carried out in relation to this plan are summarised in Chapter 12. Key findings are listed in Chapter 13 and references are given in Chapter 14.

The Sava RBMP also includes 13 annexes as well as 22 maps which graphically present key information provided in the text.

2 General characteristics of the Sava River Basin

2.1 Basic facts

The Sava River Basin (Sava RB) is a major drainage basin of South Eastern Europe with a total area of 97,713.20 km² and is one of the most significant sub-basins of the Danube River Basin, comprising 12% of this basin. The Sava RB (Figure 1) is located between 13.67 ºE and 20.58 º E longitudes and between 42.43 ºN and 46.52 ºN latitude.

Sava River is very important for the Danube River Basin also for 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 1: Location of the Sava River Basin

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

Table 1: Composition of the Sava River Basin

	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 [km^2]	20,273	56,542	51,129	88,361	13,812	27,398
Share of national territory in the Sava RB [%]	52.80	45.20	75.80	17.40	49.60	0.59
Area of the country in the Sava RB [km^2]	11,734.80	25,373.50	38,349.10	15,147	6,929.80	179
Share of the international Sava RB [%]	12.01	25.97	39.25	15.50	7.09	0.18

The population of the five countries (Albania is not included since only negligible part of the basin area belongs to its territory) of the region is approximately 18 million and half of this number resides in the Sava River Basin. Particularly, the population of the Sava River Basin in Slovenia is 61%, in Croatia 50%, in Bosnia and Herzegovina 88%, in Serbia this figure is 26% and in Montenegro around one third of the population lives in this basin.

2.2 Climate

The Sava River catchment 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 winter can be severe with abundant snowfalls, while the summer is 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 Basin in Slovenia. A moderate continental climate dominates in the right tributaries' catchment areas within Croatia, Bosnia and Herzegovina and Montenegro, while a moderate continental (mid-European) climate primarily features in the left tributaries' catchment areas that belong to the Pannonian Basin.

Average annual air temperature for the whole Sava River Basin 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.

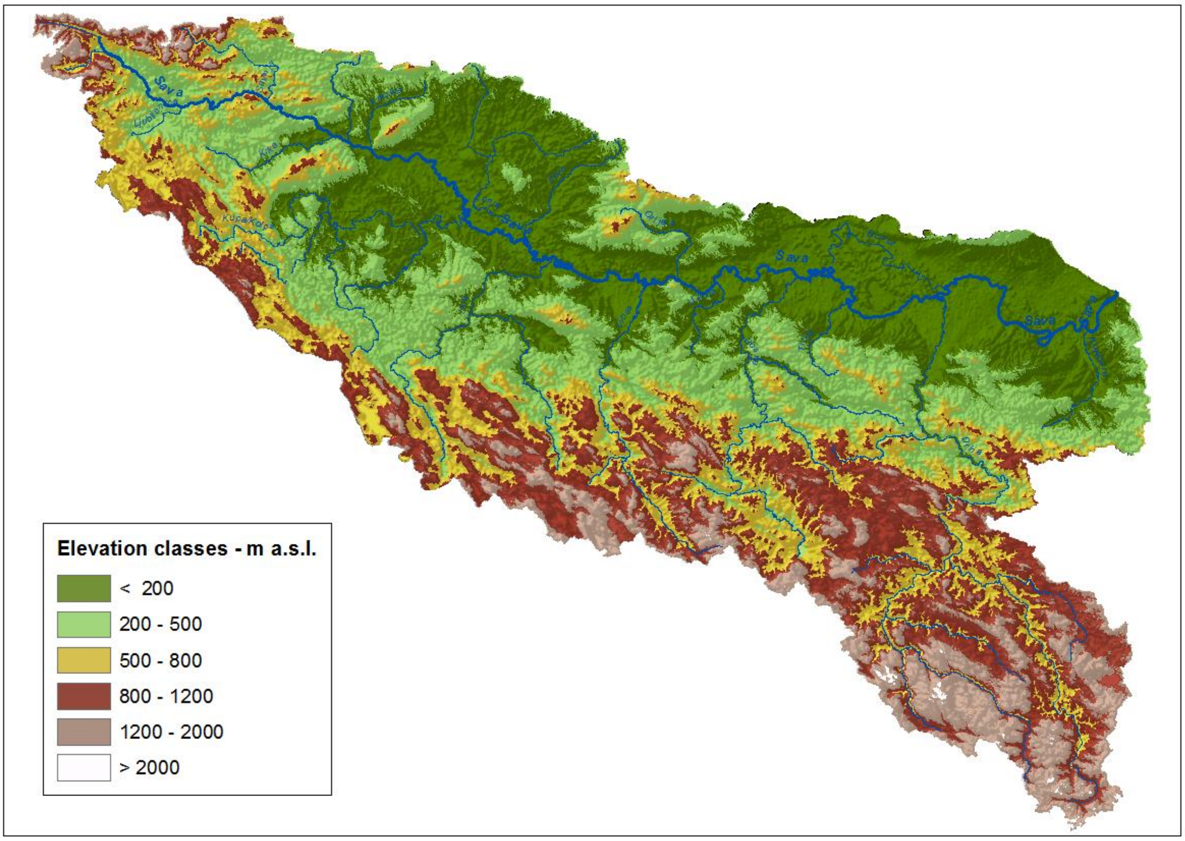
The precipitation amount and its annual distribution are fairly variable within the basin. The average annual rainfall over the Sava River Basin is estimated to be approximately

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 River Basin is diverse. The general relief characteristics are illustrated in Figure 2. Mountainous relief (the Alps and the Dinarides) dominates in the upper part of the basin, which is part of Slovenia (the highest peak is Triglav, 2,864 m a.s.l.), and the southern part of the basin is also mountainous.

Figure 2: Sava River Basin elevation



Particularly rugged terrain is a feature of Montenegro and Northern Albania. The mountains of Montenegro include some of the roughest terrain in Europe. They average more than 2,000 meters in elevation and occasionally exceed a height of 2,500 meters (the peak of Bobotov Kuk in the Durmitor Mountains). The northern part of the Sava River Basin is situated in the Pannonia Plain, which is characterized by fertile agricultural land.

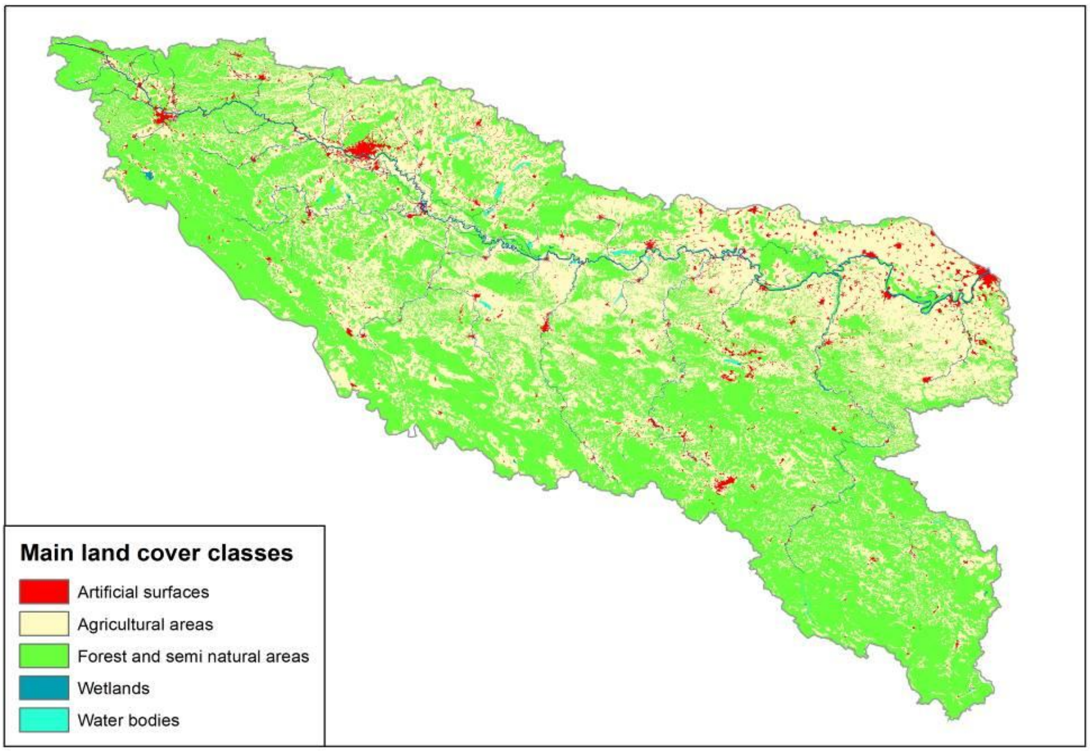
The elevation of the Sava River Basin ranges between 71 m a.s.l. at the mouth of the Sava River in Belgrade (Serbia) and 2,864 m a.s.l. (Triglav, Julian Alps). The mean elevation of the basin is approximately 545 m a.s.l.

According to the FAO classification, the dominant slope in the basin is moderately steep. The mean value of the slope in the Sava River Basin is 15.8 %.

2.4 Land cover

For an overview of the land cover in the Sava River Basin, the EEA Corine database for Europe was used, and prepared for the entire area of the Sava RB, as shown in Figure 3.

Figure 3: Distribution of main land cover classes in the Sava River Basin



Land class	Area (km^2)	Share (%)
Artificial surfaces	2,179.00	2.23
Agricultural areas	41,381.50	42.35
Forests and semi natural areas	53,458.90	54.71
Wetlands	78.20	0.08
Inland water (water bodies)	615.60	0.63
Total	97,713,20	100

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 headwater, the Sava Dolinka River in the north-west, it measures 990 km.

The confluence of the Sava River with the Danube is in Belgrade (1,170 rkm of the Danube). Its average discharge at the confluence (Belgrade, Serbia) 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 most important tributaries are listed in Table 2.

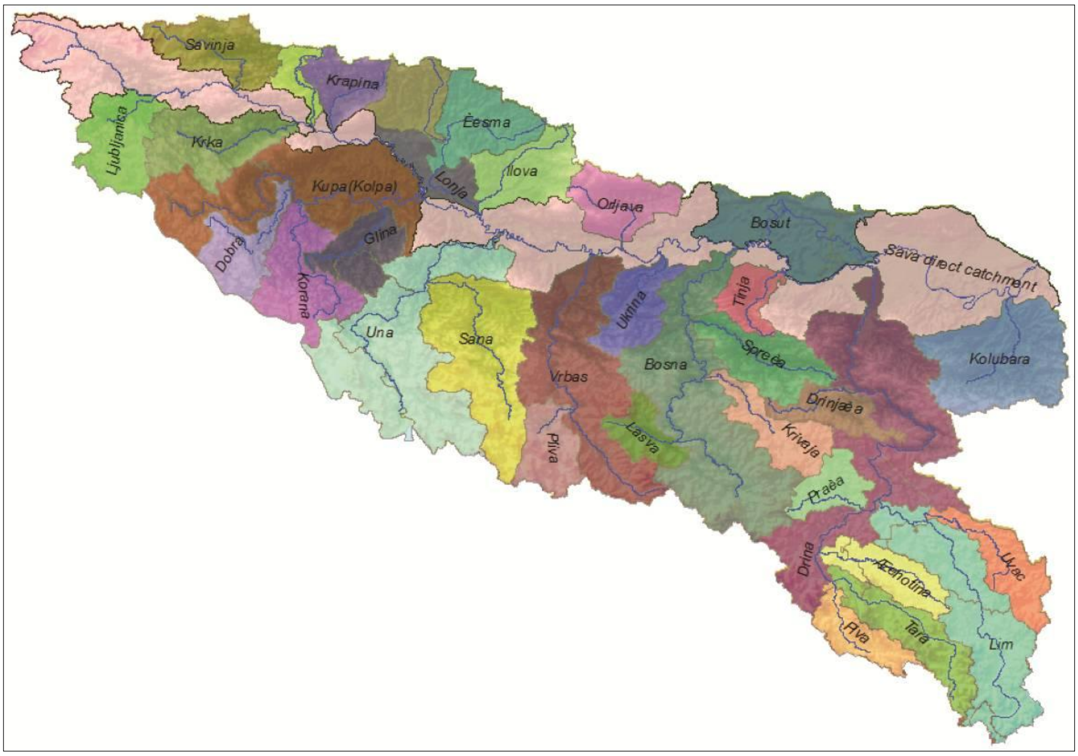
Table 2: List of the rivers in the Sava River Basin included in the Sava RBMP

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	944.7	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
Piva	1,784.0	43.50	ME	2nd	L
Tara	2,006.0	134.20	ME, BA	2nd	R
Ćehotina	1,237.0	118.66	ME, BA	2nd	R
Prača	1,018.5	62.67	BA	2nd	L
Lim	5,967.7	278.5	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.

Based on the SRBA Report (2009), it was agreed that rivers with a drainage area above 1,000 km^2 would be taken into account, in addition to reservoirs with a volume of more than 5 million m^3. There are no lakes with a surface area above the threshold value of 50 km^2. In addition to the above stated rivers, three smaller rivers (Sotla/Sutla, Lašva, Tinja) of basin-wide importance were included in the Sava RBMP. The detailed hydrological features are described in the SRBA Report (2009). The ecoregions in the Sava RB according to the WFD are shown on Map 2. The location of the selected sub-basins of basin-wide importance is presented in Figure 4.

Figure 4: Sava River sub-basins

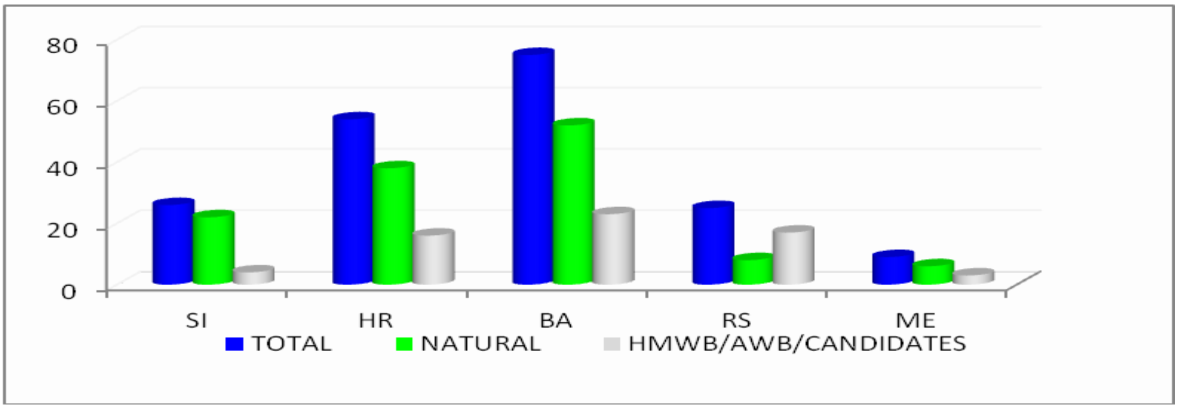


2.5.2 Delineation of surface water bodies

The list of WBs for the Sava RBMP was compiled from information provided by the Sava RB countries (available templates, data connected to shape files, various documents and reports). It should be noted that several differences regarding the borders of the delineated trans-boundary WBs have been recorded for certain stretches of the main course of the Sava River and its tributaries shared by neighbouring countries (see Map 3).

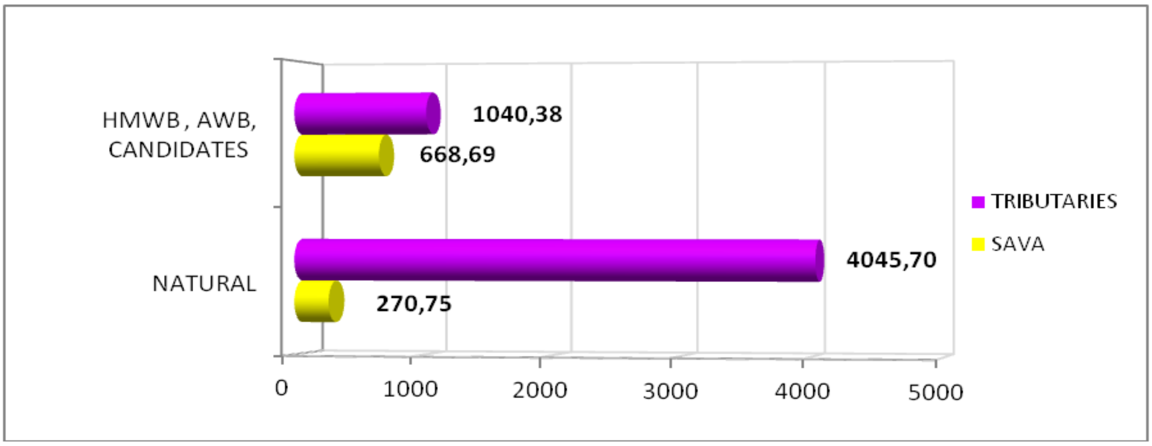
In total, 189 surface water bodies have been delineated by the Sava RB countries. Some of them (44) are shared water bodies. Of these, 126 are natural rivers and 63 heavily modified or artificial WBs (for details, see Table 1 in Annex 3 and Map 14). Distribution of the WBs in the Sava RB countries is in Figure 5.

Figure 5: Number of delineated surface water bodies in the Sava River Basin per country



From the total number of delineated WBs on the Sava River (25), 11 WBs were reported as natural, 5 WBs have been designated as HMWBs and 9 WBs are candidates for HMWB. The number of natural delineated WBs on the tributaries is 130, 24 WBs tributaries have been identified as HMWBs and 10 WBs are candidates for HMWB/AWB.

Figure 6: The length (in km) of the delineated natural WBs, HMWBs and candidates for HMWB/AWBs for the Sava River and its tributaries



The stated total length of the Sava River and its tributaries (Figure 6) is different from the real length due to problems with the harmonisation of trans-boundary water bodies. The lengths of all delineated WBs were counted if different lengths of WBs on trans-boundary stretches were reported by the neighbouring countries.

Table 3: Share and area of the Sava River Basin per country; length and number of delineated WBs for the Sava River Basin

Country	Share of national territory in the Sava RB (%)	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	52.8	11,734.8	675.20	26
HR	45.2	25,373.5	1,816.21	55
BA	75.8	38,349.1	2, 273.13	74
RS	17.4	15,147.0	904.78	25
ME	49.6	6,929.8	356.20	9

** Represents all delineated WBs.*

2.6 Groundwater in the Sava River Basin

2.6.1 Description of main hydrogeological regions

The Sava River Basin 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 River Basin, 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 regard 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, Kolpa/Kupa, 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 River Basin. 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 rock.

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 River Basin 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

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

To permit an accurate assessment of groundwater status, countries have identified GWBs as coherent units in the river basin to which environmental objectives must apply. The criteria for the delineation of GWBs vary 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 on the Identification of Water Bodies was applied by all countries. The GWBs were delineated according to a combination of criteria including the geological type, the borders of the surface catchment areas and anthropogenic pressures. More information on the delineation of GWBs can be found in Background paper No. 2.

On the scale of the Sava River Basin (following the requirements of Article 5 and Annex II of the WFD) an overview of groundwater bodies of basin-wide importance was prepared. The following criteria for the identification of GWBs of basin-wide importance were established in the 2009 SRBA Report:

- Trans-boundary and national GWBs which are important due to the size of the groundwater body (area >1,000 km^2) or

- If smaller than 1,000 km², trans-boundary GWBs which are important due to other varied criteria such as socio-economic importance; uses, impacts, pressures, and interaction with aquatic eco-system.

According to the established criteria, the Sava countries have identified 41 GWBs of basin-wide importance, which are the subject of this RBMP (Table 4; Map 4).

Table 4: Groundwater bodies of basin-wide importance in the Sava River Basin

No.	Country	GWB Name	Size (km²)	Trans-boundary (Yes/No)
1	SI	Savska kotlina in Ljubljansko Barje	774.00	No
2	SI	Savinjska kotlina	109.00	No
3	SI	Krška kotlina	97.00	Yes
4	SI	Julijske Alpe v porečju Save	772.00	Yes
5	SI	Karavanke	414.00	Yes
6	SI	Kamniško-Savinjske Alpe	1,113.00	Yes
7	SI	Cerkljansko, Škofjeloško in Polhograjsko	850.00	No
8	SI	Posavsko hribovje do osrednje Sotle	1,792.00	No
9	SI	Spodnji del Savinje do Sotle	1,397.00	Yes
10	SI	Kraška Ljubljanica	1,307.00	No
11	SI	Dolenjski kras	3,355.00	No
12	HR	Sliv Sutle i Krapine	1,405.44	Yes
13	HR	Zagreb	987.52	Yes
14	HR	Lekenik - Lužani	3,444.26	Yes
15	HR	Istočna Slavonija - Sliv Save	3,328.12	Yes
16	HR	Kupa - krš	1,026.70	Yes
17	HR	Sliv Korane	1,244.71	Yes
18	HR	Una - krš	1,574.79	Yes
19	HR	Sliv Lonja - Ilova - Pakra	5,186.09	No
20	HR	Sliv Orljave	1,575.03	No
21	HR	Žumberak - Somoborsko Gorje	443.30	Yes
22	HR	Kupa	2,870.29	No
23	HR	Una	540.57	Yes
24	HR	Sliv Dobre	754.55	No
25	HR	Sliv Mrežnice	1,370.92	No
26	BA	Posavina II	1,350.00	No
27	BA	Romanija-Devetak-Sjemeč	2,050.00	No
28	BA	Treskavica-Zelengora-Lelija-Maglić	1,240.00	No
29	BA	Manjača-Čemernica-Vlašić	1,800.00	No
30	BA	Grmeč-Srnetica-Lunjevača-Vitorog	3,770.00	No
31	BA	Unac	1,720.00	No
32	BA	Plješevica	120.00	Yes
33	RS	Istočni Srem-OVK	1,593.65	No
34	RS	Mačva –OVK	763.41	No
35	RS	Zapadni Srem-pliocen	1,172.92	Yes
36	RS	Istočni Srem –pliocen	2,248.99	No
37	RS	Mačva-pliocen	1,577.53	No
38	ME*	Sliv rijeke Pive	1,500	Yes
39	ME*	Sliv rijeke Tare	2,000	Yes
40	ME*	Sliv rijeke Ćehotine	800	Yes
41	ME*	Sliv rijeke Lim	2,000	Yes

*In ME, karstic aquifers are predominantly elevated and deep, with significant fragmentation of water bodies within them. In the scope of the preparation of the Sava RBMP, the identification of GWBs in Montenegrin portion of the Sava RB was done in a manner that groups of karstic water bodies in the river basins of Piva, Tara, Ćehotina and Lim were delineated. The boundaries of a group of water bodies correspond to the boundaries of respective river basins.

A summary of information provided by the countries on the important GWBs in the Sava River Basin concerning aquifer type, their uses and status is presented in Annex 4.

3 Significant pressures identified in the Sava River Basin

3.1 Surface water

A common methodology has been developed for the identification of significant pollution sources so that data provided by the Sava RB countries is comparable with regard to pollution and environmental emissions. The methodology for the identification of significant pollution sources in the Sava RB is based on EU Directives – primarily 91/271/EC UWWT Directive and the Directive on Industrial Emissions (2010/75/EC). These Directives, or as a minimum their main principles, have been transposed into water legislation in all Sava RB countries. Further, the country specific generated load and emissions regarding organic, nutrient and hazardous substance pollution presented in this chapter should be considered in relation to the respective countries share of the Sava RB. Details regarding methodology and data assessment can be found in Background paper No. 3. The methodologies applied for the identification of the hydromorphological alteration pressures are described in Background paper No. 4.

Special problems exist in the Sava River Basin resulting from the consequences of the military operations in early 90s. Unexploded ordnance and other hazardous material pose a great danger for the river environment. The locations and the quantity of such material are unknown and additional attention of humanitarian demining and general survey operations should take place to eliminate the danger.

3.1.1 Organic pollution

3.1.1.1 Organic pollution from urban wastewater

The population of the Sava RB (excluding Albania) is approx. 9.0 million and its activities in urban areas represent the main pressure on the environment. Population data for each Sava country is given below in Table 5.

Table 5: Sava RB countries – population

	SI	HR	BA	RS***	ME	Total*
Total country population**	1,978,000	4,437,460	3,815,297	7,498,001	627,428	**18,356,186**
Population of the country in the Sava RB	1,030,116	2,213,337	3,373,951	1,947,322	195,300	**8,760,026**
Population of the country in the Sava RB in agglomerations >2000 PE	742,282	1,837,275	2,288,389	741,400	61,638	**5,670,984**
Share of population in agglomerations >2000 PE to population of the Sava RB part of the country[%]	72	83	68	38	32	**65**

**Total number does not include the share of population of Albania.*
***Source of data – statistical agencies of the Sava countries.*
**** RS data without Kosovo.*

556 agglomerations >2,000 PE are located within the Sava RB with a total of 5.671 million inhabitants. As Table 6 shows, they represent approximately 70% of the population of the Sava RB and generate a pollution load of 6,817,357 PE. The load generated by agglomerations with less than 2,000 PE was estimated to be 3 million PE assuming that 1 inhabitant equals 1 PE. Of these, 440 agglomerations (1,705,589 PE) have a PE between 2,000 -10,000 and 116 agglomerations can be classified as having a PE >10,000 (5,111,768 PE). Table 6 states the distribution of agglomerations according to their size and the contribution of agglomerations of a given size to the generation of pollution in the Sava RB. The number and size of agglomerations within each individual country in the Sava RB are given in Background paper No. 3.

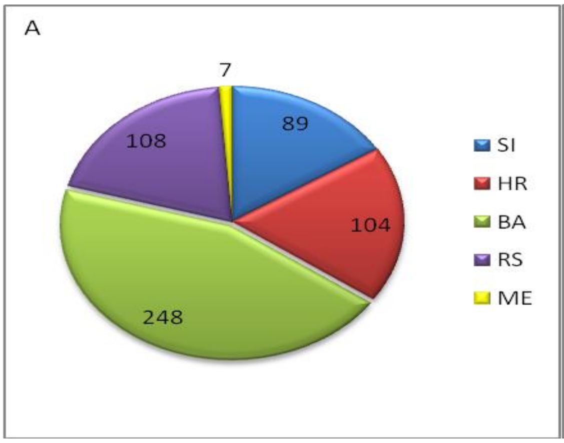
Table 6: Number of agglomerations and generated pollution load in agglomerations in the Sava RB – reference year 2007

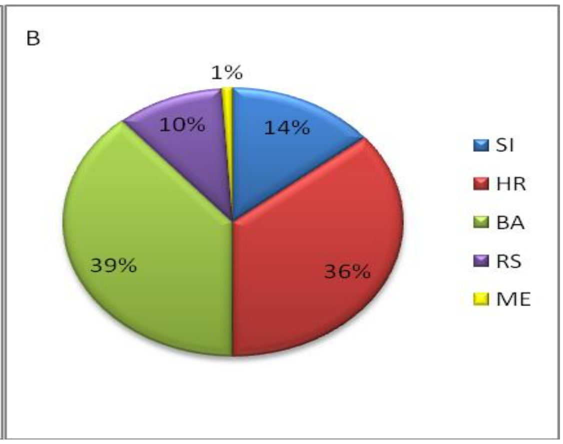
Size category of agglomeration	No. of agglomerations in the Sava RB	Generated load, PE	% of generated load in the Sava RB agglomerations	
			All size categories	>2,000 PE
≤2,000 PE	n/a	3,000,000*	30.56	-
>2,000 PE	556	6,817,357	69.44	100
>2,000 – 10,000 PE	440	1,705,589	17.70	25.02
>10,000 PE	116	5,111,768	52.07	74.98
>10,000 – 100,000 PE	109	2,656,566	27.06	38.97
>100,000 PE	7	2,455,202	25.01	36.01
Sava RB - total	n/a	9,817,357	100.	69.44**

n/a – data not available.
** Generated load (PE) in agglomerations in the category <2000 PE is an estimate (1 inhabitant = 1 PE).*
***% of generated pollution load in agglomerations >2,000 PE.*

The number of agglomerations above 2,000 PE and the share of the generated load for individual Sava RB countries are given in Figure 7. Bosnia and Herzegovina has the highest number of agglomerations with more than 2000 PE (248). They generate a pollution load of 2,363,009 PE, which represents more than 1/3 (39%) of the generated pollution load in the entire Sava RB. Approximately the same percentage of pollution (36%) is generated in 104 agglomerations of Croatia. The smallest input, less than 1%, is from Montenegro (seven agglomerations with a size of more than 2000 PE); together they produce 72,500 PE.

Figure 7: Number (A) of agglomerations >2,000 PE and share (B) of generated load for countries in the Sava RB





At present, urban wastewater from Belgrade is partially discharged into the Sava River and partially into the Danube River. The wastewater pollution load for the Sava River represents approximately 30-40% of the load generated from the central part of Belgrade. All discharge points on the Sava River are located near the confluence of the Sava and Danube (not more than 2 rkm or in the mixing zone) and therefore these discharges do not have a significant impact on the water quality of the upstream parts of the Sava River.

In the future, all urban wastewater from Belgrade will be treated at Veliko Selo UWWTP and discharged into the Danube. Since it is very complicated to divide the pollution load from Belgrade into these two basins, the discharged load from the entire agglomeration was not considered as pollution of the Sava RB in the following analysis.

The collection and treatment of urban wastewater is one of the main priorities throughout the Danube River Basin, which has been declared to be a sensitive area with the aim of the protection of its lower part and the Black Sea against eutrophication. Since the Sava RB is part of the Danube catchment area, the criteria established for sensitive areas must be respected. Slovenia's transition period for the implementation of UWWTD by 2017 and the results of the Croatian accession negotiation process with deadlines in 2023 was taken into consideration.

Table 7 shows that 56.44% (3,847,438 PE) of the generated load in agglomerations >2000 PE in the Sava RB is collected by the sewer system and 46.52 % of this load is treated. 30.2% of the total generated pollution load is treated at all types of UWWTPs.

Table 7: Urban wastewater disposal in agglomerations >2,000 PE in the Sava RB – reference year 2007

Sava countries	GPL, PE	GPL collected by sewerage system, PE	GPL collected by sewerage system but not treated, PE	GPL collected in sewerage system & treated, PE	GPL not collected & not treated, PE
SI	964,966	672,101	144,409	527,692	292,865
HR	2,442,741	1,423,964	274,076	1,149,888	1,018,777
BA	2,634,237	1,410,843	1,371,432	39,411	1,223,394
RS	698,663	293,440	224,486	68,954	405,223
ME	76,750	47,090	43,340	3,750	29,660

Sava countries	GPL, PE	GPL collected by sewerage system, PE	GPL collected by sewerage system but not treated, PE	GPL collected in sewerage system & treated, PE	GPL not collected & not treated, PE
Sava RB - total, PE	6,817,357	3,847,438	2,057,743	1,789,695	2,969,919
Sava RB - total, %		56.44	53.48*	46.52*	43.56

GPL – generated pollution load.
** % is counted from the GPL collected into sewerage system, PE.*

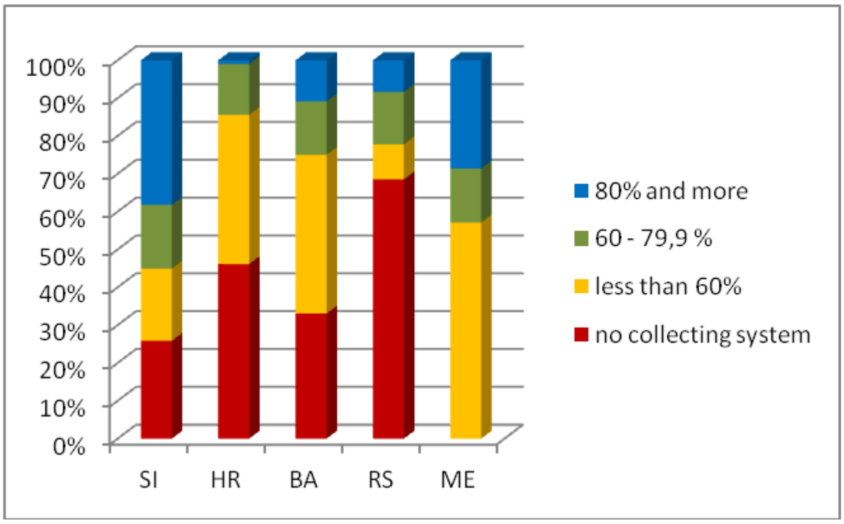
The level of wastewater collection by the sewerage systems in agglomerations >2000 PE in the Sava RB is summarised in Table 8 and presented by countries in Figure 8.

Table 8: Level of urban wastewater collection in agglomerations >2,000 PE in the Sava RB

Country/Sava River Basin	No. of agglomerations with discharge of generated pollution load (PE) into the sewerage system in the following range				
	Less than 60%	60 – 79.9%	>80%	Total number of agglomerations with sewerage system	Number of agglomeration with no sewerage system
SI	17	15	34	66	23
HR	41	14	1	56	48
BA	104	35	27	166	82
RS	10	15	9	34	74
ME	4	1	2	7	0
Agglomerations >2,000 PE	**176**	**80**	**73**	**329**	**227**
Agglomerations >10,000 PE	**36**	**44**	**25**	**105**	**8**

There is still a high number of agglomerations >2,000 PE that are not connected to a sewerage collection system or to a wastewater treatment plant. In total, wastewater is not collected and completely untreated in 227 agglomerations, eight of them are agglomerations >10,000 PE, 255 additional agglomerations (>2,000) have collection systems that require extension (176 of these systems only collect 60% of the generated load in the agglomeration) and treatment. The construction of sewerage collection systems for agglomerations >2,000 PE will reduce the volume of pollutants directly discharged which infiltrate the ground; but this may also lead to a significant increase in the amount of organic pollutants if correct treatment is not applied before discharge to surface waters. Table 8 also shows that only 25 agglomerations >10,000 PE have an appropriate collection system (>80%), sewerage systems in 80 agglomerations require extension (36 of them collect less than 60% of the generated load (PE) in the agglomeration). Figure 9 shows that the best situation regarding wastewater collection systems is in Slovenia. In Serbia, 68% of agglomerations have no wastewater treatment infrastructure.

Figure 8: Urban wastewater collection in agglomerations >2,000 PE in Sava countries



Urban wastewater from 86% of the agglomerations above 2,000 PE in the Sava RB (480 out of 556) is not treated. Table 9 shows that urban wastewater is treated in 79 such agglomerations, 66 agglomerations are equipped with UWWTPs with biological treatment processes, and nine of them are equipped for nutrient removal. The most favourable situation is in Slovenia; where urban wastewater in 52 agglomerations (of 89) are treated before discharge into the environment, however, some of the existing UWWTPs require upgrading to a higher treatment level.

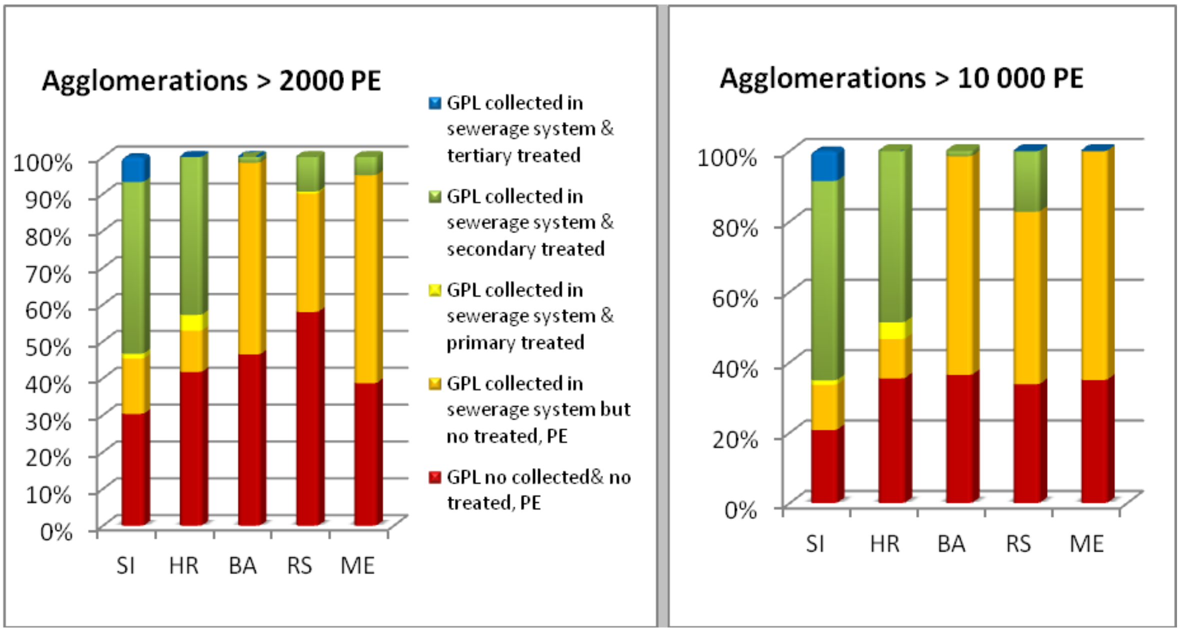
Table 9: Level of urban wastewater treatment in agglomerations >2,000 PE in the Sava RB – reference year 2007

Country	No. of agglomerations with				
	primary treatment	secondary treatment	tertiary treatment	with treatment - total	no treatment
SI	2	41	9	52	37
HR	8	7	0	15	89
BA	0	5	0	5	243
RS	2	4	0	6	102
ME	0	1	0	1	6
Sava RB total >2,000 PE	**12**	**58**	**9**	**79**	**477**
>10,000 PE	**7**	**19**	**3**	**29**	**87**

From Figure 8 it is apparent that a high proportion of urban wastewater in the Sava RB is discharged via the sewerage system into surface water without treatment. Agglomerations >10,000 PE require systematic construction of wastewater treatment plants, particularly in Bosnia and Herzegovina where a pollution load of 1,174,789 PE is discharged into surface water without treatment, but also in Croatia (239,183 PE) and Serbia (173,129 PE).

Figure 9 provides an overview of existing WWTPs, treatment levels and the degree of connection to wastewater treatment plants throughout the entire Sava RB by country.

Figure 9: Wastewater disposal in the Sava RB – reference year 2007



The level of wastewater treatment in the Sava RB countries and agglomerations >10,000 PE and >2,000 PE is shown in Table 10.

Table 10: Collection and urban wastewater treatment in the Sava RB - reference year 2007

Country	Generated pollution load, PE	GPL collected in sewerage system & primary treated, PE	GPL collected in sewerage system & secondary treated, PE	GPL collected in sewerage system & tertiary treated, PE	GPL collected in sewerage system & treated – total, PE	GPL collected in sewerage system but not treated, PE	GPL not collected & not treated, PE
SI	964,966	13,153	449,474	65,065	527,692	144,409	292,865
HR	2,442,741	104,644	1,045,244	0	1,149,888	274,076	1,018,777
BA	2,634,237	0	39,411	0	39,411	1,371,432	1,223,394
RS	698,663	3,798	65,156	0	68,954	224,486	405,223
ME	76,750	0	3,750	0	3,750	43,340	29,660
Agglomerations >2,000 PE in the Sava RB – total, PE	**6,817,357**	**121,595**	**1,603,035**	**65,065**	**1,789,695**	**2,057,743**	**2,969,919**
Agglomerations >10,000 PE in the Sava RB – total, PE	**5,111,768**	**109,508**	**1,507,410**	**56,542**	**1,673,460**	**1,712,007**	**1,726,301**

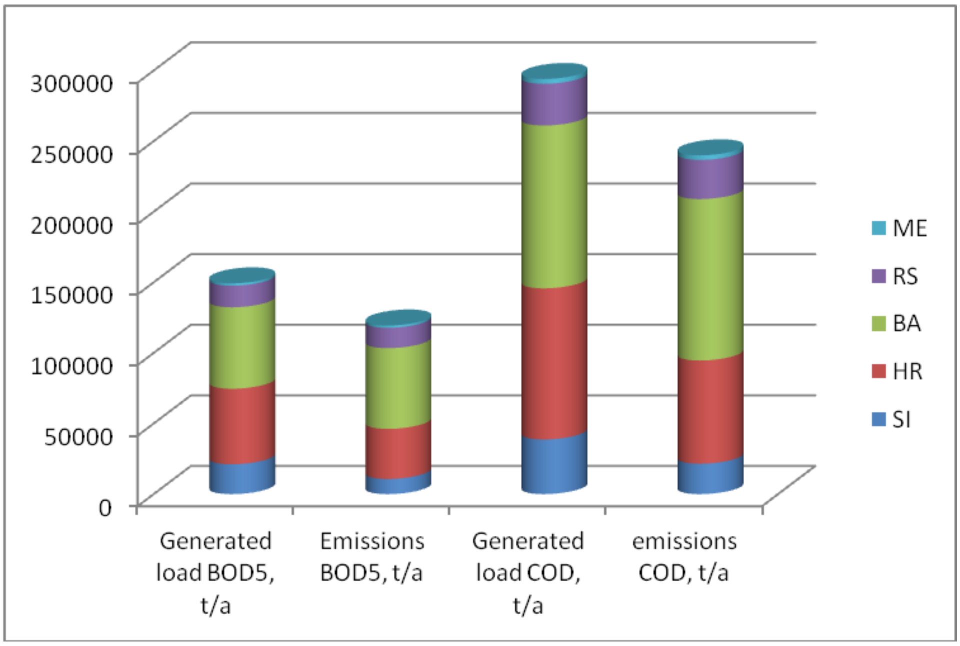
A pollution load of 6,817,357PE was generated in agglomerations above 2,000 PE in the Sava RB in 2007. This represents 149 kt/a BOD_5 and 294 kt/a COD. The total emission contribution into the environment in the Sava RB via all pathways from agglomerations >2,000 PE was 119 kt/a BOD_5 (80% of generated pollution load) and 240 kt/a COD (81.6%). “Emission” means all pollution loads emitted into the environment (groundwater, surface water and soil) and it represents potential pollution for ground and/or surface water via all pathways.

Table 11: Generated organic pollution load and emissions into the Sava RB from agglomerations >2,000 PE – reference year 2007

Country	Generated load BOD_5, t/a	Emissions BOD_5, t/a	Emissions BOD_5, %	Generated load COD, t/a	Emissions COD, t/a	Emissions COD, %
SI	21,133	10,717	50.71	38,743	21,531	55.57
HR	53,496	35,514	66.39	106,992	73,122	68.34
BA	57,690	57,199	99.15	115,380	114,327	99.09
RS	15,301	14,382	94.00	29,528	27,734	93.93
ME	1,681	1,623	96.58	3,362	3,238	96.34
Sava RB total	**149,301**	**119,435**	**80.00**	**294,005**	**239,952**	**81.62**

Figure 10 visualizes data from Table 11 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 10: Generated and emitted organic pollution load in the Sava RB from agglomerations >2,000 PE by Sava countries – reference year 2007



The results of analysis (Table 12) show that the COD and BOD_5 loads generated in large agglomerations (>10,000 PE) are 221 kt/a and 112 kt/a, respectively. The COD and BOD_5 emissions from agglomerations above 10,000 PE in the Sava RB are 171 kt/a and 84 kt/a, respectively.

The COD and BOD_5 emissions from agglomerations above 10,000 PE in the Sava RB are 171 kt/a and 84 kt/a, respectively.

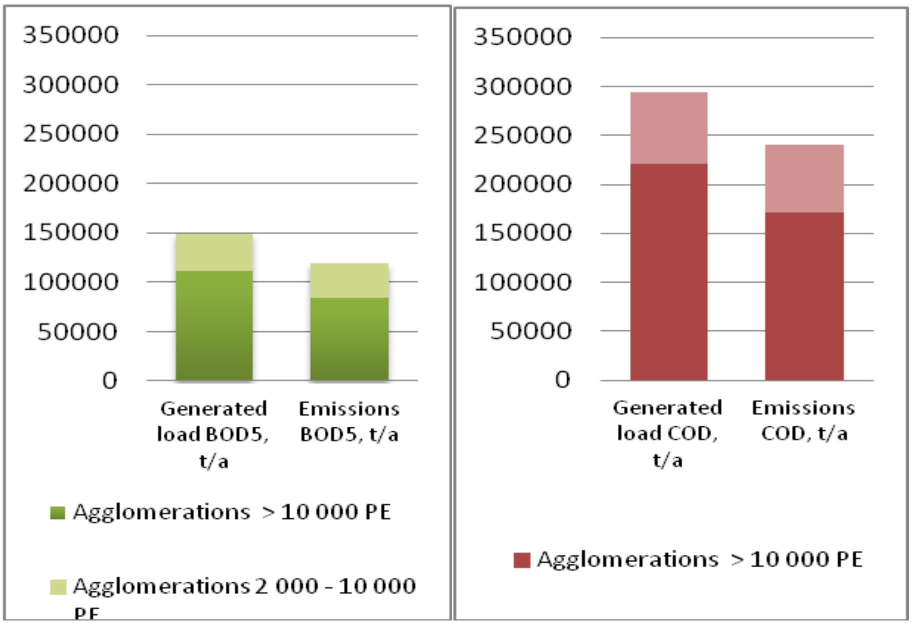
Table 12: Generated organic pollution load and emissions into the Sava RB from agglomerations >10,000 PE – reference year 2007

Country	Generated load BOD_5, t/a	Emissions BOD_5, t/a	Emissions BOD_5, %	Generated load COD, t/a	Emissions COD, t/a	Emissions COD, %
SI	14,638	5,665	38.70	26,836	11,950	44.53
HR	46,856	29,016	61.93	93,711	60,124	64.16
BA	41,407	41,102	99.26	82,814	82,161	99.21
RS	7,733	6,967	90.09	15,308	13,800	90.15
ME	1,314	1,314	100.00	2,628	2,628	100.00
Sava RB - total	**111,948**	**84,064**	**75.09**	**221,297**	**170,663**	**77.12**

A comparison of the relevant data from Table 11 and Table 12 shows that the organic (both COD and BOD_5) load generated in agglomerations >10,000 PE represents 75% of the total pollution load generated in all significant urban pollution sources (agglomerations above 2,000 PE). Emissions from these large agglomerations represent approx. 70% of organic emissions from agglomerations above 2,000 PE.

The total generated organic load and emissions from significant urban pollution sources in the Sava RB (above 2000 PE) and the share of agglomeration >10,000 PE is given in Figure 11.

Figure 11: Generated and emitted organic pollution load in the Sava RB – share of agglomerations 2,000 – 10,000 and >10,000 PE– reference year 2007



The analysis clearly indicates that the construction and extension of wastewater infrastructure in agglomerations >10,000 PE is the key to ensuring a substantial reduction of organic pollution in the Sava RB.

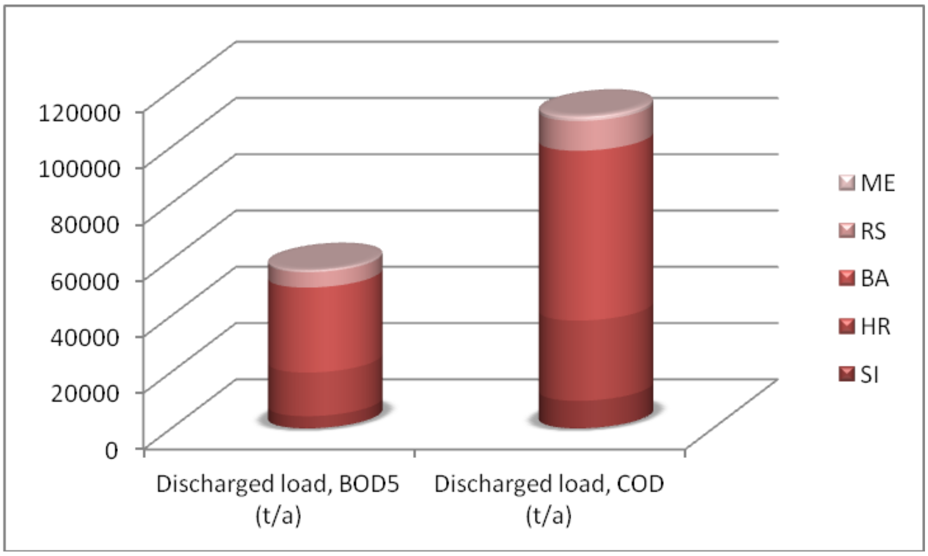
Table 13 and Figure 12 show the real pollution load discharged into surface water caused by collected & untreated urban wastewater (2,057,744 PE; see Table 10) and UWWTPs discharges from agglomerations >2,000 PE (point sources of pollution) in the reference year of 2007. The organic pollution load discharged from urban agglomerations >2,000 PE as from the point sources into surface water represents 56 kt/a BOD_5 and 111 kt/a COD (see also Figure 10).

Table 13: Quantification of organic pollution load discharged from significant urban sources in the Sava RB into surface water – reference year 2007

	Discharged load, BOD_5 [t/a]	Discharged load, COD [t/a]
SI	4,304	9,772
HR	15,514	28,519
BA	30,212	60,366
RS	5,464	10,597
ME	974	1,939
Sava RB total	**56,468**	**111,193**

The table above does not contain data on the pollution load from agglomerations entering surface water by diffuse processes.

Figure 12: Organic pollution load discharged from agglomerations >2,000 PE in the Sava RB into surface water – reference year 2007



A pollution load equivalent to 2,969,919 PE generated in agglomerations >2,000 PE (43,56%) is either transferred by individual systems of wastewater treatment or, where there is no appropriate collection or treatment system in place, it pollutes surface water and groundwater by diffuse processes (Table 10). 1,726,301PE (58%) of this pollution load is generated in agglomerations above 10,000 PE.

Detailed information about the agglomerations and the generated and emitted/discharged organic pollution from significant urban sources for each of the Sava RB countries can be found in Annex 5 (for a graphical presentation, see Map 5).

3.1.1.2 Industrial organic pollution

Over the past two decades, the political and economical situation has caused changes in industrial activities in the Sava RB countries. This process has influenced the generated pollution load and discharges of industrial wastewater into the environment.

Numerous industrial activities are undertaken within the Sava RB. A preliminary inventory carried out during the development of the Sava RBMP identified 1,096 industrial enterprises. The following industrial sectors and industrial facilities were represented: i. energy (11 power plants), ii. chemical industry (38), iii. metal processing (93), iv. paper and v. wood industry (32), all of which have been present for some time in the region. In addition to the above, agriculture and intensive livestock production (11) and the food industry (213) are well developed in the region. A large volume of industrial wastewater (from 266 industrial facilities) is discharged without any or with insufficient pre-treatment into the public sewerage network or into the environment. Due to the lack of information on industrial pollution sources in the Sava RB, only significant industrial pollution sources which meet the requirements of the IPPC Directive for reporting to the EPER have been taken into account in the analysis.

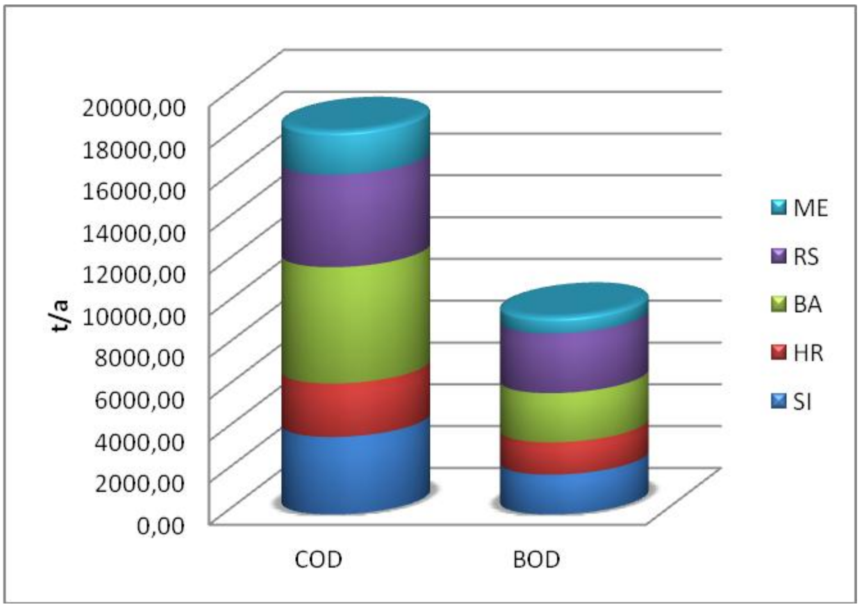
Table 14: Discharged organic load from industry facilities into the Sava RB

Country	WW discharges from significant industrial pollution sources		
	No. of significant IPS	Organic pollution load	
		COD, t/a	BOD_5, t/a
SI	89	3,709	1,904
HR	5	2,553	1,542
BA	31	5,568	2,357
RS*	10	4,424	2,856
ME	4	2,094	806
Sava RB - total	**139**	**18,348**	**9,465**

** Available data not complete.*

Table 14, Figure 13, Annex 6 and Map 6 provide information on significant industrial pollution sources. In total, 139 facilities in the Sava RB were identified as significant. Their organic pollution load discharged into the Sava RB represents 18.3 kt/a COD and 9.5 kt/a BOD_5.

Figure 13: Organic load discharged into the Sava RB from significant industrial pollution sources – reference year 2007



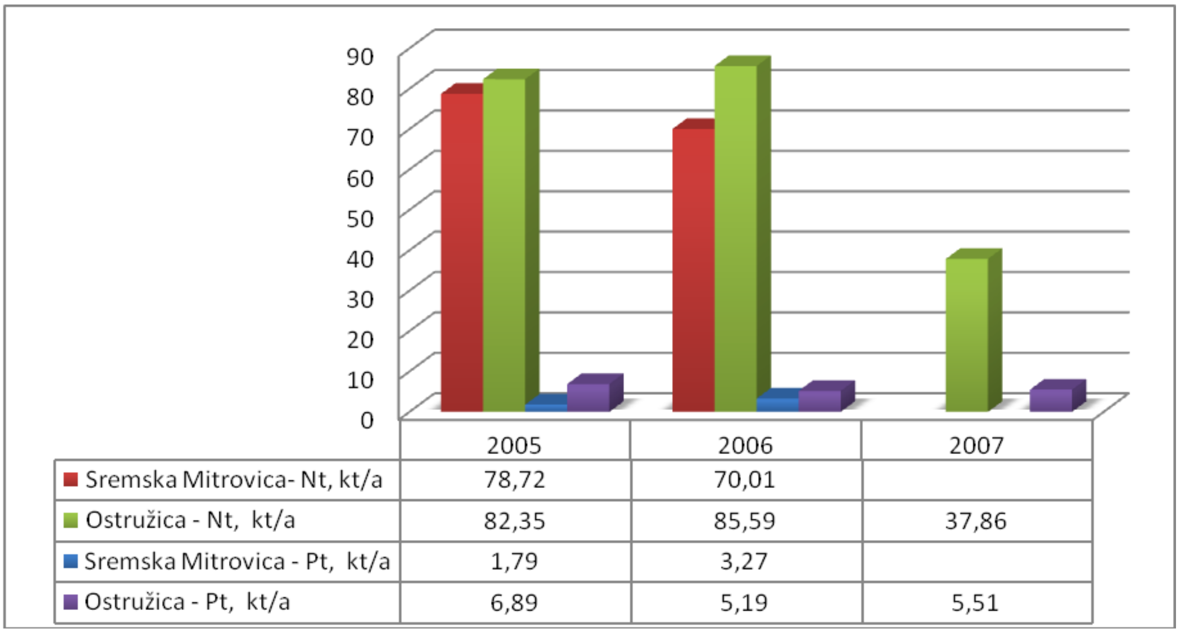
3.1.2 Nutrient pollution

Nutrient pollution – particularly nitrogen (N) and phosphorus (P) - can cause the eutrophication[2] of surface water. Nutrient pollution is a priority challenge for the freshwater. Nutrient emissions and the impact of point sources can be measured and expressed with regard to inorganic nitrogen, total nitrogen (N_t), ammonia (NH_4), nitrate (NO_3), nitrite (NO_2), total phosphorus (P_t) and phosphates (PO_4).

The Sava is the third longest tributary of the Danube and discharges the largest volume of water into the Danube of all its tributaries. With regard to nutrients, it discharges into the Danube approx. 1.79 – 6.89 kt/a of total P and 37.86 – 85.59 kt/a of total N. This estimate (see also Figure 14) was calculated from the ICPDR TNMN qualitative data from monitoring sites at Sremska Mitrovica and Ostružica using also hydrological data from the monitoring site at Sremska Mitrovica and from ISRBC and Serbian HMI Yearbooks for 2005 – 2007.

2 Definition of *eutrophication*: The enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned [Directive 91/271/EEC].

Figure 14: Estimate of the Sava River contribution of nutrients into the Danube River



The input of nutrient pollution from significant point and diffuse sources is estimated in the following chapters. This pollution influences the ecological status of surface water bodies and the chemical status of groundwater bodies in the Sava river basin (see Chapter 5).

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). An overview of urban wastewater treatment levels is provided in Chapter 3.1.1.1 in Table 9: . Technologies for nutrient removal are implemented in the Sava RB only in UWWTPs in Slovenia. The capacity of the tertiary WWTPs is used for N and P removal of generated pollution of 65,065 PE, which represents 1.70% of the collected load of urban wastewater by the public sewerage system and 1% of the overall generated pollution load in the Sava RB (Table 13). The nutrient pollution load from agglomerations >2,000 PE is shown in Table 15.

Table 15: Generated load and emissions of nutrients from agglomerations >2,000 PE in Sava RB - reference year 2007

Country	Generated load, PE	Generated load N_t, t/a	Generated load P_t, t/a	Emissions N_t, t/a	Emissions N_t, %	Emissions P_t, t/a	Emissions P_t, %
SI	964,966	3,874	704	3,179	82.06	615	87.35
HR	2,442,741	7,846	1,935	6,617	84.33	1,756	90.75
BA	2,634,237	8,461	1,971	8,425	99.57	1,966	99.75
RS	698,663	2,244	489	2,158	96.14	481	98.36

Country	Generated load, PE	Generated load N_t, t/a	Generated load P_t, t/a	Emissions N_t, t/a	Emissions N_t, %	Emissions P_t, t/a	Emissions P_t, %
ME	76,750	247	50	242	98.29	50	99.02
Sava RB - total	**6,813,357**	**22,672**	**5,150**	**20,621**	**90.95**	**4,868**	**94.4253**

Total emissions from agglomerations >2,000 PE are 20.60 kt/a for N_t and 4.90 kt/a for P_t. (Table 15 and Figure 15).

Figure 15: Nutrient emissions from agglomerations >2,000 PE - reference year 2007

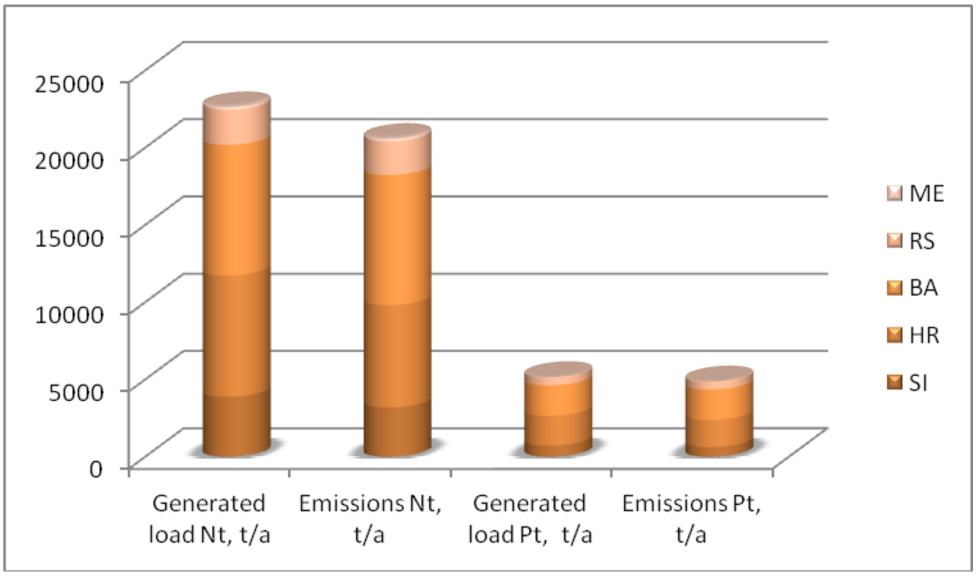


Table 16: Nutrient emission into the Sava RB from agglomerations >10,000 PE – reference year 2007

Country	Generated load, PE	Generated load N_t, t/a	Generated load P_t, t/a	Emissions N_t, t/a	Emissions N_t, %	Emissions P_t, t/a	Emissions P_t, %
SI	613,604	2,684	488	2,052	76.45	340	69.67
HR	2,139,329	6,872	1,703	5,652	82.25	1,526	89.60
BA	1,890,730	6,073	1,415	6,051	99.63	1,412	99.79
RS	309,634	1,134	255	1,052	92.77	245	96.07
ME	60,000	193	39	193	100	39	100
Sava RB - total	5,013,297	16,956	3,900	15,000	88.46	3,562	91.33

The input of nutrients from agglomerations >10,000 PE into the Sava RB by country is presented in Table 16 and Figure 16. Emissions of N and P represent 88.46% and 91.33% of the generated load in agglomerations above 10,000 PE, respectively.

Figure 16: The total emission contribution of nutrients from agglomerations >10,000 PE - reference year 2007

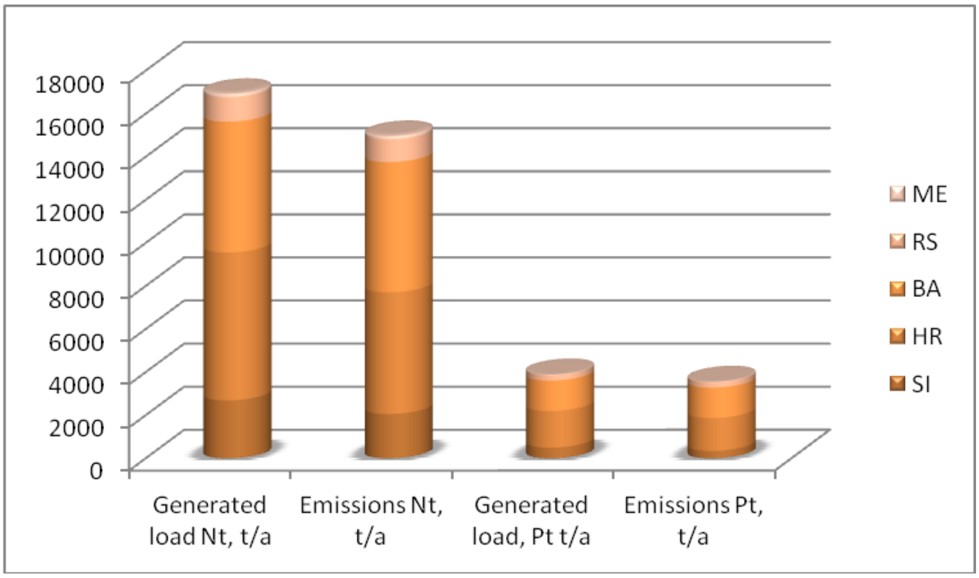
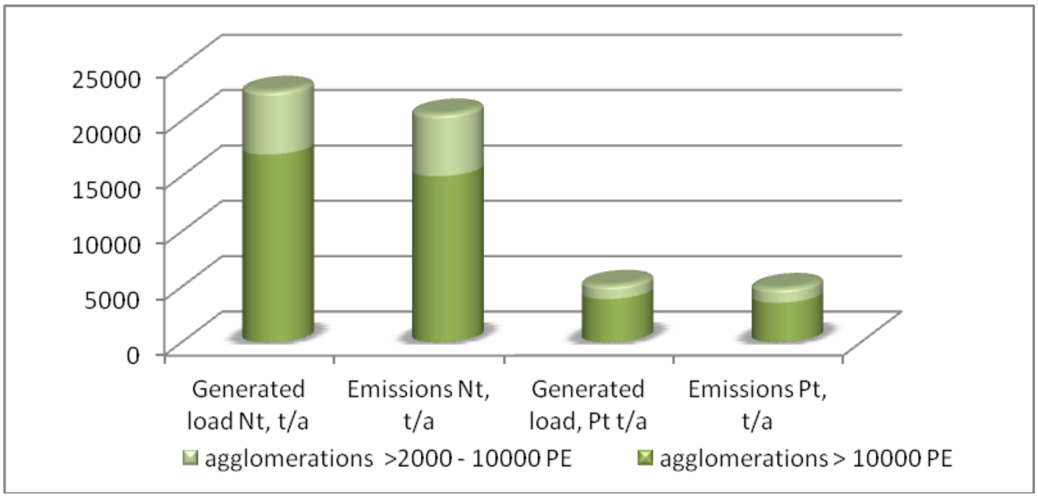


Figure 17 shows that the share of agglomerations >10,000 PE on N and P pollution load generated in agglomerations above 2,000 PE represents approx. 75% (Table 15).

Figure 17: Generated and emitted nutrient pollution load in the Sava RB – share of agglomerations >10,000 PE – reference year 2007



In addition to organic pollution, nutrients are also not removed from wastewater. Untreated wastewater discharges from collecting systems and effluents from the UWWTPs without nutrient removal are important point sources of nutrient pollution. Table 18 shows the quantity of nutrients from significant urban point sources in the Sava RB discharged into surface water. This data does not include information on the pollution load from agglomerations to the surface water transferred by diffuse processes.

Table 17: Nutrient discharges into the Sava RB from agglomerations >2,000 PE – reference year 2007

Country	Discharged load N_t, t/a	Discharged load P_t, t/a	N_t - share discharge: emission, %	P_t – share discharge: emission, %
SI	2,003	401	63.02	65.23
HR	3,484	988	52.65	56.23
BA	4,462	1,042	52.96	53.01
RS	1,016	180	47.09	37.52
ME	147	30	60,68	60,97
Sava RB - total	**11,112**	**2,641**	**53.89**	**54.27**

Detailed information about agglomerations, generated and emitted/discharged nutrient pollution from significant urban sources for each of the Sava RB countries can be found in Background paper No. 3.

3.1.2.1.2 Nutrient pollution from industry

Many industrial facilities are sources of nutrient pollution. The chemical sector and intensive livestock production are the most important contributors. The input of nutrients from the industrial sector in the Sava RB and from significant industrial pollution sources (IPS) is summarised in Table 18.

Table 18: Nutrient load discharged from the industry facilities into the Sava RB – reference year 2007

Country	Significant industrial pollution sources	
	Nt, t/a	Pt, t/a
SI	301.14	27.27
HR	37.62	3.18
BA	371.32	31.31
RS*	68.16	0.08
ME	17.81	n/a
Sava RB - total	796.05	61.84

n/a – data not available.
** Available data not complete.*

3.1.2.1.3 Nutrient point pollution sources from agriculture

Agricultural production is a point pollution source, particularly animal breeding. The pollution potential is an estimate based on an assumption that small production units predominate in livestock production, especially for cattle, pigs, sheep, goats and horses. On the other hand, poultry production is characterized by large-scale production units.

Table 19 shows an estimate of nutrient production originating from livestock manure in 2007 based on the total number of live animals (cattle, pigs, sheep, etc.) and the respective nutrient excretion coefficients per animal. For more detailed information see chapter 10.5.

Table 19: Nutrient production originating from livestock manure for 2007 – potential pollution emissions

Countries	SI	HR	BA	RS	ME	Sava RB - total
Cattle	12,968	10,976	8,863	9,835	2,964	45,606
Pigs	4,514	9,749	1,099	10,668	106	26,136
Sheep	575	2,453	3,499	2,347	1,039	9,913
Poultry	1,422	2,726	2,779	1,714	133	8,774
N_t - total, t/a	**19,479**	**25,904**	**16,240**	**24,564**	**4,242**	**90,429**
Countries	**SI**	**HR**	**BA**	**RS**	**ME**	**Sava RB - total**
Cattle	**2,045**	**1,731**	**1,398**	**1,551**	**467**	**7,192**
Pigs	**903**	**1,950**	**220**	**2,134**	**21**	**5,227**
Sheep	**219**	**934**	**1,333**	**894**	**396**	**3,776**
Poultry	**711**	**1,363**	**1,390**	**857**	**67**	**4,388**
P_2O_5 - total, t/a	**3,878**	**5,978**	**4,341**	**5,436**	**951**	**20,584**
P_t - total, t/a	**1,666**	**2,568**	**1,864**	**2,335**	**409**	**8,842**

Source: Data from country statistics agencies or FAOSTAT.

Small production units predominate in livestock production, especially for cattle, pigs, sheep, goats and horse. Poultry production, on the other hand, is characterized by large-scale production units. Assuming that small farms can be characterised as diffuse pollution sources and large ones as point pollution sources, approximately 30% of nutrients originating from the livestock manure of cattle, pigs and sheep and 90% of nutrients contained in poultry manure were estimated to have a potential impact linked to point pollution sources. Applying this assumption to the data presented in Table 18, the pollution from point sources would represent approx. 32.4 and 3.8 kt/a for N_t and P_t, respectively.

3.1.2.2 Nutrient diffuse pollution sources

3.1.2.2.1 Risk analysis of diffuse pollution sources in the Sava RB

Quantifying the pressure from diffuse pollution sources would be assessed ideally by using the monitoring data. Due to missing data on diffuse pollution sources (application of fertilisers to arable land and others) a risk analysis has been carried out. This approach uses alternative (other than monitoring) information in order to quantify the pressure from the diffuse pollution sources. The risk analysis was based on GIS using five main categories of land use: intensive agricultural use; meadows and pastures; urban areas; forest; and semi-natural areas, considered as natural areas without anthropogenic or other pollution.

The estimate of the quantity of the nutrient pollution emitted from diffuse pollution sources (Table 20) was made using emission coefficients[3]. This approach is considered to be appropriate for estimating the impacts of single land uses.

[3] Sava River Basin Analysis Report

Table 20: Nutrient emissions from diffusion pollution sources – reference year 2007 (estimation)

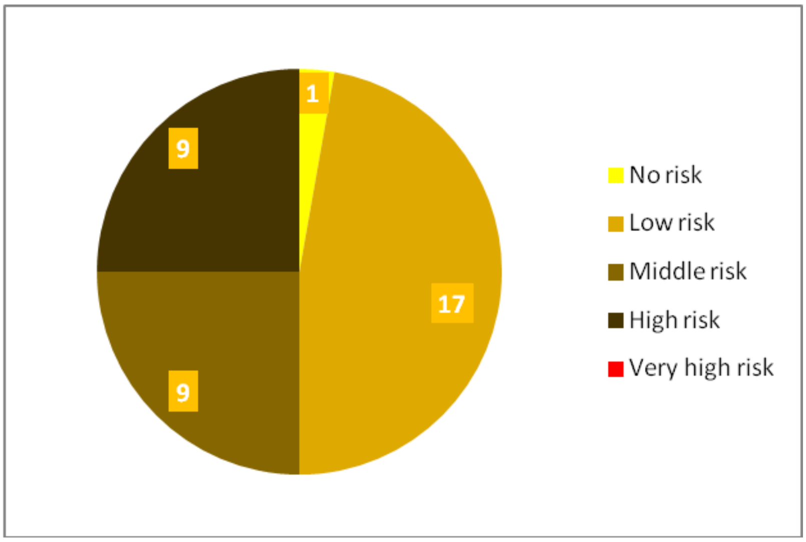
Type of emission	Nt, t/a	Pt, t/a
Urban areas	3,400	0.8
Agricultural areas	23,380	3,542.5
Pastures and meadows	1,803	82.0
Forest and semi natural areas	5,615	306.3
DPS - total	**34,198**	**3,932**

Figure 18 and Map 22 show the results of the risk assessment for the diffuse pollution sources. Of 36 sub-basins (rivers catchment areas) in the Sava RB:

- One sub-basin – is at *no risk* of pollution from diffuse sources;
- 17 sub-basins - are at *low risk* of surface water pollution from diffuse sources;
- Nine sub-basins are at *medium risk*;
- Nine sub-basins (Bosut, Glogovnica, Kolubara, Lonja, Sotla/Sutla, Tinja, Ukrina, Česma and Sava direct catchment area) are at *high risk* of surface water pollution from diffuse sources;
- No sub-basin was found to be at *very high risk* of pollution from diffuse sources.

The risk assessment was carried out in areas of specified land uses and it must be stated that it does not cover any other factors which are significant with regard to pollution from diffuse sources. Therefore, the results of this assessment have a low confidence level. More detailed information on the applied methodology is summarized in Background paper No. 3.

Figure 18: Number of sub-basins in the Sava RB which could be *at risk* from diffuse pollution



3.1.2.2.2 Calculations of emissions from point and diffuse sources

Calculations of emissions using numerical models for a long-term period and for a single year (2004/2005) were used for the elaboration of the Danube and integrated Tisza

River Basin Management plans. The applicability of the MONERIS model was also tested in the Sava RB and the results are presented in Background paper No. 3. The outcomes are based on a model run with data for a long-term period beginning in the middle of the last century up to 2004/2005.

MONERIS has also been used for the extraction of calculated nutrients loads in the Sava RB. The results obtained from the long-term dataset indicate that in total 114 kt of N and 8.9 kt of P are annually emitted into the Sava RB. According to the model output, the main pollution sources for both N and P emissions are agglomerations. For N pollution, the input from agriculture (manure, fertilizers, NOx Agri and NHy Agri) is the most important source with a total contribution of 36.1% of total emissions. For P, input from urban settlements is the largest contributor comprising 63.5% of total emissions. The main pollution pathway for nitrogen is via groundwater with 55.7% of total emissions and for phosphorus the main pollution pathway is via point sources with 42.8% of total emissions. Nutrient input via atmospheric deposition, as a pathway, represents less than 1% of total emissions for both N and P.

A comparison of the various approaches (A, B and C) regarding the nutrient pollution balance assessment in the Sava RB is presented in Table 21. Calculation mode (A) consists of separate calculations of nutrient pollution for agglomerations (A.1), an estimate of pollution from industrial sources (A.2), point pollution from agriculture (A3) and an estimate of diffuse pollution using Risk Analysis (A4). For more information regarding the (C) approach see Chapter 3.1.2 and Figure 14.

Table 21: Nutrient pollution balance assessment in the Sava RB – results

Nutrient pollution sources	Discharged N_t, t/a	Discharged P_t, t/a
A.1 Urban (agglomerations) sources	11,112	2,642
A.2 Industrial point sources (estimation)	1,872	182
A.3 Point pollution sources from agriculture	32,400	3,784
A.4 Diffused pollution sources (risk assessment)	34,198	3,932
A. Sava RB Total (ref. year 2007)	**79,582**	**10,540**
B. MONERIS (ref. year 2004 -2005)	**114,000**	**8 ,900**
C. Sava River nutrient balance	**38,000 – 85,000**	**1,800 – 6,900**

Table 21 shows that the results of calculation using approach (A) are approx. 30% lower compared to the results from MONERIS (B) in terms of the pollution load for nitrogen. For phosphorus, the results of calculation based on approach (A) are higher by 16% in comparison with MONERIS.

3.1.3 Hazardous substances pollution

Hazardous substances include man-made chemicals, naturally occurring metals, oil and its compounds and numerous emerging substances, e.g. endocrine disruptors, personal care products and pharmaceuticals.

Sources of hazardous substances are primarily industrial effluents, storm water overflow, pesticides and other chemicals applied in agriculture as well as discharges from mining operations and accidental pollution. Atmospheric deposition may also be of significance for some substances.

Article 16 of the WFD has put a mechanism in place which has created a list of 33 *priority pollutants*[4]. From this list of 33 priority substances, a group of 11 *priority hazardous substances* has been identified, which are to be subject to the cessation or phasing out of discharges, emissions and losses according to a timetable that shall not exceed 20 years.

Directive 2008/105/EC has established qualitative aims for surface water in accordance with Environmental Quality Standards (EQSs). The achievement of compliance with these standards is a condition for achieving a good chemical status of surface water bodies.

The marketing and use of chemicals is subject to EU-wide regulations. These regulations comprise:

a. Regulation of plant protection products: Directive 91/414/EEC is the key document which defines strict rules for the authorisation of plant protection products (PPPs).
b. Regulation of biocide products: The Biocide Product Directive (Directive 98/8/EC).
c. Regulation of chemicals: REACH is a new European Community Regulation on chemicals and their safe use (EC 1907/2006).

The regulation of discharged pollution from point sources is based on the requirements of the following directives:

- Integrated Pollution Prevention Control Directive (2008/1/EC);
- Dangerous Substances Directive (2006/11/EC);
- Directive 2008/105/EC on environmental quality standards for water policy.

3.1.3.1 Hazardous substances pollution – industrial sources

The Sava RB is characterised by various industrial activities, including energy production (thermo and hydro power stations), mining (coal, lead, zinc, bauxite), production of aluminium oxide, metallurgy, engineering, 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. Leaching from the large number of communal and industrial waste dumps in the Sava RB can also contaminate surface and groundwater.

The monitoring of industrial wastewater in the Sava countries mainly comprises of the monitoring of heavy metals and phenols in Slovenia. Other hazardous organic substances such as PAH and pesticides are also monitored.

From the 139 identified significant pollution sources in the Sava RB, 55 sources discharged directly into surface water and 38 sources discharged effluents into the public collection and/or treatment systems (indirect discharges). At least 39 of the 139 significant industrial sources discharged wastewater into recipients without treatment, but due to the incomplete nature of data it is believed that that this number is higher. Detailed information on significant pollution sources in the Sava RB is given in Annex 6.

[4] According to WFD Article 2(30), priority substances mean substances identified in accordance with Article 16(2) and listed in Annex X. Among these substances there are *priority hazardous substances,* which are defined as substances identified in accordance with Article 16(3) and (6) for which measures have to be taken in accordance with Article 16(1) and (8).

An overview of the discharge of hazardous substances from significant pollution sources into surface water in the Sava RB is given in Table 22.

Table 22: Hazardous substances load from significant industrial pollution sources into surface water in the Sava RB – reference year 2007

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	115	0.03	83	142	0.51	582	75	7,656	104.46
HR	n/a	n/a	145	9	n/a	53	n/a	n/a	n/a
BA	n/a	n/a	1,380	983	n/a	21	13,629	1,656	n/a
RS	2,010	n/a	n/a	n/a	n/a	n/a	58	1,223	2,038
ME	n/a	n/a	n/a	n/a	n/a	n/a	246	1	n/a

n/a – data not available.

3.1.3.2 Monitoring of hazardous substances in the Sava River during Joint Danube Surveys

The occurrence of hazardous substances in the Sava River was examined during Joint Danube Surveys organized by the ICPDR. A large number of organic substances with a wide range of polarity including priority substances and other substances such as pesticides, pharmaceuticals and endocrine disrupters as well as heavy metals were monitored in water, sediment, suspended particulate matter (SPM) and biota.

One of the key findings of the 2001 Joint Danube Survey (JDS1) was that the highest concentration of atrazine (0.78 µg/l) detected during the survey was found in the Sava River. This elevated concentration also had an influence on the Danube downstream of the confluence with the Sava at the Irongate reservoir (Station JDS65; Golubac/Koronin).

The results of JDS2 undertaken in 2007 provided more comprehensive information on the occurrence of organic micropollutants and heavy metals in the Sava River. The Sava and the Tisza Rivers were found to supply the Danube with increased amounts of Cd, Pb, Ni, Cr and Zn in SPM.

A significant impact of the Tisza and Sava Rivers on the lower Danube was an elevated concentration of cadmium in the SPM. The 1.2 mg/kg standard level was significantly exceeded in both rivers and their impact on the Danube SPM was apparent along a 1,000 km stretch of the Danube downstream of the confluence with the Sava River.

A clear impact of the Sava River was observed in results from analyses of mussels. Cadmium values in the Danube itself fluctuated from 0.17 to 11.8 mg/kg; however, the highest concentration was measured in the Sava River (29.6 mg/kg). Concentrations of lead in Danube mussels varied from 0.63 to 10.90 mg/kg, with the highest value in the Sava River (14.6 mg/kg). The concentration of chromium varied from 0.21 to 8.63 mg/kg in the Danube, with almost the same concentration in the Sava River (8.47 mg/kg). In general, most of the highest concentrations of heavy metals were measured in the Sava River from all the surveyed tributaries. The results of JDS2 clearly indicated that the accumulation of heavy metals in the Sava River is of concern and should be further studied.

As regards organic substances, the JDS2 results showed that di-(2-ethylhexyl) phthalate (DEHP; a widely-used plasticiser) exceeded the environmental quality standard for priority substances in water at the mouth of the Sava River. A significant DEHP concentration was also found in the SPM sample from the Sava River (5.03 mg/kg). A detailed investigation of emerging substances provided evidence of the occurrence of a number of compounds (see Table 23), which require additional research.

Table 23: a/b Water concentrations of organic substances determined in the Sava River during the JDS2 (in [ng/L])

a)

No.	River, location	Nap-roxen	Bent-azone	Keto-profen	Meco-prop	Ibu-profen	Gem-fibrozil	PFOA	PFOS	Caffeine
SA1	Sava, Županja	2	6		2	5	3	2	7	139
SA2	Sava, Jamena	2	4		2	5	3	2	7	176
SA3	Sava, Sremska Mitrovica		2	31		5	1	1	5	146
SA4	Sava, Ušće	4	5			10	2	2	5	141

b)

No.	River, location	Desethyl-atrazine	Carba-mazepine	Sulfamethox-azole	Atra-zine	Terbutyl azine	Desethyl terbutylazine	NPE1 C	Nonyl-phenol	Bis-phenol A
SA1	Sava, Županja	10	28	35	3	2	4	47		24
SA2	Sava, Jamena	11	27	46	3	4	3	46		18
SA3	Sava, Sremska Mitrovica	9	15	25	2	2	1	46	110	246
SA4	Sava, Ušće	10	18	37	2		3	55	100	

Source: Joint Danube Survey 2, Final Scientific Report, ICPDR, 2008.

3.1.3.3 Use of agricultural pesticides

Agricultural pesticides are used in the Sava River basin in large quantities to manage pests and diseases of crops and livestock. According to the Statistical Agency, 1,281 t of pesticides were applied in Slovenia in 2006, while 2,010 t of pesticides were applied in the Croatian section of the Sava RB in 2007. However, comprehensive and up to date information on basin-wide pesticide application is missing. These substances and their break-down products such as Atrazine, Desethylatrazine or Terbutylazine, can pollute soils, ground and surface waters, posing a risk to environmental and human health if above a certain threshold value. The Joint Danube Surveys (see Table 23) detected some of these compounds in the Sava waters. While amounts of measured pesticides were not alarming, data are too patchy to conclude on overall pollution levels and risks they pose.

3.1.3.4 Accidental pollution

Article 12 of the Seveso II Directive requires Member States to ensure that the objectives of preventing major accidents and limiting the consequences of such accidents are taken into consideration in their land-use planning policies. In response to a number of major accidents in the Danube Basin, the ICPDR elaborated a basin-wide inventory of Potential Accident Risk Sites in the Danube River Basin. No additional data on Accident Risk Spots (ARSs) has been collected in this planning cycle for the Sava RB level. The ARSs inventory 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. The inventory of operating industrial sites was finalised in 2001 for most of the Danube countries, and updated in 2003.

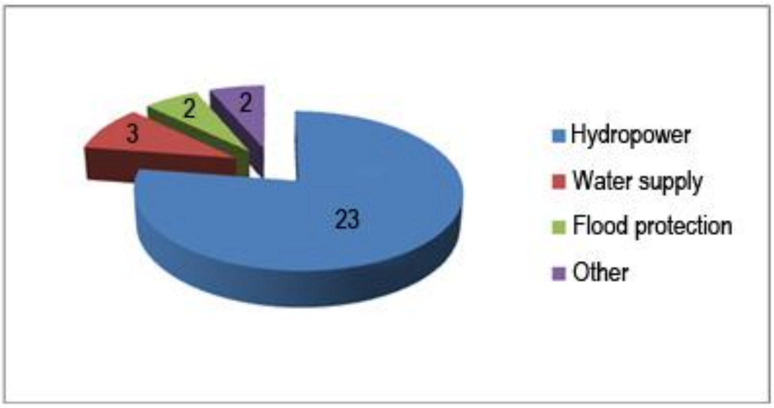
Slovenia reported two ARSs. Both are refuse depots ("land fill sites") for metalworking and petrochemical industries. Croatia reported 26 ARSs. The highest potential hazard is connected with a wastewater pond.

3.1.4 Hydromorphological alterations

3.1.4.1 River and habitat continuity interruption

The key driving forces causing river and habitat continuity interruption in the Sava RB are primarily hydropower (78%), water supply (10%), and flood protection (6%) – Figure 19.

Figure 19: Interruptions of river continuity in the Sava River Basin (in numbers)



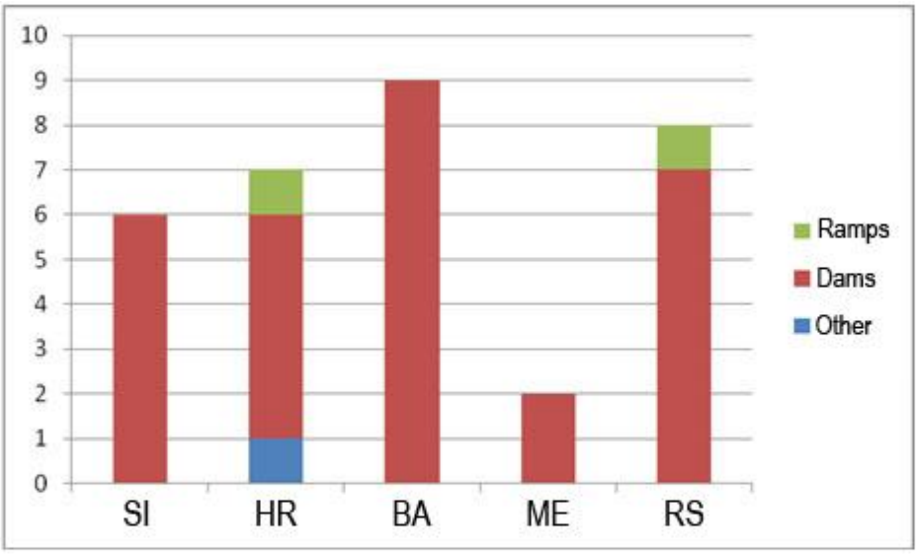
There are 30 barriers in the Sava RB with 7 barriers on the Sava River itself and 23 on the tributaries. An overview of the number of river continuity interruptions (reference year 2010) is provided in Table 24. Proposed restoration measures by 2015 and exemptions according to the WFD Article 4(4) for each Sava country is provided in Annex 7 (see also Map 7). Of the 30 barriers, 27 are dams, 2 are ramps (Figure 20) and one of the barriers is classified as “other type of interruption”.

Table 24: Overview of the river continuity interruptions 2010

Country	Barriers 2010	Passable by fish 2010	River continuity interruptions 2010
SI	6	1	5
HR	7	1	6
BA	9	1	8
RS	8	2	6
ME	2	0	2
Total[5]	**30 (32)**	**4 (5)**	**26 (27)**
Sava	7	2	5

[5] Both BA and RS included in their lists HPP Zvornik and Bajina Basta, located on the trans-boundary river Drina.

Figure 20: Types of interruptions of river and habitat continuity in the Sava RB



Three barriers (HPP Blanca on the Sava River in Slovenia, Kolubara (vodozahvat TE Veliki Crljeni) and Drina river (HE Zvornik) in Serbia, trans-boundary with Bosnia and Herzegovina) are equipped with functional fish passes. HPP Mavčiče and HPP Vrhovo on the Sava river in Slovenia are not passable by fish. HPP Krško on the Sava river in Slovenia is presently under construction and the fish pass will be constructed. Gate Trebež (HR) on the Lonja River has a sluice with limited connectivity.
The key migration route for migratory fish species in the Upper Sava (between 42.9 and 189.7 km from the river source) is interrupted, impacting the development of self-sustaining populations. Fish migratory routes are also interrupted on the tributaries, e.g. dams on tributaries: Sotla/Sutla, Kolpa/Kupa, Dobra, Una, Vrbas, Pliva, Lasva, Spreča, Bosut (gate), Drina, Ćehotina, Piva, Uvac, and Lim.

3.1.4.2 Disconnection of adjacent wetlands/floodplains

The Sava River has lost a significant area of floodplain, although along the lower courses some important floodplains still remain. The Sava River has the second largest active area of floodplains (1,900 km^2) after the Danube (without the Delta around 5,000 km^2). The lateral connectivity of river and floodplain is included as one of the features of morphological alteration assessment.

The results of the assessment show that more than 2/3 of water bodies in the Sava tributaries have no more than 15% of dykes and other hydrotechnical constructions limiting floodplain inundation during regular floods. For the remaining 1/3 of the water bodies, the length of the dykes is more than 15% of their total length.

3.1.4.3 Hydrological alterations

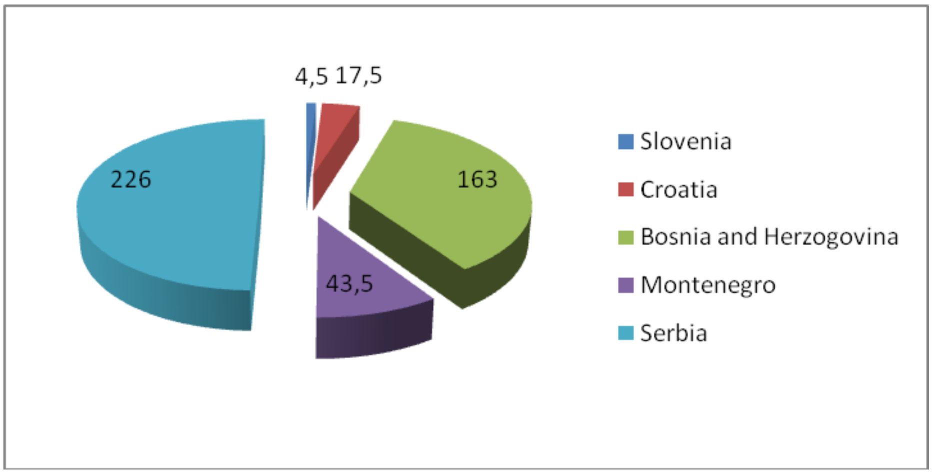
Hydrological alterations refer to pressures resulting from impoundment, water abstraction and hydropeaking / altered flow regime. Hydrological alterations are of local importance and do not necessarily result in basin-wide trans-boundary effects. However, the cumulative effect of water abstractions may become significant in a trans-boundary context.

The main pressure types in the Sava River Basin causing hydrological alterations[6], are the 27 impoundments[7], one case of water abstraction (Otilovici on the Ćehotina river in Montenegro) and one case of hydropeaking with a water level fluctuation >1m/day (on Piva river) and six cases of altered flow regime.

Impoundments are the major type of hydrological pressure in the Sava River Basin.

Impoundment leads to an alteration/reduction in flow velocity in the water body. Hydropower is the main driving force. The above mentioned significant impoundments at 27 water bodies lead to changes in the water body category. The length of impoundment in different countries is presented in Figure 21.

Figure 21: The length of impoundments in the Sava RB (in km)



Water abstraction for urban, industrial, agricultural and other uses, including seasonal variations and total annual demand, and the loss of water in distribution systems, leads to an alteration in the quality and discharge in the water body. The significant water abstraction reported for one water body is causing changes to the water body category.

Hydropeaking leads to the alteration of flow variation/discharge changing along the river. The main driver is hydropower. The significant hydropeaking at the one reported water body is causing changes to the water body category. The hydrological alterations are shown on Map 8.

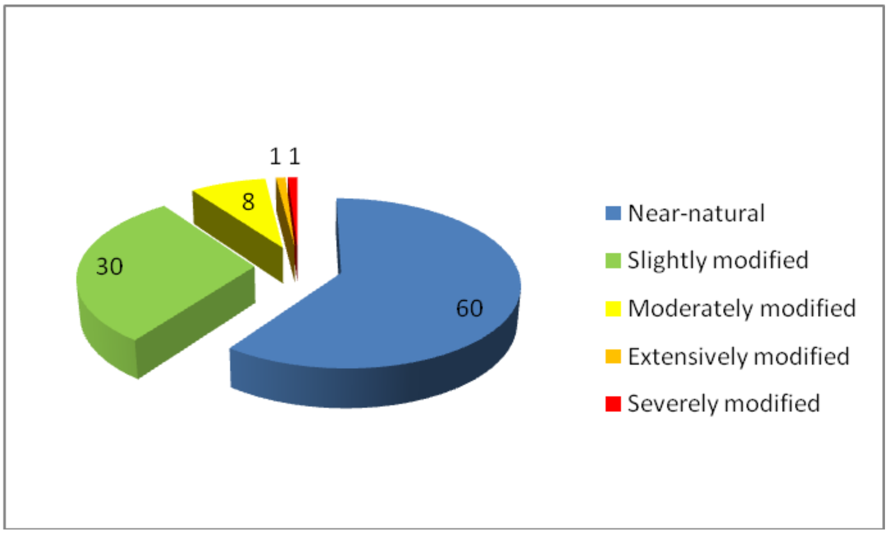
3.1.4.4 Morphological alterations

The main drivers of morphological alterations in the Sava RB are flood protection, navigation, hydropower, and urbanization. Based on the methodology of assessment of morphological alterations of rivers described in Background paper No. 4, 130 water bodies have been assessed (Figure 22). Morphological alterations have only been assessed for non-HMWBs. For more details, see Background paper No. 4 and Map 9.

[6] According to criteria, as given by the ICPDR HYMO TG impoundment is significant when impoundment length during low flow conditions is longer than 1 km; water abstraction is significant if the flow below dam < 50% of mean annual minimum flow for a specific time period (comparable with Q95), hydropeaking is significant if water level fluctuation is higher than 1 m /day.

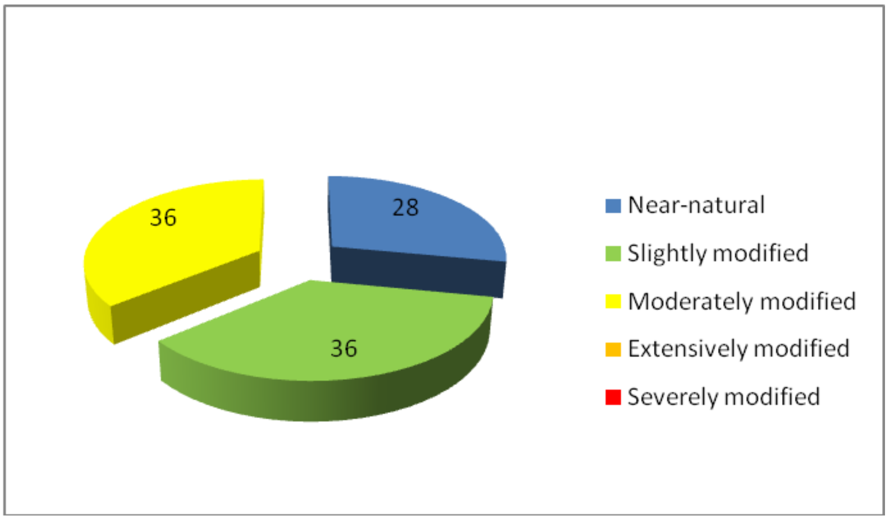
[7] The location of impoundments corresponds to longitudinal interruptions. See Annex 7.

Figure 22: Classes of modification of the morphology of river water bodies in the Sava River Basin (in %)



In the Sava River, 14 water bodies have been assessed. The results are shown in Figure 23.

Figure 23: Classes of modification of the morphology of river water bodies of the Sava River (in %)



The main causes of the morphological alterations (3rd, 4th and 5th class of morphological quality) are changes to the river geometry, channel longitudinal section and cross-sections, substrate/sediment, bank structure, and lateral connectivity of river and floodplain.

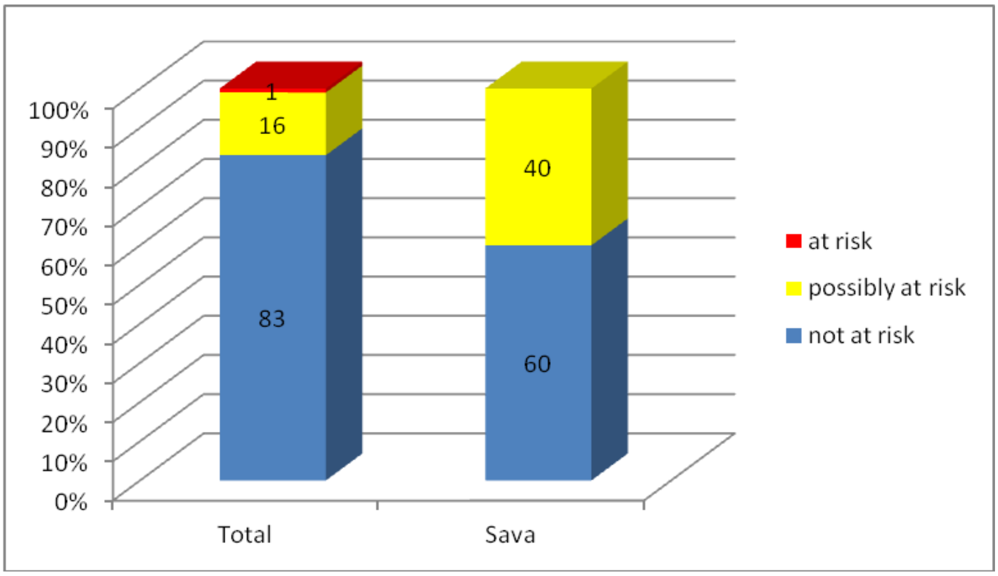
3.1.4.5 Risk assessment - hydromorphological alterations

Water bodies classified as "*not at risk*" are those which do not have any significant hydrological alterations (impoundments, water abstraction, hydropeaking) and are classified as 1st "near-natural" or 2nd "slightly modified" with regard to the modification of river morphology. 83% of water bodies fall into this category in the Sava RB, although this figure is 60% for the Sava River itself.

Water bodies classified as "*possibly at risk*" include water bodies which do not have any significant hydrological alterations and are included in the 3rd class of modification of river morphology, i.e. "moderately modified". There are 16% and 40% of such water bodies in the Sava River Basin and in the Sava River, respectively.

Water bodies classified as "*at risk*" include water bodies which have one or more significant hydrological alterations, or are included in the 4th class (extensively modified) or the 5th class (severely modified). 1% of water bodies in the Sava River Basin fall into this category (see Figure 24 and Map 10).

Figure 24: Risk assessment – hydromorphological alterations (figures in columns represent the number of relevant water bodies)



3.1.4.6 Future infrastructure projects

Future infrastructure projects (FIPs) in the Sava RB (e.g. navigation, hydropower and flood protection) may have negative impacts on the water status and must therefore be addressed accordingly. In order to prevent and reduce basin-wide and trans-boundary effects from FIPs in the Sava RB, the development and application of BAT and BEP is crucial. For new infrastructure projects, it is of particular importance that environmental requirements are considered as an integral part of the planning and implementation process. An assessment of the impact of developments in the water-related areas on river basin management has to be undertaken and particular attention has to be given to ecological status.

Transboundary impacts of all existing infrastructures (including those listed in Table 25) and FIPs shall be assessed within the work of bilateral commissions using all available tools (e.g. WFD, FD, etc.) and international mechanisms (e.g. ESPOO Convention, FASRB).

Table 25: List of existing infrastructure in the Sava River Basin

Hydropower							
Country	**Name of the HPP**	**River**	**Capacity installed** (MW)	**Installed discharge** (m^3/s)	**Average yearly production [2005-2007]** (GWh/year)	**Countries share in average total production**	**Countries share 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	192	4%	4%
	Lešće	Dobra	42	123	94		
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%

Navigation		
Country	**River**	**Structure**
HR, BA, RS	Sava	Sava river waterway from Sisak to Belgrade

* Reversible HPP

3.2 Groundwater

3.2.1 Pressures on groundwater quality

According to the collected data, groundwater quality is mostly endangered in urban areas and areas with intensive agriculture production, which are mostly located on the alluvium plains of the Sava River and its tributaries. Groundwater pollution has been recorded in four Sava countries: Savinjska kotlina and Krška kotlina (SI), Zagreb area (HR), Semberija, Lijevče polje (BA) and Mačva area (RS).

The main causes of groundwater pollution in the Sava River Basin are:

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

The main pollutants causing a poor chemical status in certain GWBs are nitrates and pesticides from diffuse sources, i.e. agricultural activities, non-sewered settlements and urban land use (run-off from urban paved areas).

The groundwater quality in the karstic regions of the Interior Dinarides is high, although this is considered to be the most vulnerable environment to man-induced and/or natural hazards, due to a number of abnormal geological and hydrogeological features. Agriculture and land use changes may lead to degradation of the karst landscape due to stone clearing and crushing, which leads to erosion and ultimately results in rocky desertification. Due to the inaccessibility of many karst terrains, the present degree of pollution of the water bodies is low. The only problem is the occasional occurrence of bacteriological pollution resulting from inadequate wastewater collection in recharge areas and high turbidity in spring due to snow melting. However, the possibility of the pollution of groundwater accumulated in revealed karst aquifers from surface terrain is widespread, especially in regions with active abysses.

Information on identified pressures causing poor chemical status (or *at risk*) is presented in Table 26.

Table 26: Pressures causing poor chemical status of important GWBs in the Sava River Basin

Sources	Pressures causing poor chemical status	SI	HR	BA	RS	ME	Total*
Point sources	Leakages from contaminated sites	-	-	1	-	-	1
	Leakages from waste disposal sites (landfill and agricultural waste disposal)	1	1	6	-	-	8
	Leakages associated with oil industry infrastructure	-	-	-	-	-	0
	Mine water discharges	-	-	-	-	-	0
	Discharges to ground such as disposal of contaminated water to soak ways	-	-	-	-	-	0
	Other relevant point sources	-	-	-	-	-	0
Diffuse sources	Due to agricultural activities	2	1	1	2	-	6
	Due to non-sewered settlements	1	1	7	2	-	11

Sources	Pressures causing poor chemical status	SI	HR	BA	RS	ME	Total*
	Urban land use	3	1	1	1	-	6
	Other significant pressures	-	-	-	-	-	0

**Poor status can be caused by more than one type of pressure.*

Extensive agricultural activities and the lack of sewerage systems in settlements are the main diffuse sources which cause pressures on groundwater quality, mostly due to the high natural vulnerability of aquifers. Shallow GWBs with overlying strata of less than 5 meters have a low capacity to reduce the level of pollutants and are mostly *at risk* of not achieving good chemical status. The high vulnerability of some GWBs, combined with the absence of wastewater collection & treatment systems and/or the use of fertilizers, requires the application of systematic measures for improving the quality of shallow groundwater.

3.2.2 Pressures on groundwater quantity

Even though the Sava RB can be described as groundwater abundant, there are areas in all Sava countries where a decrease of the groundwater level is being recorded. However, the lowering of groundwater levels is not primarily due to over-abstraction. It is primarily related to the lowering of river levels, caused by river bed regulation, HPP construction, gravel exploitation (dredging), etc. In deep GWBs, formed in the Pliocene complex, (East Srem, RS) which have insufficient natural recharge, over-abstraction is virtually the only cause of the poor quantitative status. The extent of exploitation of the high quality water potential of the karstic aquifers is currently very low, although they provide the water supply for the majority of the population and industry.

Aquifers of intergranular porosity such as the fluvial deposits of the Sava River and downstream sections of its tributaries - Ljubljanica, Krka, Kupa, Una, Vrbas, Ukrina, Bosna and Drina are directly hydraulically linked with river courses, which are often used for water abstraction by bank filtration process. The public water supply of major cities such as Ljubljana, Zagreb and Belgrade, rely almost entirely on these water resources.

The most significant pressures on groundwater quantity are related to abstraction for drinking water purposes. In all five of the Sava countries groundwater is used as the main source of drinking water: more than 95% of drinking water is from this source in SI, 90% in HR, 89% in BA and 85% in RS. A list of significant GW abstractions in the Sava River Basin (Qann,av >50 l/s) is presented in Annex 8.

3.3 Other pressures and impacts

3.3.1 Pressures and impacts on the quantity and quality of sediments

Sediments enter river basins mainly as a result of land and channel erosion processes. Sediment balance and transport in a river is mainly determined by land use, climate, hydrology, geology, topography, morphology and hydromorphological alterations.

Sediments are a highly dynamic part of the river system and are transported through the countries of a river basin. In a river system, sedimentation processes are influenced by dams, navigation infrastructure and reservoirs. The sediments get trapped behind dams and reduce the sediment supply downstream, which, for example, takes place in the Croatian part of the basin because of the hydropower plants constructed upstream. A disturbed sediment balance leads to problems with elevated sedimentation levels in the sections with a low shear stress and also to erosion in dynamic sections below dams. Natural river hydrodynamics maintain a dynamic equilibrium, which regulates small variations in water-flow and sedimentation by re-suspension and resettlement.

The quality of sediment affects the water ecosystem. In particular, the presence of substances such as heavy metals, nutrients, pesticides and other organic micropollutants affects the attainment of a good ecological and chemical status of a river.

The implementation of the WFD requires integrated management of the 'soil-sediment-water-system' at the river-basin scale. Sediment management has direct links to the ecological status via river hydromorphology as well as via the physico-chemical quality elements. The chemical status of surface water can be affected by sediment quality.

The quality of sediments in the Sava RB has been estimated at the national and international level. The SARIB project established integrated tools based on a combination of chemical analysis and biological effect methods to assess historical trends in, and geographical distribution of, sediment contamination in the Sava River Basin. The findings of the project based on an analysis of sediments sampled at 20 locations along the Sava River indicated a moderate elevation of mercury levels in sediments (up to 0.6 mg/kg) and Cr and Ni (up to 400 and 210 mg/kg, respectively) in industrially impacted sites. However, Cr and Ni occur primarily in less soluble forms and therefore do not represent a heavy environmental burden. Contamination of Sava sediments by Pb, Zn, Cu, Cd and As was not significant. An analysis of organic pollutants indicated that the Sava River is not polluted with butyltin, phenyltin or octyltin compounds. The concentrations of PAHs increased downstream in the Sava River, while concentrations of PCBs were found to be environmentally insignificant. In general, the results indicate that the environmental status of Sava River sediments is comparable to other moderately polluted rivers in Europe.

3.3.2 Invasive alien species in the Sava River Basin

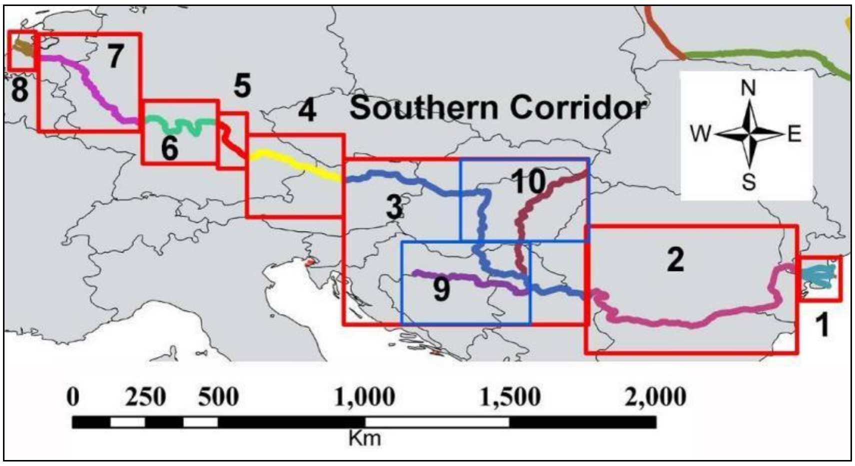
Invasive alien species (IAS) has become an emerging issue in aquatic ecosystem management. The consequences of biotic invasions are diverse and interconnected, since invaders can alter the structure and function of an ecosystem. The anthropogenic spread of plants and animals is a major threat to biodiversity. Aquatic ecosystems are no exception in this respect. The ballast water of ships, fish stocking and the introduction of aquaculture are all possible agents for the dispersal of non-indigenous species.

Given the gaps in our knowledge regarding the distribution and abundance of invasive alien species, their influence on native biota in the Sava River Basin and the current lack of measures for addressing invasive alien species in European river basin management, there is clearly a need for basin-wide action to effectively address this issue.

The Sava River has been defined as a branch of the Southern Invasive Corridor – see Assessment unit 9 in Figure 25.

The Southern corridor 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. Thus, the Sava River faces high invasive pressure.

Figure 25: Southern Invasive Corridor



Based on analyses of the available information on IAS within the Sava River Basin, the following conclusions regarding this pressure can be made:

- IAS represent a significant pressure within the region. Biological invasions are important issue that have to be properly managed.
- There is a general lack of systematised data on IAS within the region, i.e. there is no detailed list of invasive taxa, their abundance and influence on native biota and habitats.
- The available data (i.e. quantity and quality of the information) are not sufficient for proper management of IAS.
- Neither adequate regulation, nor clear institutional organization regarding invasive species is currently in place in the Sava countries.
- IAS must be properly examined in future in order to provide sufficient data for proper management of the issue, including appropriate risk assessment procedure and effective measures.

A more detailed discussion of IAS, including information sources, terminology, a preliminary list of IAS, the threats posed by non-indigenous taxa, and various systems (codes of practice) from the IAS Risk Assessment, is provided in Background Paper No. 7.

4 Protected areas and ecosystem services in the Sava River Basin

4.1 Overview of protected areas according to the WFD

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[8], sites subject to the Birds Directive 79/409/EEC and the Habitats Directive 92/43/EEC);
- Areas where measures have been implemented to protect economically significant aquatic species (PA under Directive 2006/44/EC (freshwater fish directive); Shellfish Directive 79/923/EEC);
- Bathing waters (PA under Bathing Water Directives 76/160/EEC and 2006/7/EC); and
- Nutrient sensitive areas (PA under Nitrates Directive 91/676/EEC; Urban Wastewater Treatment Directive 91/271/EEC).

Slovenia delineated all areas identified according to the WFD or other related directives. The same applies in the case of Croatia (the relevant by-law on Ecological network has been ratified - NN 109/07, while the designation of Natura 2000 sites will take place with accession of the country to the EU). In Serbia, the new by-law (Official Gazette of the RS, 102/2010) identifies the sites and regulates the issue of management and financing of the Ecological network. As applicable national legislative in non-EU countries is not fully harmonized with EU standards, a complete inventory of PA as required by the WFD cannot currently be drawn up for the basin as a whole. Therefore, a modified approach has been applied, which takes into consideration:

- National standards for the delineation of PA;
- A different status within Bern Convention implementation and NATURA 2000 network design within the countries;
- The different level of adaptation of national legislation to EU legislation and standards in non-EU countries;
- The general lack of registers and/or effective databases of PA in certain countries;
- Shared responsibility regarding maintenance and the protection of drinking water zones between national and sub-national level competent authorities;
- Shared responsibility for the monitoring of drinking water protection areas.

[8] Natura 2000 – the network of protected areas based on the Birds Directive (1979) and the Habitats Directive (1992).

The Sava RBMP PA register includes:

- A register of areas important for the protection of habitats and/or species that are protected under the relevant international conventions;
- A register of 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.

4.2 Inventory of nature conservation areas

a. Register of nature conservation areas

The following criteria have been included in the inventory of the water relevant PAs as important with regard to nature conservation within the Sava RBMP:

- Areas protected at the national, sub-national level (municipal, provincial, cantonal, etc.) and areas that are covered by specific international initiatives (Natura 2000[9], RAMSAR sites);
- The protected area should be of significance with regard to water ecosystem protection and/or the protection of water dependent habitats and/or the protection of aquatic or semi-aquatic biota, as well as the taxa that depends on the health of the aquatic ecosystem;
- Areas larger than 100 ha;
- Additional habitats/areas recommended by countries based on specific expertise – e.g. habitats <100ha which are important for the preservation of an endangered taxa or habitat type, or habitats of endemic taxa that are suspected to be endangered or that may be endangered in the near future.

The Sava RB is of specific significance due to its exceptional landscape diversity. The area is characterised by the largest complex of alluvial floodplain wetlands in the Danube basin and extensive areas are covered by lowland forests.

The Sava River has areas where the floodplains are still intact, especially in the central Sava basin. The central Sava is characterised by a mosaic of natural floodplains and cultural landscapes formed by traditional land-use patterns. The Sava River can be considered as one of the "crown jewels" of European nature and has been selected as a focal region in the Pan European Biological and Landscape Diversity Strategy (PEBLDS) of the Council of Europe.

Alluvial forests are one of the most species rich habitats in Europe. They are under the strict protection of the EU Habitats directive. They play a key role in the control of the structure and function of ecosystems along the lowland rivers in the Sava RB. Alluvial forests are one of the most valuable, but also one of the most endangered habitat types in Europe. They play a vital role in the filtration and cleaning of water and also replenish groundwater and prevent erosion. The central Sava Basin includes the largest complex of alluvial hardwood forests of oak and ash not only in Europe, but also in the Western Palaearctic.

Flood protection in most parts of the Sava RB relies on flood-protection embankments and retention fields. The basic idea of retention fields is the creation of Flood Control

[9] Natura 2000 – the network of protected areas based on the Birds Directive (1979) and the Habitats Directive (1992).

Systems capable of storing part of the floods in the natural inundation areas. It is an effective approach which contributes to the reduction of negative consequences on species and habitat biodiversity of flood control activities. In particular, the Lonjsko Polje Nature Park in Croatia serves as a natural retention area and is a good example of how to link flood control measures with the conservation of natural and cultural landscapes of national and international importance.

According to the register of areas important for biodiversity conservation (Map 12, Background paper No. 8) 176 sites were identified with total surface area of more than 17,231.24 km^2 (77 sites with total area of 515 057.79 ha in SI, 41 site with total area of 719,845.28 ha in HR, 29 sites with total area of 102,626.95[10] ha in BA, 21 site with total area of 103,448.03 ha in RS and 8 sites with total area of 282,146.41 ha in ME).

The register includes nine national parks within the Sava RB (Triglav, Plitvice, Risnjak, Sutjeska, Kozara, Una, Tara, Durmitor and Biogradska gora) with total coverage of 221,958.51[11] ha, as well as three parks of nature with total area of 90,921.00[12] ha. Besides, seven Ramsar sites[13] are situated within the Sava RB (Bardača in BA, Lonjsko polje and Crna Mlaka in HR, Peštersko polje, Obedska bara and Zasavica in RS and Cerkniško Lake in SI), with total area of 71,673.00 ha.

The list of PAs includes 121 Natura 2000 sites (total area coverage of 1,281,663.71 ha), out of which 12 sites are important for the protection of avifauna (proposed to preserve the birds species enumerated in the Birds Directive - 79/409/EEC), 91 sites are proclaimed as of the Community importance for protection of the habitat types and the species enumerated in Habitats Directive 92/43/EEC and 18 sites are important in accordance to both directives.

b. Drinking Water Protected Areas

Groundwater is the main source of drinking water in the Sava RB and an important water supply source for industry and agriculture (80-95% of water is used for this purpose). 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 Article 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).

Based on the definition of “groundwater DWPAs” used in CIS Guidance Document No. 16[14], Sava countries have identified 86 GWBs utilised for human consumption which provide more than 10 m^3/day on average or which supply more than 50 people, in addition to bodies of water intended for such future use. This register is presented in Annex 9 and in Background paper No. 8.

[10] Data not complete –information on area for Semešnica Park of Nature still missing.

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

[12] Onlya part of Park of Nature Papuk is within the Sava RB.

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

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

4.3 Main pressures on protected areas

There are a number of pressures relevant for the PAs and other areas rich in natural assets 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 fertilisers in regions with intensive agriculture can cause water pollution.

Dropping of groundwater level, mostly due to the exploitation of river bad material (sand and gravel extraction), as well as change of the water regime (e.g. preventing of periodical flooding as a consequence of embankment and damming) the structure and functioning of floodplain wetlands depend on, can threaten water dependent PAs, especially lowland forests.

Although flood protection systems have generally negative influence on PA, there are examples within Sava RB where a wise concept of such systems minimises the negative impacts on areas valuable for biodiversity conservation, such as the Park of Nature “Lonjsko Polje” in Croatia. The long-lasting tradition of adjustment to and living with and not against the floods has preserved its continuity in the contemporary flood defence system, in which the natural floodplain areas are deliberately used as areas for floodwater retention.

Quite often, pressures can be lowered or fully mitigated through wise planning and the application of the best available technologies. Identifying these opportunities is one of the tasks of the Sava River Basin Management Plan.

4.4 Water dependent ecosystem services

PAs contribute not only to the halting of the loss of biodiversity, but also to conservation, and the improvement of relevant ecosystem services. However, the Sava basin is rich in valuable water-dependent ecosystems both within and beyond the borders of the PA. The vast lowland and alluvial forests, which are characteristic for the region, are an important resource with multiple functions and economic significance: they provide valuable timber, store a significant amount of climate-relevant carbon and prevent soil erosion. However, if the groundwater level drops, these forests and their service function deteriorate. Similarly, floodplain wetlands provide a host of benefits to people as long as they enjoy a proper water regime. The retention volume of the Sava wetlands is outstanding and this lowers flood peaks when water levels are high. This function would be very costly to replace with “grey” infrastructure. These wetlands are also a source of water during droughts, which is of growing importance as a result of climate change. The Sava wetlands also purify water and while effective treatment plants are in short supply, this benefit should not be underestimated.

The economic value of ecosystem services can be included in cost-benefit analyses and in payment for ecosystem service schemes (see Chapter 8.5.3.), thereby creating incentives for their protection.

5 Monitoring networks

5.1 Surface water

5.1.1 Surface water monitoring network in the Sava River Basin

5.1.1.1 National monitoring networks

Slovenia

Slovenia is a Member State and it established its monitoring programme in line with the principles of the WFD, which are described in the national RBMP. Surveillance and operational monitoring have been implemented and cover most of the relevant quality elements and frequencies. The Environmental Agency of Slovenia is responsible for monitoring.

Croatia

In Croatia the water quality monitoring network is operated by Croatian Waters. The whole monitoring system has been revised so it is in line with the requirements of the WFD. Surveillance monitoring has been conducted since 2009 and covers most of the relevant quality elements, but operational monitoring has not yet been implemented. A complete operational monitoring network will be designated in the near future.

Bosnia and Herzegovina

The monitoring of water quality and quantity in BA-FBiH has been put in place, but it is not in compliance with the WFD. In 2009, 42 physico-chemical and four microbiological quality elements were monitored at 47 sites in the Sava RB. Two biological quality elements (phytobenthos and benthic invertebrates) were monitored at 33 sites. Physico-chemical quality elements were monitored three times per year, biological quality elements were monitored twice a year. 34 organic toxic substances (OCP, VOC, PAH, OPP, triazines and urea pesticides) were monitored at selected sites.

In the BA-Republika Srpska, surface water quality monitoring (including water level and flow, where possible) has been performed since 2000. In 2007, the surface water monitoring network was revised with the main goal of meeting WFD compliant monitoring requirements as far as possible. The monitoring network for rivers with a catchment area >1000 km^2 used the design agreed by the ICPDR (for details, see Background paper No. 1).

Serbia

Republic Hydrometeorological Service of Serbia has been running systematic monitoring of quantity and quality of both surface and groundwaters, until 2011. The surface water network encompasses 147 monitoring stations at rivers and channels in the whole territory of Serbia. The assessment started in the 1960s with approximately 55 stations and has been enlarged mainly until the 1990s to the present number. Within the last ten years there have not been major changes to the network design, except introduction of 15 additional monitoring sites at the Kolubara River Basin (interim and supplementary interim monitoring). Therefore, for the majority of stations long-term series of data are available. A set of by-laws currently under preparation will cover the water status monitoring methodology, and will provide system compliant with WFD principles.

Up to now, the structure of monitoring network does not follow the ICPDR design (SM 1, SM 2 and OM) except for the former TNMN sites. A preliminary proposal for an upgrade of monitoring stations has been prepared for the Kolubara River Basin (part of the Sava RB), as a pilot area for WFD implementation.

Since 2011, quality monitoring of surface and groundwater is under responsibility of Serbian Environmental Protection Agency.

Montenegro

Surface water quality monitoring in Montenegro does not comply with the requirements of the WFD. It is operated by the Hydrometeorological institute of Montenegro in Podgorica. Parameters and frequencies are focused mostly on the protection of the drinking water abstraction areas.

5.1.1.2 Danube TNMN

The provisions of the DRPC include the need for cooperation with regard to monitoring and assessment, which is accomplished via the Trans-National Monitoring Network (TNMN) in the Danube River Basin. The TNMN has been in operation since 1996, but the first steps were taken ten years earlier under the Bucharest Declaration, when a monitoring programme was established including 11 trans-boundary cross sections on the Danube River.

The TNMN laboratories are free to select their own analytical method, providing they are able to demonstrate that the method meets the required performance criteria. Therefore, the minimum concentrations expected and the tolerance required for actual measurements have been defined for each parameter so that method compliance can be checked. To ensure the quality of collected data, a basin-wide analytical quality control (AQC) programme is regularly organized by the ICPDR.

During the first ten years of its operation, the TNMN network comprised over 75 water quality monitoring stations and more than 50 chemical, biological and microbiological parameters were recorded. Ten years of TNMN operation provided an excellent overview of water quality in the Danube River Basin. It provided decision-makers with the data to make the correct policy and investment decisions to improve water quality.

Implementation of the WFD after 2000 required the revision of the TNMN in the Danube River Basin District. In line with the WFD implementation timeline, a revised TNMN has been under operation since 2007 (for a map and a detailed description of the network see Background paper No. 1).

5.1.1.3 Overview of monitoring sites and monitoring variables

An overview of monitoring sites and of methods and sampling frequencies used for surveillance monitoring 1 and 2 and for operational monitoring in the Sava River Basin is included in Background paper No. 1 and Map 13.

5.1.1.4 Comparability of monitoring results

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

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

To ensure the quality of TNMN data, an interlaboratory comparison exercise has been organized every year since 1992. At present, the National Reference Laboratories and other national laboratories taking part in the monitoring activities of the TNMN participate in the QualcoDanube proficiency testing organized by VITUKI in Hungary. As part of these testing, all monitored determinands are covered by three quarterly test sample distributions. The fourth distribution is dedicated to those determinants which showed more than 30% flagged results.

More details on the activities designed to ensure the comparability of monitoring results are given in Background paper No. 1.

5.2 Groundwater

5.2.1 Overview of groundwater monitoring networks in the Sava River Basin

The GWBs status assessment (in some cases risk assessment) was based on the results of established groundwater monitoring programmes. In general, these programmes are based on already existing national monitoring programmes which, in most cases (BA, HR, RS) are still being adapted to meet WFD requirements.

In order to comply with WFD requirements, *Slovenia* established quantitative and chemical (surveillance and operational) monitoring programmes in 2006. The monitoring network is comprised of different types of stations: drinking water wells, individual wells, automatic monitoring stations, springs etc. For karstic and fissured GWBs, the monitoring of surface water flow (discharge) is used. The density of the monitoring network is adjusted to the hydrogeological homogeneity of aquifers and to anthropogenic pressures.

In *Croatia* groundwater monitoring in the Sava River Basin is conducted at around 270 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.

Bosnia and Herzegovina has lacked systematic GW monitoring since the early 1990's, except for groundwater sources used for the drinking water supply, which are monitored and controlled by the water supply companies and institutions responsible for public health. In 2005, systematic monitoring of groundwater in the northern part of BA was established in three municipalities (Bijeljina, Šamac and Modriča), using 33 sampling sites.

Serbia only has GW monitoring of major alluvial aquifers. Water quality is monitored at water supply abstraction points and groundwater is occasionally tested as 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 River Basin is performed at several levels: at the national level (network of Hydrometeorological Service of Serbia; HMSS), 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).

No information on groundwater monitoring in *Montenegro* was available.

The number of groundwater monitoring stations on GWBs of basin-wide importance is presented in Table 27. The density of the groundwater monitoring network (area of GWB divided by the number of monitoring stations) is given in order to show differences in the development of monitoring networks between countries. Lower values for monitoring density (expressed in km^2/station) in general indicate better spatial coverage of GWBs by the monitoring network and monitoring sites for sampling and the possibility for a more reliable status assessment.

The parameters and frequency of the chemical surveillance and quantitative monitoring programmes are listed in Background paper No. 2.

Table 27: Number of monitoring stations and range of density of stations in the Sava River Basin

Country	No. of monitoring stations		Range of density of GW monitoring network (km^2/station)	
	Quantitative monitoring	Chemical surveillance monitoring	Quantitative monitoring	Chemical surveillance monitoring
SI	73	70	6-654	14-479
HR	630*	379*	3-472	4-1299
BA	NA	NA	NA	NA
RS	71*	38*	20-532	109-1594
ME	NA	NA	NA	NA

**Number of monitoring stations in RS and HR includes both state monitoring stations (programmes) and other monitoring stations (such as drinking water wells and springs).*

Monitoring results concerning the chemical and quantitative status of GWBs in large parts of the Sava River Basin are very limited or absent. This poses the main obstacle for a confident groundwater status assessment in a large number of GWBs. An analysis of existing groundwater monitoring networks, WFD requirements and a proposal for a WFD compliant groundwater monitoring programme is presented in Background Document No. 2.

6 Water status

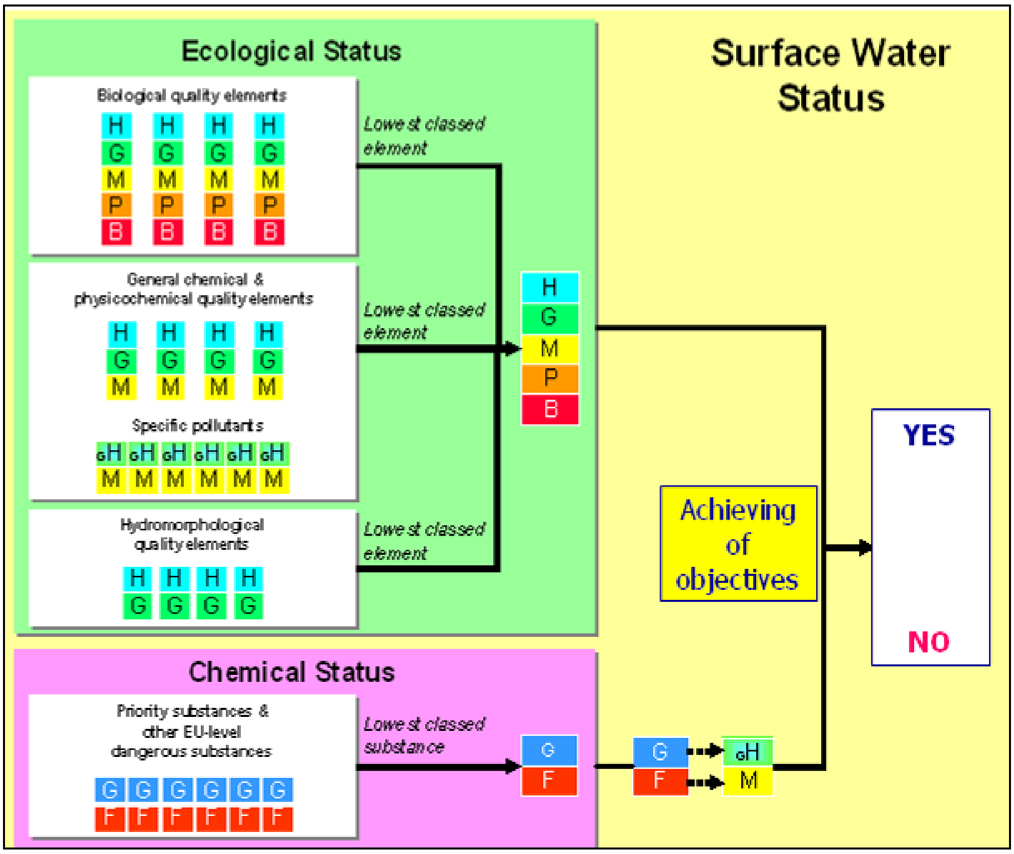
6.1 Surface water ecological/chemical status

6.1.1 Surface waters - ecological status/ecological potential and chemical status definition and methods

The WFD stipulates that good ecological and chemical status must be achieved for all surface water bodies. For those water bodies identified as heavily modified or artificial, good ecological potential and chemical status must be achieved. Monitoring networks must be put in place to validate the pressure analysis (SRBA Report, 2009) and to provide an overview of impacts on water status in order to initiate measures.

Surface water status is the general expression of the status of a body of surface water as determined by the worst of its ecological and chemical parameters. Good surface water status means that the ecological status is at least ”good” and its chemical status is “good”.

Figure 26: Scheme of ecological and chemical status assessment



- H High status
- G Good status
- M Moderate status
- P Poor status
- B Bad status
- F Failing to achieve good status

Ecological status is an expression of the quality of the structure and functioning of an aquatic ecosystem. Good ecological status is the status of a surface water body classified

in accordance with Annex V of the WFD. Good ecological potential is the status of a heavily modified or artificial body of water.
Ecological status classification must include the following basic principles: a type specific classification; stressor specific elements, a comparison with the reference conditions, which meets normative WFD definitions.

The baseline for the assessment of chemical status is the list of priority substances and certain other pollutants and the environmental quality standards for these substances stated in Directive 2008/105/EC. Good chemical status requires that these standards are not exceeded. A classification of ecological and chemical status has been made based on the scheme given in Figure 26.

6.1.2 Confidence in the status assessment system

Methods for the assessment of ecological status vary between different countries in the Sava River Basin. To ensure the comparability of results of the methods for the assessment of ecological status (comparability of water status class boundaries: high/good, good/moderate) an EU-wide intercalibration exercise is organized. In the Sava River Basin the intercalibration exercise is performed by the work of the Eastern Continental Geographical Intercalibration Group (EC GIG), in which Slovenia and Croatia have to date taken part. In the future, it will be necessary for all Sava countries to intercalibrate to ensure full comparability of their classification systems.

Since at present the intercalibration exercise is not participated in by all Sava countries, full comparability and a high level of confidence in the ecological water status assessment results cannot be ensured throughout the entire area of the Eastern Continental region of the Sava River Basin.

With regard to the above mentioned situation and with regard to the monitoring data available as well as the level of the development of ecological status assessment methods in the different Sava RB countries, a method for defining a level of confidence in ecological status assessments and in chemical status assessments has been proposed. This method is described in Background paper No. 1.

6.1.3 Ecological status/potential and chemical status

The ecological status of 183 water bodies (of a total of 189) in the Sava River and its tributaries has been assessed. A high ecological status has been attained by 10 water bodies. A good ecological status was assessed for 65 water bodies. The majority of water bodies (70) had moderate status. Poor status was found at 17 WBs, while no water bodies had a bad status (see Table 2 in Annex 3 and Map 15). Ecological potential was assessed at 20 HMWB/candidates on the Sava, Vrbas, Bosut, Drina, Lim and Kolubara rivers. In 17 WBs, a good ecological potential was identified and in three WBs a moderate ecological potential was identified. Figure 27 shows the extent of river for the individual ecological status classes. Table 28 presents the assessment of the ecological status of the Sava River and its tributaries. National assessments of the status of surface water bodies in the Sava River Basin are given in Background paper No. 1. With the exception of Slovenia, the status assessments do not fully comply with WFD requirements.

Table 28: Assessment of ecological status for the Sava River and its tributaries

	Sava River		Tributaries	
	No. of WBs	Length (km)	No. of WBs	Length (km)
High status	0	0	10	232,78
Good status	5	81.21	60	1,661.84
Moderate status	15	562.50	55	1,648.91
Poor status	5	295.73	12	392.36
Bad status	0	0	0	0
No data	0	0	5	99.63

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

It should be mentioned that the results of the assessment of ecological status and ecological potential had low and medium confidence. Assessments of high ecological status with low confidence comprised 93.75% and with medium confidence 6.25%; good ecological status (medium confidence – 20.29%, low confidence – 79.71%); moderate ecological status (medium confidence – 31.25%, low confidence – 68.85%) and poor ecological status (medium confidence – 10.53%, low confidence – 89.47%).

The most frequently measured biological quality element used for an ecological status assessment was benthic invertebrates. It was used to classify ecological status in the majority of the evaluated water bodies. Among the pollutants most frequently measured were non-synthetic compounds (arsenic, copper, zinc and chromium). The national environmental quality standards for specific pollutants were exceeded in several water bodies (Sotla, Sava, and Spreča rivers).

176 water bodies had good chemical status and 26 water bodies did not have good chemical status. 13 water bodies were not assessed. Table 29 shows the number of water bodies and the length of water bodies which did or did not have good chemical status. The chemical status of SWBs is shown in Table 2 of Annex 3 and in Map 16.

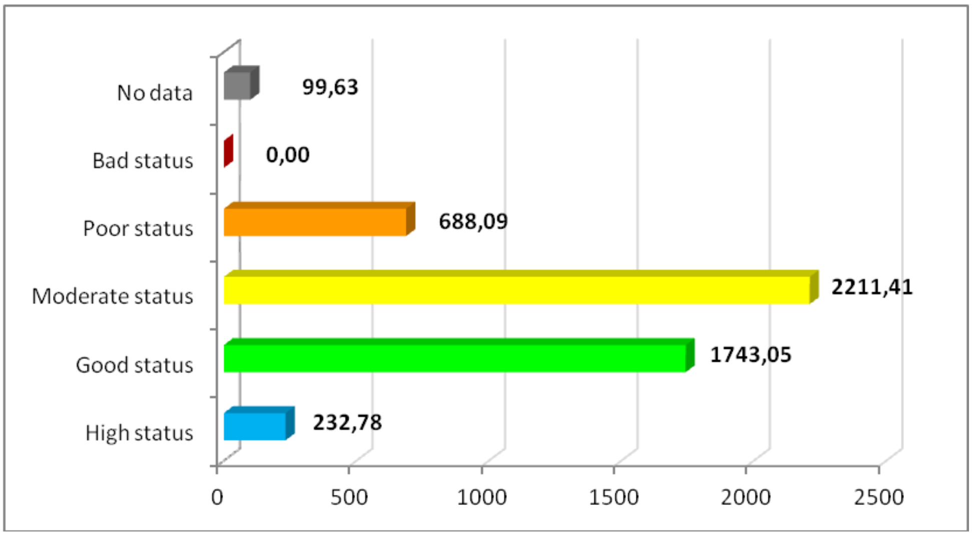
The confidence level for the assessment of water bodies in good chemical status was generally low (low – 63%, middle – 29%, high – 8%). The confidence level for the assessment of water bodies which did not have good chemical status was higher (high – 6.67%, middle – 26.67%, low – 66.67%).

In the majority of water bodies with good chemical status, the assessment was done using risk analysis (low confidence). Failure to attain good chemical status was due to the detection of tributhyltin, endrin, isodrin and endosulphane (Sava River); mercury (Krka River); and nickel and cadmium (Kolubara River).

Table 29: Assessment of chemical status for the Sava River and its tributaries

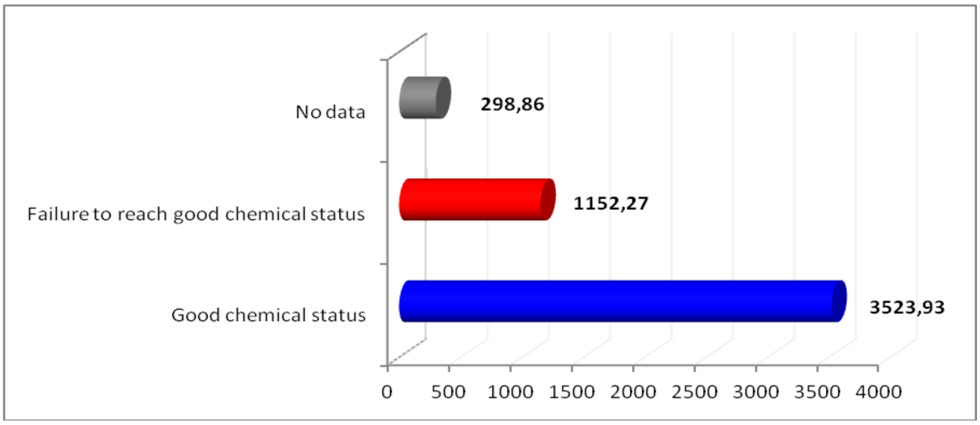
	Sava River		Tributaries	
	No. of WBs	Length (km)	No. of WBs	Length (km)
Good chemical status	20	683.60	108	2,840.33
Failure to attain good chemical status	5	255.84	21	896,43
No data	0	0	13	298.86

Figure 27: Length (km) of the individual ecological status classes in the Sava River and its tributaries



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

Figure 28: Assessment of chemical status in water bodies of the Sava River and its tributaries (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 harmonisation of trans-boundary water bodies (lengths of all delineated WBs counted where different lengths of WBs on trans-boundary stretches were reported by the neighbouring countries).

6.1.4 Gaps and uncertainties

During the assessment of the ecological status, WFD compliant methods for the analysis of biological quality elements had to be applied for the first time for a number of water bodies in the Sava RB. Great effort was needed to apply the new sampling methods for all biological quality elements, to establish appropriate classification systems and to put these new methods into practice at the national level in the EU Member States. In most of the Sava RB countries, this process is still under development. Sava RB countries have not yet managed to use all the biological quality elements required by the WFD for ecological status assessment. The key missing data were those for macrophytes and/or phytobenthos as well as for fish.

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. In general, the reasons for low and medium confidence regarding the ecological status assessment were:

- Lack of the monitoring data;
- Not all biological methods, which were applied for assessment of the individual quality elements were WFD compliant;
- Biological quality elements were not fully supported by additional parameters (physico-chemical and hydromorphological) in the national classification schemes for ecological status assessment;
- Methods for assessment of ecological potential are not developed in all Sava RB countries;
- Relevant river basin specific pollutants not identified in all countries;
- Monitoring schemes in the individual countries are not fully WFD-compliant (e.g. not monitored at required frequencies).

These results indicate that achieving a fully coherent and WFD compliant ecological status assessment in the Sava RB requires additional time. As a consequence, there are shortcomings related to the final designation of HMWBs. The final HMWB designation still needs validation based on high confidence assessment results regarding the ecological status.

Chemical status assessment of the surface water bodies is based on results of monitoring in combination with estimation of the risk of failure good status achieving. The reasons for low and medium confidence were:

- General lack of monitoring data;
- Monitoring schemes in the individual countries are not fully WFD-compliant (not all WFD PS has been monitored in all countries; not at required frequencies);
- The methodologies for analysis of WFD PS and assessment of chemical status not fully compliant with the QA/QC Directive (2009/90/EC) and 2008/105/EC Directive.

6.2 Groundwater

6.2.1 Status assessment approach and confidence in the status assessment

The definitions of good chemical status and good quantitative status for groundwater are given in the WFD. For chemical status, the compliance regime is based on quality objectives (compliance with relevant standards, no saline intrusion) that must be achieved by the end of 2015. Management Plans should focus on actual risks identified by an analysis of pressures and impacts in accordance with Article 5 of the WFD. The 2006 Groundwater Directive requires Member States to establish their own groundwater quality standards and threshold values, taking into account identified risks and the list of pollutants/indicators given in Annex II of the GWD. Established threshold values are to be published in the WFD River Basin Management Plans and provide a summary of the information set out in Part C of Annex II of the Directive.

In the Sava RB, the process of establishing status (or risk) assessment methodologies is currently in different phases in different countries, depending on the level of WFD implementation in each country. The principles set down in CIS Guidance Document No. 18 "Guidance on groundwater status and trend assessment" have been followed, often adapted to specific conditions at the country level (assessment methods, monitoring programmes, data availability).

Slovenia has adopted laws and supporting documents for groundwater status assessment, transposing the requirements of Groundwater Directive (2006/118/EC, GWD). Quality standards have been established for nitrates and active substances in pesticides (biocides), as well for a certain number of man-made synthetic substances. In *Croatia*, in line with WFD and GWD requirements, the results of national groundwater quality monitoring were used for establishing «reference indicator values». For each identified groundwater body, an analysis of the loads and impacts of human activity on groundwater was conducted using a CORINE Land Cover Map and assessing the agriculture impacts. In *Bosnia and Herzegovina,* no defined methodology for status/risk assessment exists. The status assessment was done using the available data from waterworks and comparing them with the national drinking water standards. *Serbia* has not yet established a groundwater monitoring programme according to WFD requirements and only a risk assessment is available. The chemical risk assessment was analyzed by combining the type of land use and the natural protection of the groundwater bodies. *Montenegro* has not established a methodology for groundwater status/risk assessment, so the assessment of the risk of not achieving environmental objectives for groundwater is based on expert knowledge. A more detailed description of the methodologies applied and the established threshold values can be found in Background paper No. 2.

6.2.2 Groundwater chemical status

The results of chemical status (or risk) assessment of GWBs uses four categories: two status categories "good" and "poor" and two risk categories "at risk" (or "possibly at risk") and "not at risk". A GWB is classified as having poor status or being "at risk" if criteria for good chemical status are not met after applying nationally adopted status assessment methodologies. In the event of insufficient data, GWBs have been classified as being "possibly at risk" until more detailed information is available. The results of chemical status and risk assessment for the GWBs in the Sava RB are presented in Table 30.

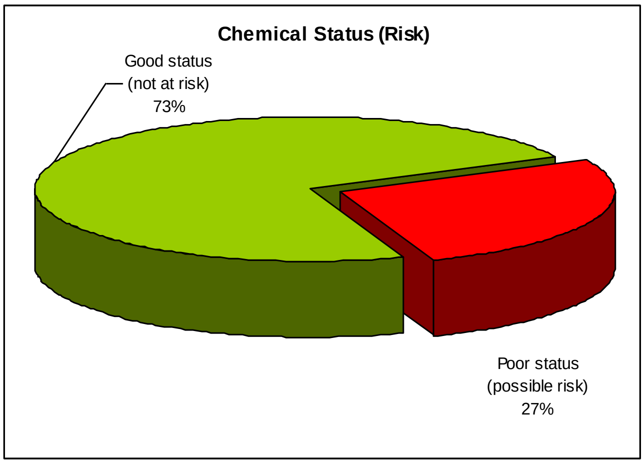
Table 30: Results of chemical status and risk assessment for the GWBs in the Sava River Basin

GW bodies		SI		HR		BA		RS		ME		Total Sava RB
		Nat.	Tran.	Nat.	Tran.	Nat..	Tran.	Nat.	Tran.	Nat.	Tran.	
Chemical status (risk)	Not at risk	-	-	4	5	-	-	2	1	-	4	16
	Good status	2	8	1	3	-	-	-	-	-	-	14
	At risk (or possibly at risk)	-	-	-	1	6	1	2	-	-	-	10
	Poor status	1	-	-	-	-	-	-	-	-	-	1

The results of status (risk) assessment concerning the chemical status of groundwater show that 11 GWBs (or almost 30%) are possibly "at risk" or have a poor status and 30 GWBs have in good status (or are not "at risk"; Figure 29:, Annex 4 and Map 17).

Where no status information was available due to a lack of information (HR, BA, RS and ME), information based on a risk assessment is included. To achieve a harmonized description of the status of GWBs, it was necessary to include the results of a risk assessment as a status assessment with a low confidence level. The confidence level is given as high, medium or low, reflecting the confidence and precision of the results provided by the chemical monitoring programmes.

Figure 29: Percentage of important GWBs with good/poor chemical status in the Sava RB



6.2.3 Groundwater quantitative status

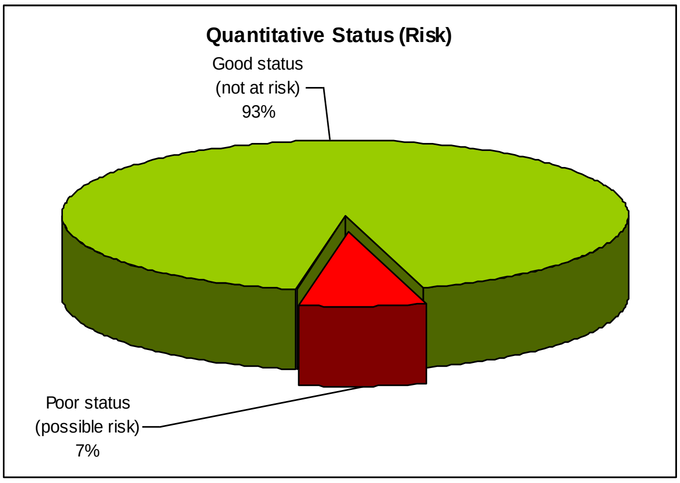
As for the chemical status assessment, the results of the quantitative status (or risk) assessment is presented using four categories: two status categories "good" and "poor", and two risk categories "at risk" (or "possibly at risk") and "not at risk". A GWB is classified as having poor status or being "at risk" if criteria for good quantitative status are not met after applying the nationally adopted status assessment methodologies. In the event of insufficient data, GWBs are classified as "possibly at risk" until more detailed information is available. Based on the quantitative status (or risk) assessment, only 3 GWBs are possibly "at risk", i.e. do not have good quantitative status, 38 GWBs have good status or are not "at risk" (Table 31; Figure 30; Annex 4 and Map 18).

Table 31: Results of quantitative status and risk assessment for GWBs in the Sava RB

GW bodies		SI		HR		BA		RS		ME		Total Sava RB
		Nat.	Tran.	Nat.	Tran.	Nat.	Tran.	Nat.	Tran.	Nat.	Tran.	
Quantitative status (risk)	Not at risk	-	-	3	5	6	1	2	1	-	4	22
	Good status	3	8	2	3	-	-	-	-	-	-	16
	At risk (or possibly at risk)	-	-	-	1	-	-	2	-	-	-	3
	Poor status	-	-	-	-	-	-	-	-	-	-	0

If no information on status information was available (HR, RS, BA and ME), a risk assessment was used to present the status of GWBs. As for the chemical status assessment, the results of a risk assessment for quantity were presented as a status assessment with a low confidence level. The confidence level is presented as high, medium or low, reflecting the confidence and precision of the results attained by the quantitative monitoring programmes. The results of the quantitative status assessment of important GWBs in the Sava River Basin are presented in Figure 30 and Map 18.

Figure 30: Percentage of important GWBs in good/poor quantitative status in the Sava RB



6.2.4 Gaps and uncertainties (including proposal for monitoring programmes)

The monitoring results used for the assessment of the chemical and quantitative status of GWBs in some parts of the Sava RB are limited or not available. This fact highlights the need for the adaptation of the existing monitoring programmes to meet the WFD requirements set out in Art. 8. More information on proposed measures is provided in Background paper No. 2.

Another important issue is the bilateral coordination of trans-boundary groundwater bodies and the need for cross-border harmonization. Joint conceptual models for all of the trans-boundary GWBs (as a whole) need to be developed in order to better understand the groundwater system and better manage the shared resource. Joint management of shared GW resources via the establishment of joint monitoring programmes and data exchange for TB GWBs characterized as “at risk” or in poor status should be included in future bilateral agreements. Bilateral agreements should also cover TB GWBs intended for future water supply in order to prevent any impairment of GW quality and quantity.

7 Environmental objectives and exemptions

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

The WFD requires that Member States implement the necessary measures to prevent the deterioration of the status of all bodies of surface water and that the following environmental objectives are achieved by 2015:

- Good ecological/chemical status of surface water bodies;
- Good ecological potential and chemical status of HMWBs and AWBs;
- Good chemical/quantitative status of groundwater bodies.

The Sava RBMP provides an overview of the status assessment results for surface water bodies and groundwater bodies for the entire Sava RB as well as risk assessment classifications where data is not available and/or WFD compliant methods are not applied. 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 and groundwater bodies (see text below and Background paper No. 5). These provide guidance for Sava countries with regard to attaining agreed goals of basin-wide importance and also assist with the achievement of the overall WFD environmental objectives. The visions are based on common values and describe the principle objectives for the Sava RB. The respective management objectives describe the first steps towards the environmental objectives in the Sava River Basin 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 implementation success of a measure 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 (Slovenia) and an Accession state (Croatia), these measures are to be implemented according to the commitments and deadlines set down in the accession treaties with the EU. More specifically, the deadline for implementation of Directive 91/271/EC (organic pollution) is 2017 for Slovenia and 2023 for Croatia.

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 needs 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 River Basin 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 River Basin;
- 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 River Basin 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 Articles 4(4), 4(5) and 4(7)

Exemptions are given for SI and HR according to their national RBMPs. Other Sava RB countries (BA, RS and ME) have non-EU or non-accession status and therefore currently have no legal obligation to report exemptions.

7.2.1 Slovenia

Exemptions from environmental objectives may be applied in the following two situations:

1. Failure to achieve good status of SWBs, good ecological status or good ecological potential, or the deterioration of surface water or groundwater is permitted with regard to the consequences of new modifications of physical characteristics or alterations to the status of SWBs. The conditions are prescribed in detail in the National Directive related to the preparation of the Water Management Plans (Official Gazette 26/06, 5/09).

2. The deterioration of a SWB from very good to good status is permitted if it arises as a consequence of new sustainable human development activities and fulfils the conditions prescribed by the National Directive related to the preparation of the Water Management Plans (Official Gazette 26/06, 5/09).

Water body interventions were discussed as a modification of physical characteristics which affect the status of water bodies and for which the national spatial plan is adopted or is in the process of adoption and which will apply to the implementation of interventions in the period covered by the Water Management Plan. Other planned interventions are included in the final scenario. Before the start of the new planning period a decision will be made (i) as to whether the newly-designed interventions are transforming the physical characteristics of the water body or not and (ii) on whether to activate the process of obtaining permits for land use. With regard to the above, six exemptions from the environmental objectives, as a result of new modifications of physical characteristics of SWB have been identified (Table 32).

Table 32: Exemptions according to WFD Articles 4(4), 4(5) and 4(7) for water bodies in Slovenia

		Exemptions according to WFD		
River	WB code	Article 4(4)	Article 4(5)	Article 4(7)
SAVA	SI111VT7	X		
SAVA	SI1VT713	X		
SAVA	SI1VT739			X
SAVA	SI1VT913			X
SAVA	SI1VT930			X
Sotla	SI192VT1	X		

Reasons for determination of the Article 4(7) exemption on the three listed water bodies are HPP Blanca (already in operation), HPP Krško (under construction), HPP Brežice and HPP Mokrice (both planned), as defined in the national RBMP.

Measures and conditions to mitigate adverse impacts on the status of water bodies were defined at the national level and are taken into account at the concessions of HPPs Krško, Brežice and Mokrice (see also Chapter 3.1.4.6 dealing with FIPs).

A reason for the new modification is public interest, namely to ensure the security of electrical energy in SI. Electricity production in SI is currently insufficient. The share of electricity increased from 1992 to 2007 by an average annual rate of 2.8%. Recently, electricity consumption has been increasing faster than production. Due to this increase, it is necessary to provide additional energy resources. The planned hydropower production facilities on the lower Sava will allow the use of a renewable and affordable energy source, thereby providing an increase in the autonomy, reliability and competitiveness of the Slovenian electricity system and this is therefore of national importance.

Additional benefits will include a reduction of erosion processes, an improvement of overall flood protection by the construction of flood-prevention infrastructure, creation of opportunities for waterway usage, increase in safety and operation of existing thermal and nuclear energy facilities and promotion of tourism and recreation.

Additional sources of energy must be provided in order to reduce dependence on energy imports to SI. Pursuant to the requirements of the Directive 2001/77/EC on the promotion of electrical RES in the internal electricity market, and to the accession treaty of SI to the EU and to the Resolution on the National Energy Programme (subsequently referred to as “Official Gazette 57/04; in ReNEP”), it is important that new resources for the production of renewable electricity are established.

The aim, which is designed to present new modifications, is to increase annual electricity production by 296 GWh in accordance with the above requirements. Other renewable energy sources may need to be utilised to attain this goal. A possible alternative is the reduction of electricity consumption.

Hydropower has been chosen as the best option, as it is the most important renewable energy source for electricity production in SI. The Slovenian economy has a long track record in the design, construction and operation of hydroelectric plants. As noted in a study on the definition of the basis of national potential for negotiations with the European Commission on achieving national targets by 2007 published by the Centre for Diversified Energy Sources at the University of Ljubljana, only full-size hydroelectric renewable sources of electricity can compete in the market without financial incentives (wind energy can only complete in the selected wind fields). The price of energy produced by hydroelectric power plants compared to other renewable energy sources is relatively low and can even compete with modern thermal-energy installations. A considerable contribution by hydropower is also foreseen in the Green Paper on the Slovenian National Energy Plan and is considered to be one of the most economical ways of achieving targets on renewable energy sources.

7.2.2 Croatia

All exemptions from the environmental objectives applied in the first RBM Plan are temporally classified as Article 4(4) exemptions, i.e. extension of the deadline to achieve good status. There are two sets of reasons to justify these exemptions:

1. Transitional reasons – for WBs assessed to achieve good status by implementation of basic measures scheduled after the year 2015, in line with the transitional periods which HR has been granted through the negotiating process (e.g. for the UWWTD until the year 2023). Essentially, it is a question of limited capacities (first of all financial ones), recognized by the European Commission, which hinder compliance with the previous EU legislation in a shorter time period.
2. Technical reasons - for WBs assessed to need further supplementary measures to provide appropriate improvement of the water status. Technical infeasibility is justified by both limited time for preparation of the Programme of Measures (it takes longer to fix some problems than there was time available), as well as gaps in data and knowledge (there was no sufficient and/or reliable information on the real status and risks, on the cause of some problems, effectiveness of basic measures, costs and effects of different supplementary measures at disposal for solving some problems; hence appropriate solutions could not be identified). A final selection of supplementary measures, accompanied by an application for permanent exemptions in terms of Article 4(5) – less stringent objectives, Article 4(7) – new modification, as well as Article 4(3) - final designation of HMWB, is postponed for the second planning cycle. In the meantime, an extensive data collection and knowledge improvement has been undertaken to fill the gaps.

8 Economic analysis of water uses

8.1 WFD economics

The WFD requires that river basins in Europe are considered not only in hydrological, but also in economic terms. Economic principles are addressed in WFD Article 5 (and Annex III) and Article 9. A preliminary economic analysis of water use in the Sava River Basin and a projection of water demand up to 2015 were carried out in 2009.

Article 9 requires that by 2010 EU Member States take account of the principle of cost-recovery, including environmental and resource costs. The polluter pays principle is the key to establishing who should pay for existing and future water services. More specifically, Member States have to ensure by 2010 that water pricing policies provide adequate incentives to water users to use water efficiently and to ensure that different water uses contribute adequately to the recovery of the costs of water services.

The WFD does not specifically address international river basin management plans in this regard, but it is recognised that an improvement of basin-wide cost recovery of water services is also an essential tool for the protection and efficient use of water resources in the Sava RB and that countries apply this principle within their territory. A co-ordinated approach within a river basin is a central element of the WFD. The success of the Directive depends on the willingness to co-operate beyond regional and national boundaries including the implementation of the cost recovery and polluter pays principle.

8.2 Results of economic analysis in the Sava River Basin Analysis Report 2009

The main purpose of the 2009 SRBA Report was to identify the major water uses in the Sava River Basin. A rough estimate of the water use of the countries has been made based on the data supplied by countries. The 2009 Analysis Report did not include Montenegro. The level of confidence for the data was relatively low due to problems with data gathering in most of the countries in the Sava River Basin for various reasons. The 2009 SRBA Report stated that water use could not be considered as a significant water management issue.

On the basis of existing national plans for future water demand up to 2015, an analysis was prepared for all important water uses in the Sava River Basin. The confidence level in such an analysis is low due to the rapidly changing political and economic conditions. Furthermore, some of the countries were unable to perform such an analysis only for the Sava River Basin.

The available data led to the conclusion that an increase of water use is probable, particularly for irrigation, but this will depend on the general economic situation in the region.

8.3 Description of water uses and economic importance

Two aspects of the economic characteristics of the Sava River Basin are considered below: a description of the economic importance of water use and an outline of the general socio-economic situation in the basin.

8.3.1 Current water uses

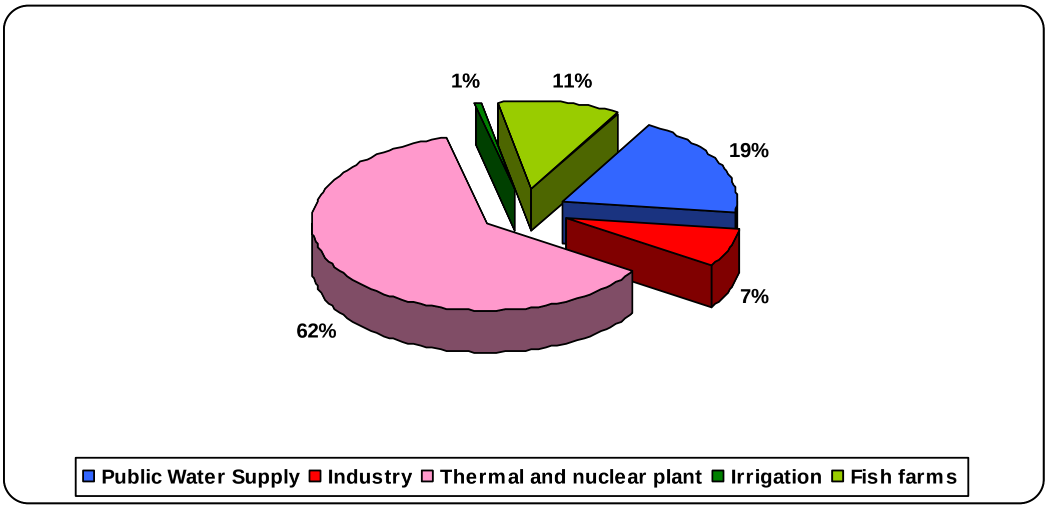
The data on water uses within the Sava RB was further refined by repeating the data collection. As in 2005 the countries reported the following major water uses:

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

The total water use in the Sava RB is 4.1 billion m^3 and approximately two-thirds of this is used by thermal and nuclear power plants (2.5 billion m^3; 62%). The public drinking water supply uses 760 million m^3 (19%). The agricultural water use, including irrigation, amounts to 600 million m^3 (12%). Water used for irrigation in the Sava countries has the lowest share of 30 million m^3 (0.70%) annually. Industrial water use is less than 300 million m^3 (7%).

A percentage breakdown of major water uses is presented in Figure 31 below. Detailed information is outlined in Annex 10, Table 1.

Figure 31: Major water uses in the Sava RB – 2005 (excluding hydropower)

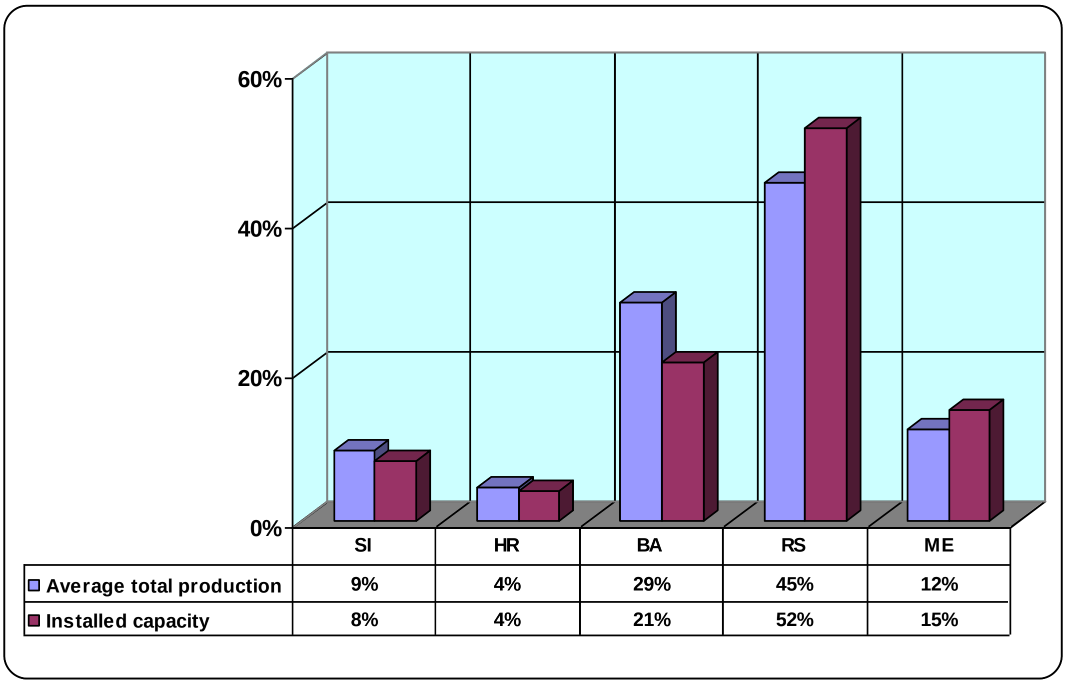


The average per capita water use in Sava RB, calculated from the public water supply, is 238 l/person/day. It varies from 140 l/person/day to 328 l/person/day. Public water use includes drinking water for households, industrial and institutional water use, as well as internal use and losses of the service provider.

Another important water use in the Sava RB is by hydropower plants. The capacity of the 18 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 32 below. Detailed information is outlined in Annex 10, Table 2.

Figure 32: Percentage breakdown of installed capacity and energy production of hydropower plants >10 MW in the Sava RB countries – 2005



In conclusion, it can be stated that in 2005 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.

8.3.2 Economic analysis

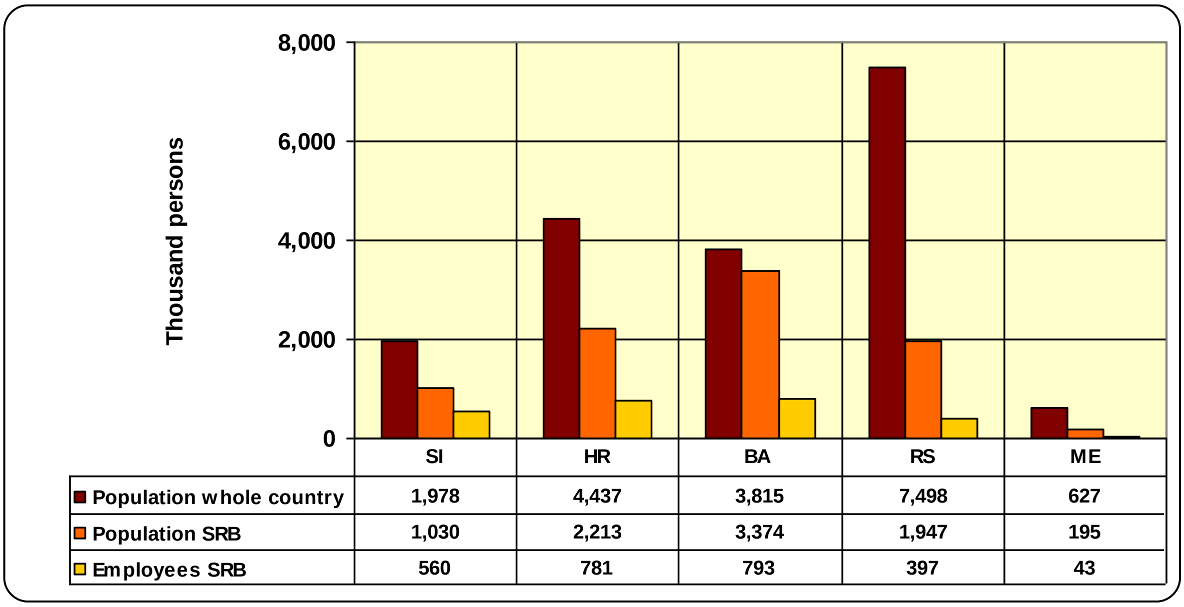
The general socio-economic situation in the Sava River Basin can be characterised by the following data:

- number of inhabitants in the countries and the parts of the Sava River Basin;
- GDP per capita in the region;
- employment situation;
- Gross Domestic Product;
- Gross Value Added.

The significance of the river basin to individual countries can be gauged by the share of the population which is resident there. The population of the five countries of the region is over 18 million and half of this number resides in the Sava River Basin. In Bosnia and Herzegovina 88% 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.
The unemployment rate does not show great divergence within each of the countries. The average employment rate in the river basin is relatively low (29%); the 2005 EU27

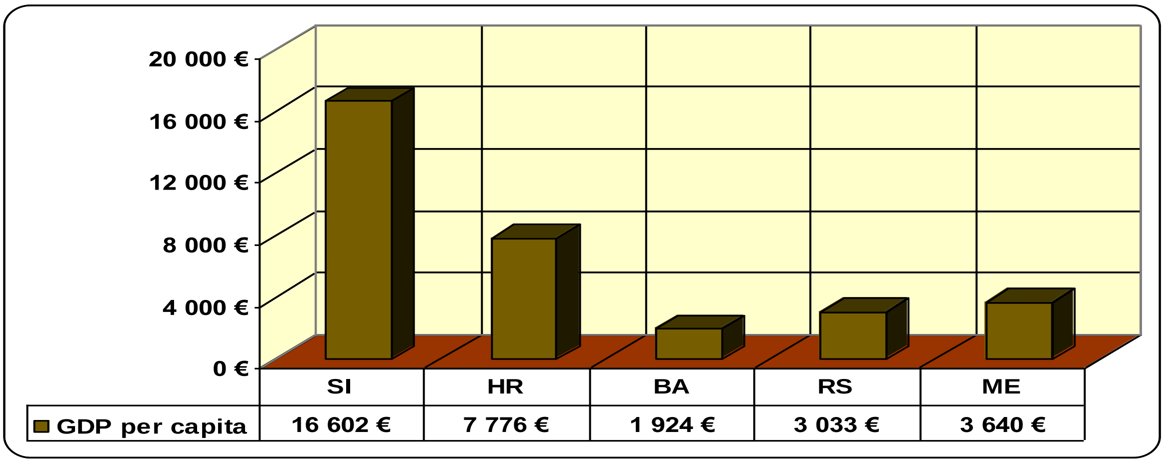
employment rate was 64%[15]). The highest figure was in Slovenia (47%) and below average figures were recorded in Bosnia and Herzegovina, Montenegro and Serbia (20-24%). The distribution of inhabitants is presented below in Figure 33. Detailed information is given in Annex 10, Table 3.

Figure 33: Population of the countries, their Sava RB part and employees – in 2005



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 eightfold, and the difference between the highest and second highest indicator (Slovenia and Croatia) is twofold. 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. 5,413 €/person. Economic conditions have not changed significantly since 2005, when the data was collected. GDP per capita is presented graphically below in Figure 34. Detailed information is given in Annex 10, Table 4.

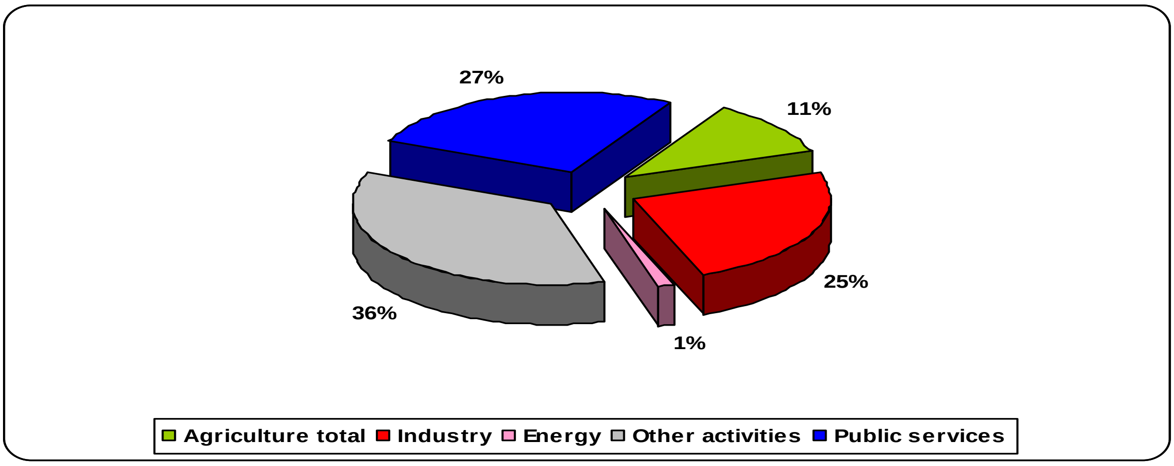
Figure 34: GDP per capita in the countries of the Sava RB - 2005



[15] EUROSTAT information

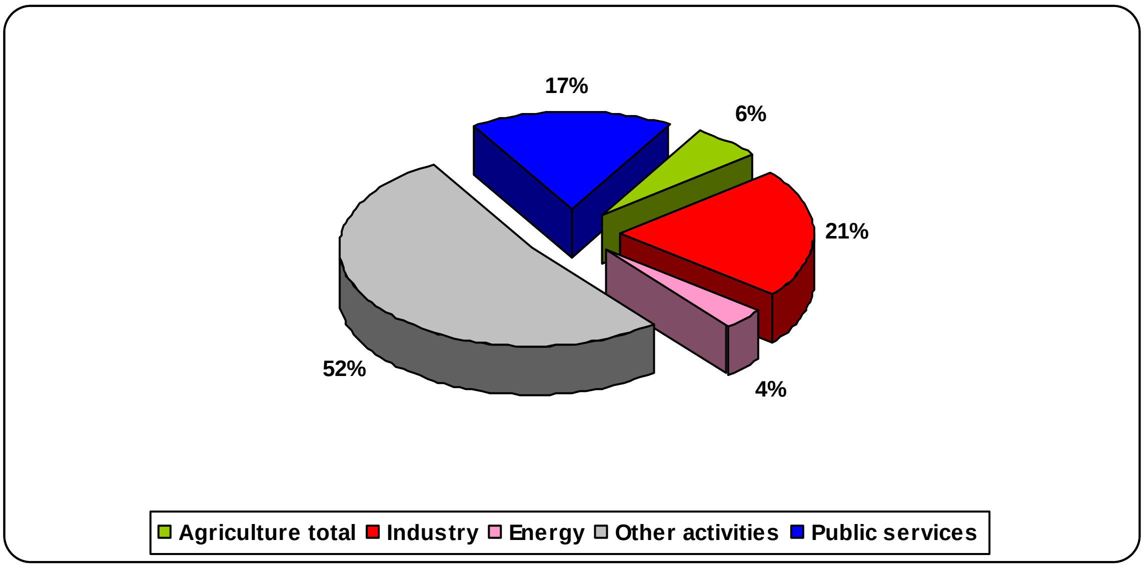
A distribution of employees between economic sectors is given in Figure 35 below. In the Sava River Basin 2.6 million persons are employed. The largest employer is the service sector (other activities), followed by the public sector and industry; nearly 90% of all employees work in these sectors. 11% are employed in agriculture and the energy sector provides work for 1% of the total workforce. Detailed information is presented in Annex 10, Table 5.

Figure 35: Distribution of employees between economic sectors in the Sava RB – 2005



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 40% and the agriculture and energy sector create 10% of total GVA in the Sava River Basin. The distribution of the GVA by sectors is shown in Figure 36 below. Details of GVA by countries and economic sectors are outlined in Annex 10, Table 6.

Figure 36: Gross Value Added by sectors in the Sava RB - 2005



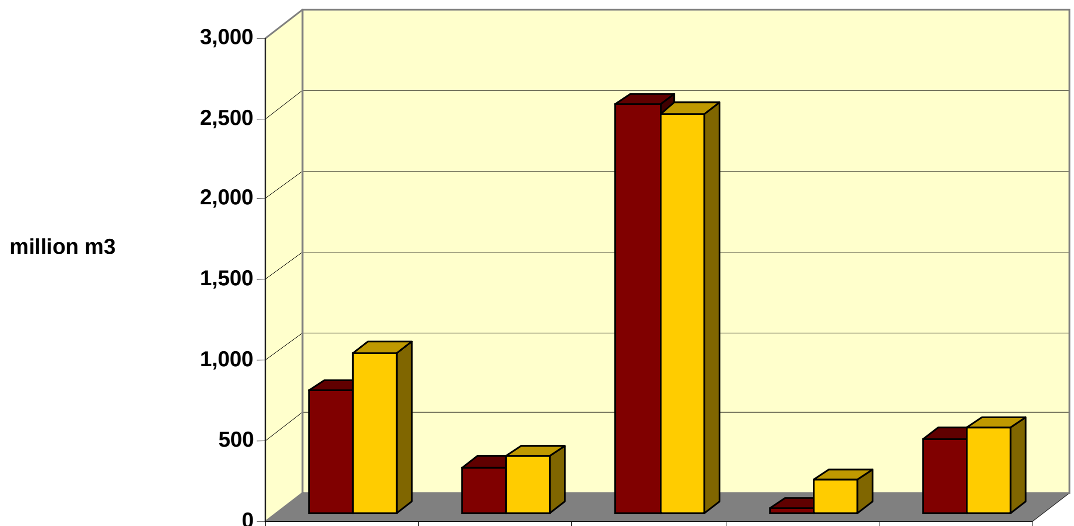
In conclusion, it can be stated that the Sava River Basin is an important socio-economic location for all the countries and half of the population of the five countries lives here. The divergence in GDP per capita is large, there is an eightfold difference between the highest and lowest GDPs. Careful coordination of the planned measures is therefore required. Low GDP per capita figures means a low household income in Serbia, Bosnia and Herzegovina, and Montenegro, which will necessitate a cautious analysis of tariff affordability before implementing the cost recovery principle to water services in the short term. The cost recovery level in different economic sectors will be investigated.

8.4 Projection of water use up to 2015

The projection of water demand up to 2015 has the same structure as the analysis of existing water uses. The water demand projection is calculated based on different national methodologies.

The trends are presented by economic sectors and by country. The overall volume of water use is not expected to change considerably by 2015 in the Sava RB (approximately 12% overall growth is planned). The total water demand is expected to reach 4.6 billion m^3. Higher demand is predicted in all sectors in 2015 than for 2005. The distribution of water use by economic sector in 2005 and the projected water demand in 2015 is presented in Figure 37 below.

Figure 37: Water demand by economic sector – 2005 - 2015 (excluding hydropower)



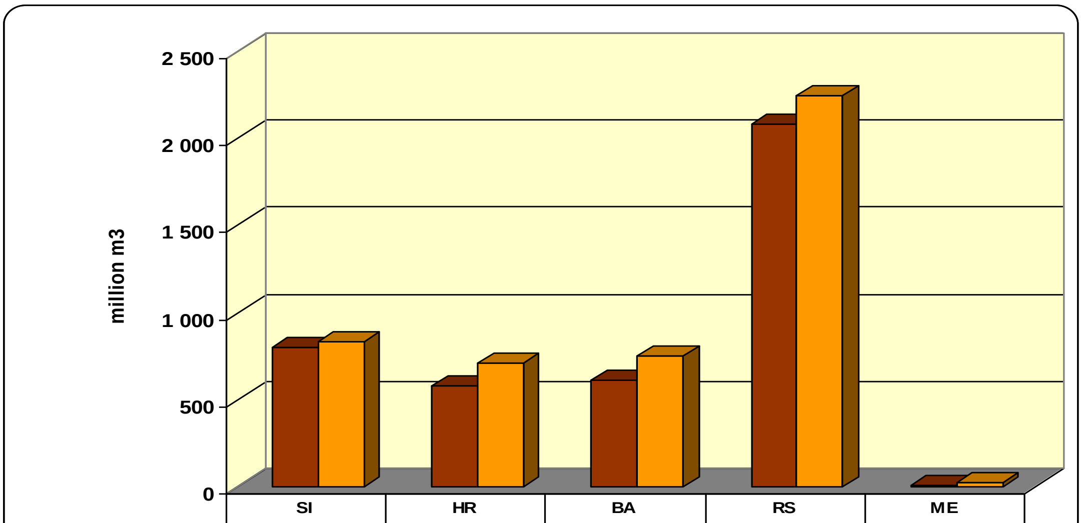
	Public Water Supply	Industry	Thermal and nuclear plant	Irrigation	Fish farms
Total water demand 2005	760	288	2,532	30	459
Total water demand 2015	994	354	2,472	208	530

The share of individual sectors of total water use is projected to change slightly: a growing proportion of use by the public water supply, industry and irrigation are expected. Detailed information is presented in Annex 10, Table 7.

Total water use and water demand by country are presented in Figure 38.

A minor increase of 5-8% is predicted in Serbia and Slovenia, in Bosnia and Herzegovina and Croatia moderate growth of 22% is expected, while in Montenegro a 4-fold increase in water demand compared to the reference year is predicted.

Figure 38: Water demand by country 2005 – 2015 (without hydropower)

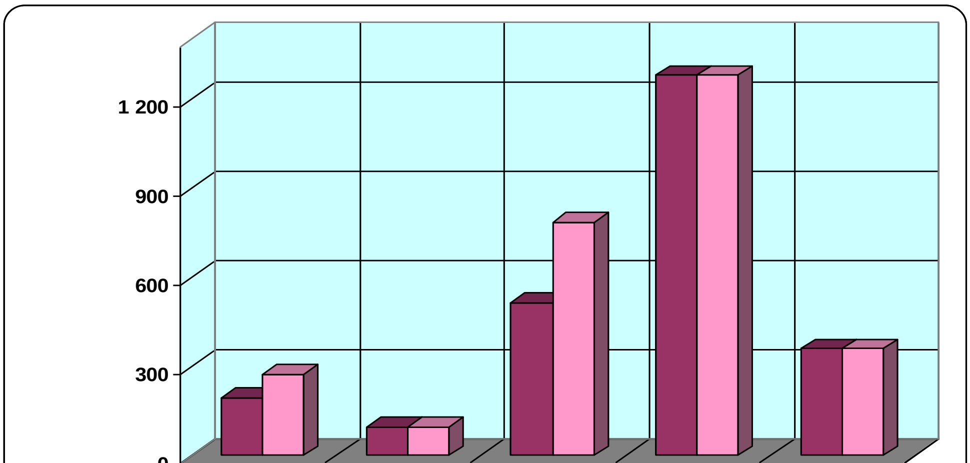


	SI	HR	BA	RS	ME
Water use 2005	795	580	612	2 077	5
Water demand 2015	833	710	747	2 244	22

An increase in water use by hydropower plants is projected due to planned new capacity. The overall predicted increase of installed capacity in the Sava RB is 14%, from 2,449 MW to 2,800 MW, while the annual energy production is predicted to grow by 19%, from 6,445 GWh to 7,700 GWh per annum. A considerable number of hydropower plants less than 10 MW are predicted in Montenegro and Bosnia & Herzegovina which will increase the capacity and energy production data given above.

The hydropower capacity in the countries will change unevenly by 2015, as displayed in Figure 39 below. Serbia and Croatia do not plan any change in hydropower capacity by 2015. The largest relative capacity increase is expected in Slovenia, and Bosnia and Herzegovina. The highest physical capacity increase is planned by Bosnia and Herzegovina, almost 300 MW.

Figure 39: Capacity of hydropower plants >10 MW by country 2005 – 2015 (MW)



	SI	HR	BA	RS	ME
Capacity 2005	195	98	515	1 281	360
Capacity 2015	275	98	786	1 281	360

In conclusion, it can be expected that water use in the Sava RB will not change significantly by 2015. The energy sector, i.e. thermal, nuclear and hydropower, is predicted to still be the most important water use in the Sava River Basin.

8.5 Economic control tools

The WFD calls for accounting related to the recovery of costs of water services and information on who pays, how much and what for. Cost recovery for specific water services is defined as the ratio between the subsidy-free revenues paid for a specific service and the costs of providing the service. The issue of cost recovery is primarily an issue of national importance. Case studies for the countries are presented in Background paper No. 6.

8.5.1 Cost recovery in the Sava River Basin countries

The assessment of cost recovery focuses mainly on water supply as well as sewerage services for households and industry. Costs include operation and maintenance costs, management costs, depreciation, interest, taxes and fees, and for some countries environmental and resources costs. Environmental and resource costs are not taken directly into account in most countries in the economic analysis, due to a lack of methodology and information. Revenues comprise fee income from customers minus subsidies. The best performance is when the current operation and maintenance costs are covered, but the recovery of depreciation is not achieved. Indicators are recorded in case studies on the cost recovery level of water services of 63 to 78 per cent for non-EU member states and a higher level is recorded for SI and HR.

No information is available on cost recovery of self-supply for industrial and agriculture sectors.

8.5.2 Incentive pricing policies in the Sava River Basin 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 of the countries payment discipline has to be improved.

8.5.3 Towards cost recovery and incentive pricing

Moving to an incentive pricing policy is a common intention in all countries in the Sava RB.

Incentive pricing policy for the whole Sava River Basin will:

- stimulates the rational use of water resources;
- permit the recovery of environmental costs, thus preventing the deterioration of water resources from a quantitative and qualitative point of view.

Important elements of incentive pricing policies are:

- Distinction between users is made with regard to pollution, not with regard to the economic sector – the Polluter Pays Principle is applied.
- Cross-subsidies are reduced.

- Technical improvement of water infrastructure is a pre-condition for sustainable water services.
- Recovery of environmental costs is aimed at if the appropriate methodology and information are available.
- Reliable and comprehensive database is crucial for assessment of cost-recovery level.
- Payment for Ecosystem Services (PES) schemes.

PES schemes can provide finance mechanisms for the protection and enhancement of water related ecosystem services such as carbon sequestration, landscape beauty and biodiversity conservation. For PES schemes to be implemented effectively, it is important to create mechanisms for valuing (or at least measuring) services that are currently not valued by markets. A sustainably operating fish pond owner, for example, might contribute to nutrient retention, carbon sequestration and protection of rare birds but society is not rewarding this production of “public goods”. In order for PES schemes to be successful, the following steps are necessary: identify how additional amounts of these services can be provided in a more cost-effective way; decide which land managers (e.g. farmers, aquaculture operator) to compensate for providing more of these services, and determine how much to pay them.

9 Programme of Measures (PoM)

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 basin-wide importance. It is based on the national programmes of measures (which in Slovenia, as an EU MS, will be made operational by December 2012). However, the specific situation in the accession and non-EU countries must be taken into account. The PoM includes the ”basic” measures to be implemented in order to achieve the objectives defined for 2015 by the management plan in accordance with Community and/or national laws. Where necessary, ”supplementary” measures are proposed. Supplementary measures are those measures designed and implemented in addition to the basic measures, with the aim of achieving the environmental objectives.

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 SWMIs agreed for the Sava River Basin.

The Programme of Measures represents more than a list of national measures, as the effect of national measures from the basin-wide perspective must be estimated. The implementation of measures of basin-wide importance is ensured by their integration into the national programme of measures of each Sava country. A continuous feedback mechanism from the international to the national level and vice versa will be crucial for the achievement of the environmental objectives in the Sava River Basin.

9.1 Surface water

An achievement of the environmental objectives according to the WFD 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 in order to achieve good water status.

9.1.1 Organic pollution

Organic pollution can cause significant changes in the oxygen balance of surface water. As a consequence, it can impact the composition of aquatic species/populations and therefore also the water status. Organic pollution is mainly caused by the emission of partially treated or untreated wastewater from agglomerations, industry and agriculture.

Many agglomerations in the Sava River Basin have no, or insufficient, wastewater treatment and are therefore key contributors of organic pollution. Direct and indirect discharges of industrial wastewaters are also important. 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).

9.1.1.1 Organic pollution - measures

The management objectives (Chapter 7.1.1) will be achieved by the implementation of the following basic measures:

- Implementation of the Urban Waste Water Treatment Directive (91/271/EEC);
- Implementation of the Sewage Sludge Directive (86/278/EEC) and the Directive on industrial emissions - IPPC (2010/75/EC);
- Increase of the efficiency and level of treatment when necessary.

In the EU MS (Slovenia) and an Accession state (Croatia), these measures will be implemented according to the commitments and deadlines set down in the accession treaties with the EU. The implementation deadline for Directive 91/271/EC is 2017 for Slovenia and 2023 for Croatia. In non-EU countries, the basic measures are to be implemented within a timeframe which is realistic and acceptable by all these countries.

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

- Specification of number of wastewater collecting systems (connected to respective WWTPs) which are planned to be constructed by 2015;
- Specification of number of municipal and industrial wastewater treatment plants which are planned to be constructed by 2015 including;
    - Specification of treatment level (secondary or tertiary treatment);
    - Specification of emission reduction targets.

9.1.1.2 PoM approach to management objectives

Data for the PoM has been collected in combination with pressure information. Details on significant pollution sources identification and data collection and evaluation can be found in Background paper No. 3. The PoM considers and addresses pollution pressures from agglomerations, industries and agriculture as identified in Chapter 3.

A scenario approach has been used to estimate the effectiveness of specific measures regarding the reduction of organic pollution on a basin-wide scale. The scenario approach is relevant for both organic and nutrient pollution when point sources are addressed.

The scenario approach initially describes the status in 2007 regarding wastewater treatment in the Sava RB (Reference Situation) and its potential future development (three scenarios) using different assumptions.

The Reference Situation in 2007 is analysed in Chapter 3 and provides an overview of the current situation regarding wastewater treatment and treatment efficiency in the Sava RB (see Map 5). The analysis shows that the situation regarding pollution control within the Sava RB is not satisfactory and one of the serious challenges is wastewater disposal.

The scenarios were based on the following assumptions:

- The priority for the 1st planning cycle (2015) is to agree on lists of agglomerations with wastewater infrastructure in the Sava RB (Baseline scenario – scenario I));

- Priorities for the next scenarios:
  - Midterm scenario (scenario II) – wastewater collection and treatment in agglomerations >10,000 PE;
  - Vision scenario (scenario III) - wastewater collection and treatment in agglomerations >2,000 PE;
    - The UWWTPs capacity will be constructed for the entire generated pollution load;
    - The entire pollution load will be collected by a sewerage collecting system in agglomerations with UWWTP.

National master plans for the construction of wastewater infrastructure will take into consideration a more precise scale of prioritisation of UWWTP construction (construction of UWWTP in agglomerations with collecting systems already in place is of higher priority for surface water protection than in agglomerations without waste water collection). Such an approach is also preferable from the financial point of view.

According to the Danube RBMP, the entire Danube RB is considered as a sensitive area under Article 5(5) of the UWWTD in order to protect the Black Sea environment against eutrophication. This implies that discharges from UWWTPs situated in the Danube catchment area (for EU countries), including the Sava RB, need to apply a more stringent treatment for urban wastewater from agglomerations >10,000 PE. As an alternative approach, these provisions do not apply to individual plants if it can be shown that the minimum percentage of reduction of the overall load in that area is at least 75% for total P and 75% for total N.

9.1.1.2.1 Baseline scenario - first cycle of the WFD implementation (up to 2015)

This scenario describes the agreed measures for the first cycle of WFD implementation on the Sava RB scale up to 2015 (see Map 19). Measures that are legally required for the EU MS and other measures that can realistically be implemented by the non-EU MS have been taken into account. The following assumptions for measures to be implemented by 2015 were considered:

- EU MS (SI) and accession country (HR): Implementation of results of negotiations with the EC by 2015 by realization of wastewater collection and treatment systems in national operational programmes for implementation of the UWWTD;
- Non-EU MS (BA, RS, ME): Implementation of national strategies – taking into consideration reported number of wastewater treatment plants with secondary or more stringent treatment to be constructed by 2015.

The number of agglomerations for which WWTPs will be constructed or reconstructed by 2015 is summarised in Table 33:. According to this scenario, 65 UWWTPs will be constructed or upgraded.

Table 33: Number of agglomerations for which collection systems and/or UWWTPs will be constructed or reconstructed by 2015

Country	SI	HR	BA	RS	ME	Sava RB - total
No. of agglomerations	37	14	4	2	1	58

As shown in Table 34 urban wastewater from agglomerations above 2,000 PE will be treated in 120 agglomerations, of which 110 will have biological treatment (55 with secondary and 55 with more stringent treatment including N and P nutrient removal process).

Table 34: Number of agglomerations and level of urban wastewater treatment after implementation of planned measures by 2015

Country	No. of agglomerations > 2,000 PE with:				
	UWWTPs I	UWWTPs II	UWWTPs III	UWWTP - total	Without UWWTP
SI	1	35	39	75	14
HR	6	8	12	26	78
BA	1	7	1	9	239
RS	2	4	2	8	100
ME	0	1	1	2	5
Sava RB total	**10**	**55**	**55**	**120**	**436**

519,480 new PE will be connected to sewer collection systems and by implementation of these measures the connection rate in agglomerations >2000 PE in the Sava RB will increase for 4,366,919 PE from 56.4% (ref. year 2007) to 64.1%. Collection systems and/or UWWTPs will be constructed or reconstructed in 58 agglomerations. UWWTPs will deal with a pollution load of 3,005,360 PE in 2015 (see Table 35). Secondary and tertiary (advanced removal of nutrients – N & P) biological treatment and/or chemical precipitation of phosphorus will be used in the new UWWTPs. During the RBMP period, the capacity of UWWTPs will increase by 947,616 PE and wastewater treatment will improve from 30.2% to 44 % in terms of generated pollution load.

Table 35: Pollution load collected by sewerage systems and treated in UWWTPs after implementation of planned measures by 2015

Size of agglomerations, PE	Collected load, PE	Collected & treated load, PE	UWWTP-I PE	UWWTP-II PE	UWWTP-III PE
>2,000 -10,000	542,722	226,332	12,087	150,040	64,147
>10,000 – 100,000	1,819,577	963,018	86,691	219,679	656,648
>100,000	2,004,620	1,816,010	0	1,579,962	236,048
>2,000 - total	**4,366,919**	3,005,360	98,778	1,949,681	956,843

Organic emissions from urban wastewater will decrease during the RBMP period in terms of BOD_5 and COD by approx. 28.6 kt/a (26.4%) and 56.6 kt/a (25.6%) respectively (Figure 46).

9.1.1.2.2 Midterm scenario – urban wastewater collection and treatment in agglomerations >10,000 PE

This scenario has no deadline and it is based on the requirements of the UWWTD for N and P removal in agglomerations >10,000 PE in order to achieve the management objectives. This measure would clearly be a major step towards achieving the goal, as agglomerations >10,000 PE generate approximately 75% of the total pollution load.

Scenario II plans an upgrade of seven UWWTPs equipped with primary treatment, an upgrade or construction of 17 UWWTPs with secondary treatment and construction of 91 new UWWTPs with tertiary treatment in the Sava RB. Table 36 and Map 20 summarizes the number of urban wastewater treatment plants per country after implementation of these measures.

Table 36: Situation in UWWT in the Sava countries after implementation of the Scenario II

Country	No. of agglomerations > 2,000 PE with				
	UWWTPs I	UWWTPs II	UWWTPs III	UWWTP - total	Without UWWTP
SI	1	27	47	75	14
HR	2	4	24	30	74
BA	0	7	49	56	192
RS	2	2	15	19	89
ME	0	1	4	5	2
Sava RB - total	**5**	**41**	**139**	**185**	**371**

The realisation of this scenario in the Sava RB will increase the connection rate to the public sewerage system from 64.10% (planned for 2015) to 82.80% (1,281,083 new PE) and will reach 5,648,003 PE in agglomerations >2,000 PE. The capacity of UWWTPs will increase in this period by 2,254,981 PE. Wastewater treatment will improve from 44% to 78% (in terms of the generated pollution load). As is shown in Table 37, the connection rate in agglomerations > 10,000 PE is planned to be more than 85% (4,967,819 PE), with the assumption that all the collected load will be treated. A tertiary treatment processes will be applied for 90.7% of the treated load.

If necessary this scenario can be divided into sub-scenarios according to national priorities and available capital funds.

Table 37: Pollution load collected by sewerage systems and treated in UWWTPs after implementation of the planned measures of the Scenario II

Size of agglomerations, PE	Collected load, PE	Collected & treated load, PE	UWWTP-I	UWWTP-II	UWWTP-III
>2,000 - 10,000	580,183	272,960	12,087	142,832	117,984
>10,001 – 100,000	2,612,618	2,597,219	0	34,993	2,562,226
>100,000	2,455,202	2,455,202	0	400,000	2,055,202
>10,000 total	5,067,820	5,052,421	0	434,993	4,617,428
>2,000 total	5,648,002	5,325,381	12,087	577,825	4,735,412

Emissions of organic pollutions from urban wastewater as measured by BOD_5 and COD will decrease after the implementation of the measures planned by the Midterm scenario by approx. 36 kt/a (45%) and 59 kt/a (36%) respectively (Figure 42).

9.1.1.2.3 Vision scenario - urban wastewater collection and treatment in agglomerations >2,000 PE

This scenario is based on the assumption that the full technical potential of wastewater treatment with regard to the removal of organic effluent and nutrients is exploited for all Sava countries.

If such a scenario is to be realised, it is assumed that agglomerations >10,000 PE are equipped with N and P removal (secondary/tertiary wastewater treatment) and all agglomerations >2,000 PE to 10,000 PE are equipped with secondary treatment (see Map 21).

This will require the upgrade of five UWWTPs with primary treatment and the construction of 373 UWWTPs with secondary treatment. Table 38 and Map 21 summarize the number of urban wastewater treatment plants in the Sava RB after implementation of these measures.

Table 38: Situation in UWWT in the Sava RB countries after implementation of Scenario III

Country	No. of agglomerations >2,000 PE with				
	UWWTPs I	UWWTPs II	UWWTPs III	UWWTP - total	no UWWTP
SI	0	42	47	89	0
HR	0	74	30	104	0
BA	0	196	52	248	0
RS	0	93	15	108	0
ME	0	3	4	7	0
Sava RB - total	**0**	**408**	**148**	**556**	**0**

The implementation of the measures of this scenario in the Sava RB will provide collection and treatment of all urban wastewater in agglomerations >2,000 PE. The capacity of UWWTPs will increase to 6,807,340 PE. Wastewater treatment will improve from 76.60% to 100% (in terms of the generated pollution load). As is shown in Table 39: , the connection rate in agglomerations >2,000 PE is planned to reach 99.99% (6,807,340 PE) under the assumption that all the collected load will be treated. Tertiary treatment processes will be applied for 76% of the treated pollution load.

Table 39: Pollution load collected by sewerage systems and treated in UWWTPs after implementation of the planned measures of the Scenario III

Size of agglomerations, PE	Collected load, PE	Collected & treated load, PE	UWWTP-I	UWWTP-II	UWWTP-III
>2,000 -10,000	1,701,167	1,701,167	0	1,582,959	118,208
>10,001 – 100,000	2,655,221	2,655,221	0	0	2,655,221
>100,000	2,455,202	2,455,202	0	0	2,455,202
>2,000 - total	6,811,590	6,811,590	0	1,582,959	5,228,631

During this period, UWWTPs with secondary biological processes will be constructed in agglomerations smaller than 10,000 PE. Emissions of organic pollutions from urban wastewater will decrease after the implementation of measures planned within the scenario III in terms of BOD_5 and COD by approx. 26.6 kt/a (61%) and 53.6 kt/a (51%) respectively (Figure 42).

If necessary this scenario can be phased into other sub-scenarios according to the national priorities of the Sava RB countries and available capital funds.

9.1.1.3 Summary of measures of basin-wide importance

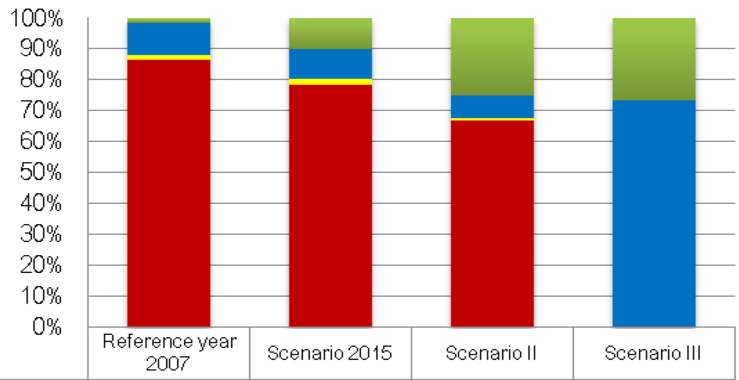
The implementation of the UWWTD in the EU MS and the development of wastewater infrastructure in the non-EU countries are the most important measures to reduce the organic pollution in the Sava RB by 2015 and beyond.

At present, extensive improvements to urban wastewater treatment are being implemented throughout the basin. For full implementation of the UWWTD in the Sava RB for the EU MS, facilities for areas of >10,000 PE must be subject to more stringent treatment since the Danube RB discharges into a sensitive area. Alternatively, requirements for individual plants need not apply to sensitive areas if the minimum percentage of overall load reduction entering all UWWTPs in that area is at least 75% for total P and at least 75% for total N. The overall application of nutrient removal technologies is expanding, particularly in response to the UWWTD in the new EU MS. It is recommended that the investments in wastewater collection and treatment in Non EU countries should also consider nutrient removal technologies during an upgrade or construction of new UWWTPs. This approach is essential to prevent the discharge of excessive amounts of nutrient pollution when an increase in wastewater flow occurs as a result of more communities being connected to sewerage collection systems.

There are approx. 556 agglomerations >2,000 PE in the Sava RB, which generate a load of more than 6.8 million PE. Of these seven are agglomerations >100,000 PE and 116 agglomerations are >10,000 PE, which produce approx. 36% and 75% respectively of the total wastewater load.

Figure 40 and Figure 41 provide an overview of scenarios for the development of urban wastewater collection and treatment in the Sava RB in agglomerations >2,000 PE. They indicate the changes in wastewater disposal which could be achieved by the implementation of the proposed scenarios. The construction of infrastructure in 480 agglomerations and the upgrade of UWWTPs in approx. 60 agglomerations will allow for full collection and appropriate treatment of wastewaters produced by agglomerations >2,000 PE.

Figure 40: Development of urban wastewater treatment in agglomerations above 2,000 PE in the Sava RB



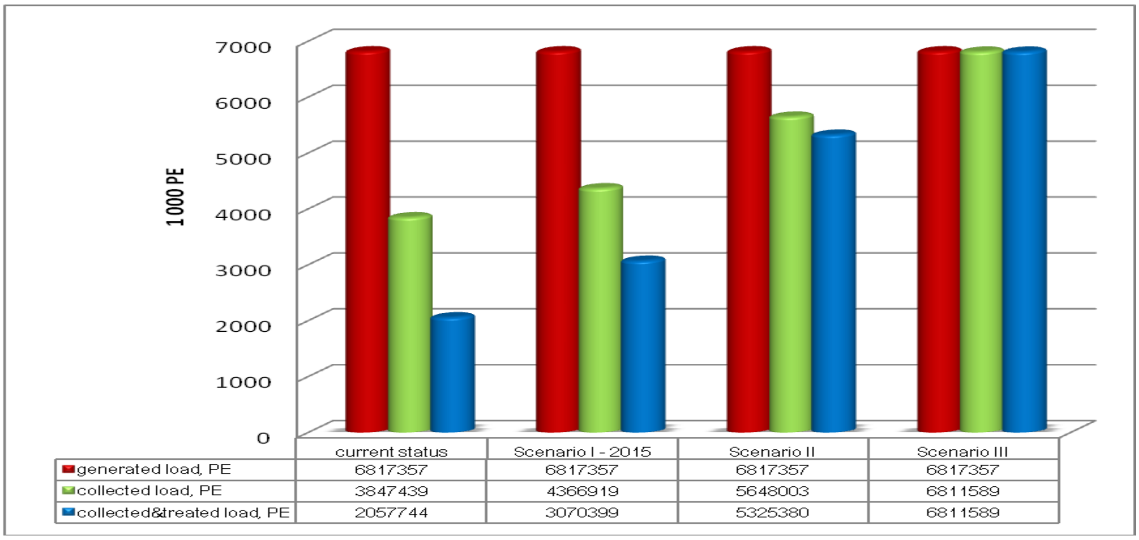
	Reference year 2007	Scenario 2015	Scenario II	Scenario III
No of agglomerations with UWWTPs -III	9	55	139	148
No of agglomerations with UWWTPs -II	57	55	41	408
No of agglomerations with UWWTPs -I	10	10	5	0
No of agglomerations with no UWWT	480	436	371	0

76 agglomerations >2,000 PE in the Sava RB are reported to be served by wastewater treatment plants (Map 5: Urban Wastewater Discharges - Reference year 2007). For the reference year 2007, wastewater treatment plants served a total of 27 agglomerations >10,000 PE. However, 329 agglomerations >2,000 PE with sewerage collecting systems still lack wastewater treatment plants (for parts or for the entire volume of the collected wastewater). 227 agglomerations >2,000 PE are not equipped with sewerage collecting systems and there is no wastewater treatment for the entire generated load.

By 2015, 120 agglomerations will have wastewater treatment plants. As a consequence, not all emissions of untreated wastewater from agglomerations with >10,000 PE will be phased out (Map 19: Urban WastewaterDischarges- Baseline scenario (2015)).

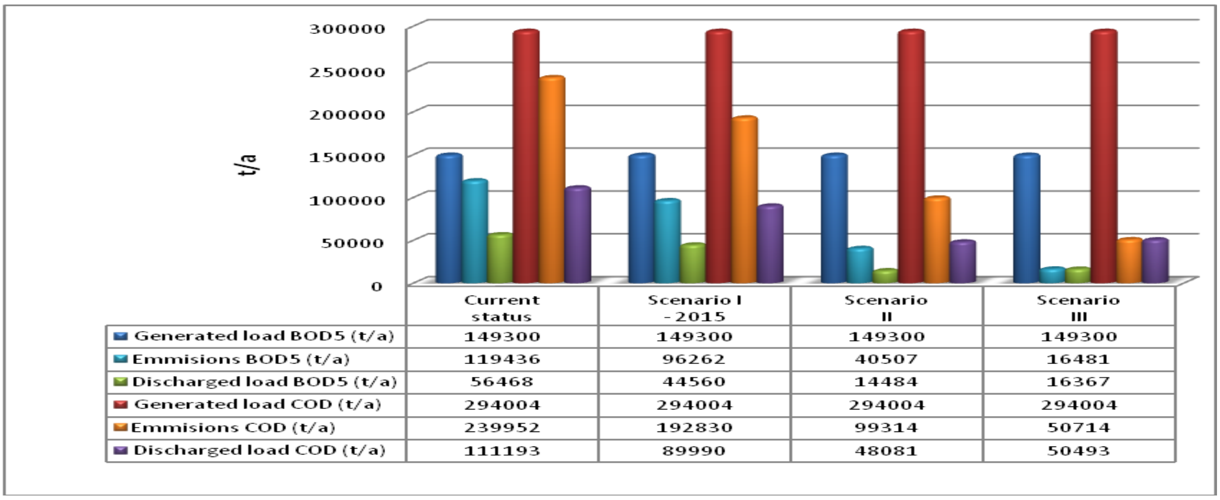
In order to avoid any deterioration of the current situation, the construction of collecting systems is recommended to be combined with the implementation of appropriate wastewater treatment techniques.

Figure 41: Planned developments in collection and treatment of generated load in the Sava RB



The results of calculations, the effects of the agreed measures up to 2015, as well as the implementation of measures according to the Scenario II and Scenario III (BOD_5/COD emissions) are presented in Figure 42 and Annex 11. The graph also illustrates the potential for further reductions and the input of the individual Sava countries to the reduction of pollution in the Sava RB.

Figure 42: Development of organic pollution reduction in the Sava RB



The effect of the agreed measures to be implemented up to 2015 will be as follows:

- The construction or upgrade of collecting systems and/or UWWTPs in 58 agglomerations will increase the capacity of urban wastewater treatment plants by 947,616 PE. UWWTPs will deal with a pollution load of 3,005,360 PE in 2015 and the wastewater treatment rate will improve from 30.2% to 44%.

- The connection of 519,480 new PE to the sewerage collecting system will increase the connection rate to 4,366,919 PE (from 56.4 to 64.1%).
- The reduction of organic pollution emissions by 26.4% (28.6 kt/a) in terms of BOD_5 and 25.60 % (56.6 kt/a) in terms of COD. The discharge of organic pollution into surface water from agglomerations will increase by 22% (17.9 kt/a) of COD and 7% (3.3 kt/a) of BOD_5 as a consequence of unbalanced total connection rate to the sewerage systems and UWWTPs in the Sava RB.

By realization of the Midterm scenario full compliance can be achieved with Articles 3, 4 and 5 of UWWTD (91/271/EC) concerning collection and treatment of urban wastewater in agglomerations generating load from more than 10,000 PE. Constructing urban collection and wastewater treatment systems will satisfy the requirements of Articles 3 and 4 concerning agglomerations with less than 10,000 PE after implementation of measures in the proposed Scenario III. The implementation of measures from all three scenarios would result in the reduction of organic pollution emissions in terms of BOD5 and COD by 91.64 kt (84.4%) and 169.23 kt (76.7%) respectively. Figure 42 illustrates the efficiency of the implementation of measures for organic pollution reduction in the Sava RB.

A comparison of Scenario II with Scenario III shows an increase of emissions after implementation of Scenario III, which is due to an increased collection of pollution discharges from all agglomerations of more than 2,000 PE (previously released uncontrollably into the environment and, thus, not accounted for). However, it should be emphasized here, that as a direct consequence of the increased collection of wastewater diffuse pollution will be decreased, which will lead to an improvement of the status of GWBs.

9.1.2 Nutrient pollution

9.1.2.1 Nutrient pollution - measures

The management objectives (Chapter 7.1.2) will be achieved by the implementation of the following basic measures:

- Implementation of the UWWTD (91/271/EEC);
- Implementation of the EU Nitrates Directive (91/676/EEC) taking vulnerable zones into account if natural freshwater lakes and other freshwater bodies of the Sava River Basin are found to be eutrophic or may become eutrophic in the near future.

In the EU MS (Slovenia) and an Accession state (Croatia), these measures must be implemented according to the commitments and deadlines set down in accession treaties with the EU and, in non-EU countries, according to a timeframe which is realistic and acceptable for these countries.

In addition, in the EU MS (Slovenia) the new EU detergent regulation applies: "Regulation No 259/2012 of the European Parliament and of the Council of 14 March 2012 amending Regulation (EC) No 648/2004 as regards the use of phosphates and other phosphorus compounds in consumer laundry detergents and consumer automatic dishwasher detergents".

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 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, up to 2015;
- Specification of number of wastewater collecting systems (connected to respective WWTPs), which are planned to be constructed by 2015;
- Creation of baseline scenarios for nutrient input taking the respective preconditions and requirements of the Sava countries into account, up to 2015;
- Implementation of the Best Available Techniques and Best Environmental Practices regarding agricultural practices (for EU Member States linked to EU Common Agricultural Policy – CAP).

9.1.2.2 PoM approach to management objectives for the first planning cycle

The Danube countries have committed themselves to implement the Memorandum of Understanding adopted by the International Commission for the Protection of the Black Sea (ICPBS) and the ICPDR in 2001 and have agreed that "the long-term goal is to take measures to reduce the nutrients load discharged to such levels necessary to permit Black Sea ecosystems to recover to conditions similar to those observed in the 1960s".

The inter-linkages between nutrient emissions and organic pollution are considered as part of the working methodology. In addition to measures related to the improvement of wastewater treatment and the application of BAT for industry and agriculture, measures to control diffuse nutrient pollution are required. Further, measures to reduce phosphate emissions from household laundry and dishwater detergents are addressed and, finally, nitrogen pollution from atmospheric deposition is also dealt with.

Nutrient removal is required to avoid eutrophication in many surface waters and the Black Sea, in particular taking into account the character of the receiving coastal waters as a sensitive area under the UWWTD. The nutrient loads discharged from the Sava RB are also an important factor responsible for the deterioration and eutrophication of parts of the Black Sea ecosystem.

9.1.2.3 Summary of measures of basin-wide importance

The main measures contributing to nutrient reduction at the basin-wide level are (i) the basic measures (fulfilling the UWWTD, IPPC Directive and EU Nitrates Directive) for the EU MS (ii) the implementation of the ICPDR Best Agricultural Practices Recommendation for non-EU countries and (iii) construction of the agreed number of UWWTPs.

9.1.2.3.1 Implementation of measures regarding urban wastewater treatment

As outlined above, the implementation of the UWWTD by the EU MS and the reported measures of non-EU countries will significantly contribute to the reduction of nutrient point source pollution. Map 5 illustrates the current situation regarding nutrient point source pollution and UWWT in the Sava RB (Reference Situation). Maps 6 and 7 illustrate the outcomes of the three different scenarios for UWWT (Baseline Scenario - UWWT 2015, Midterm Scenario, and Vision Scenario) and, thus, future developments and improvements regarding point source pollution. From the results, it is obvious that an additional measure to decrease phosphates in detergents would further contribute to the reduction of P emissions.

The expected development of N and P nutrient emissions after implementation of planned measures proposed by the three scenarios is shown in Figure 43 and Figure 44, respectively.

Figure 43: Changes in emissions of N_t from significant urban pollution sources in the Sava RB - reference year 2007 and proposed scenarios

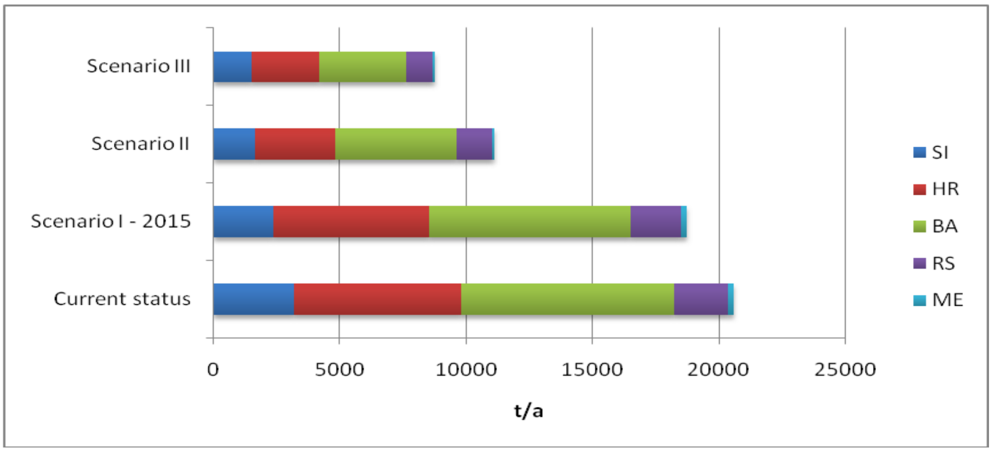
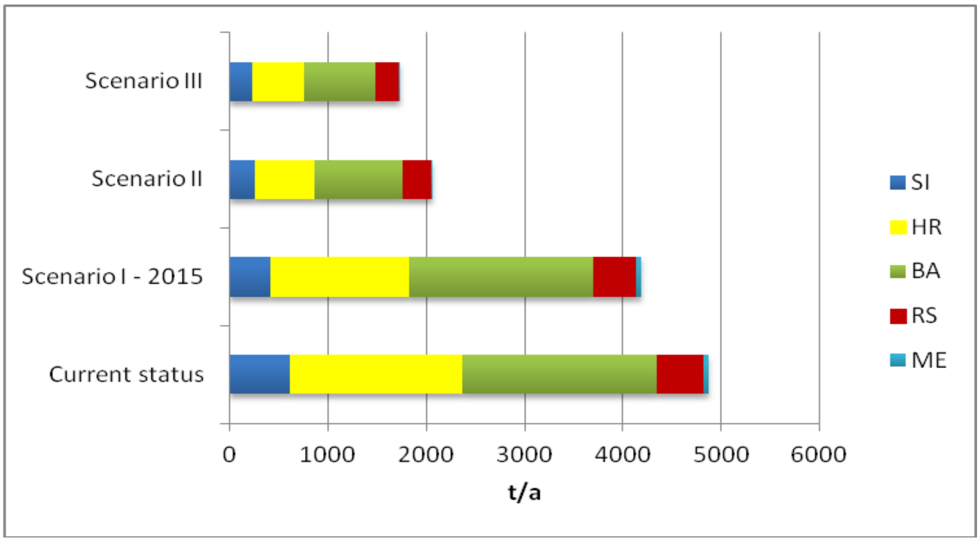


Figure 44: Changes in emissions of P_t from significant urban pollution sources in the Sava RB - reference year 2007 and proposed scenarios



9.1.2.3.2 Implementation of the EU Nitrates Directive

Implementation will be undertaken by a key set of measures to reduce nutrients from farming practices and land management. Nitrates in particular, leach easily into water from soils that have been fertilized with mineral fertilizers or treated with manure or slurry. The EU Nitrates Directive aims to limit the amount of nitrate permitted and applied and the resulting concentrations in surface water and groundwater.

9.1.2.3.3 Implementation of Best Agricultural Practice (BAP)

A concept for BAP has been developed for the Danube RB. This is complementary to the existing EU concepts of Codes of Good Agricultural Practice (GAP) under the EU Nitrate Directive and verifiable standards of Good Farming Practice (GFP) under the EC Rural Development Regulation 1257/1999. To be effective, any BAP must not only be technically and economically feasible, but it must also be socially acceptable to the farming community. As such, BAP can be applied as a uniform concept across the whole Sava RB, but the level of environmental management/performance that can be expected from farmers in different regions/countries will vary significantly according to:

- the agronomic, environmental and socio-economic context in which they are operating, and
- the availability of appropriate policy instruments for encouraging farmers to adopt more demanding pollution control practices.

A key action for the successful implementation of BAP is ensuring an adequate storage capacity for manure generated on farms and the application of advanced techniques for spreading manure. It is clear that the implementation of BAPs should be linked to the EU CAP. Future reforms of the CAP, its funds and strategic priorities can also contribute to WFD objectives. In particular, voluntary agri-environmental measures can be used to address diffuse and point sources of agricultural water pollution (nitrates, phosphates and pesticides) as well as soil erosion.

9.1.2.3.4 Implementation list of measures to control diffuse pollution

The information concerning diffusion pollution sources in the Sava RB provided by the countries is not sufficiently consistent to allow the realistic assessment of diffuse pollution sources. Therefore, only a rough quantification and estimation of the possible risk of discharges from diffuse pollution sources into surface waters is provided.

Measures include:

- Establishing regular data collection on the application of fertilisers and pesticides (annually);
- Revising the risk assessment of impacts with regard to diffuse pollution sources;
- Development of capacity building measures for preparation and/or implementation of agri-environmental schemes.

9.1.2.3.5 Scenarios for nutrient reduction

To explore the potential and effect of nutrient reduction measures, a set of scenarios has been developed on the basis of data provided by the countries and by using additional assumptions.

The scenarios are analogous to those referring to wastewater treatment plants (see chapter 9.1.1.2).

Scenario III includes the synergy effect of additional implementation of secondary wastewater treatment in agglomerations >2,000 PE (nutrient consumption of macronutrients for biomass growth represents approximately 35% and 20% for N_t and P_t, respectively).

9.1.2.4 Estimated effects of national measures on a basin-wide scale

UWWT Scenarios

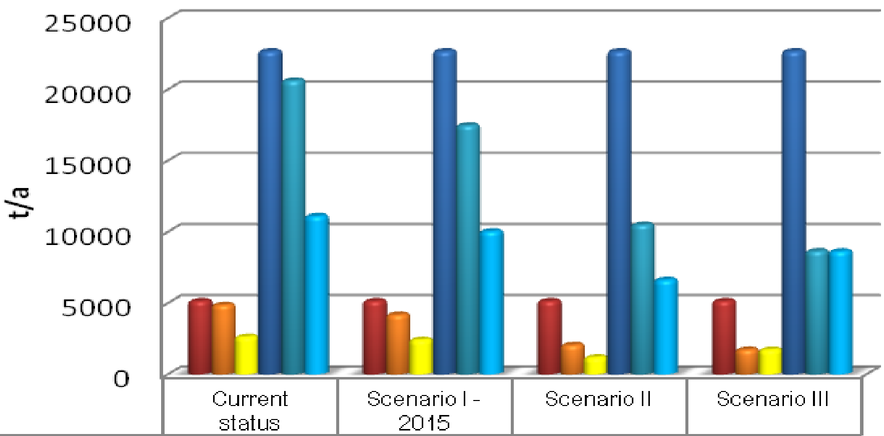
There is a high potential to reduce N_t and P_t emissions by connecting the generated pollution load to wastewater treatment plants.

Baseline scenario suggests a reduction potential of 1.8 kt N_t (9.4%) and 0.32 kt P_t (7.1%).

Intensive measures according to the Midterm scenario will lead to a better reduction of N_t – 6.50 kt (37%, in comparison with year 2015) and P_t – 2 kt (47.4%) emissions.

The implementation of the Vision scenario will lead to an additional reduction of 2.4 kt N_t (21.5%) and 0.45 kt P_t (20.7%) emissions. The final results of implementation of all the proposed scenarios will lead to a reduction of 10.7 kt of N_t and 3.1 kt of P_t with a final effect of 55.1% and 61.2% respectively, in comparison to the reference year 2007 (see Figure 45).

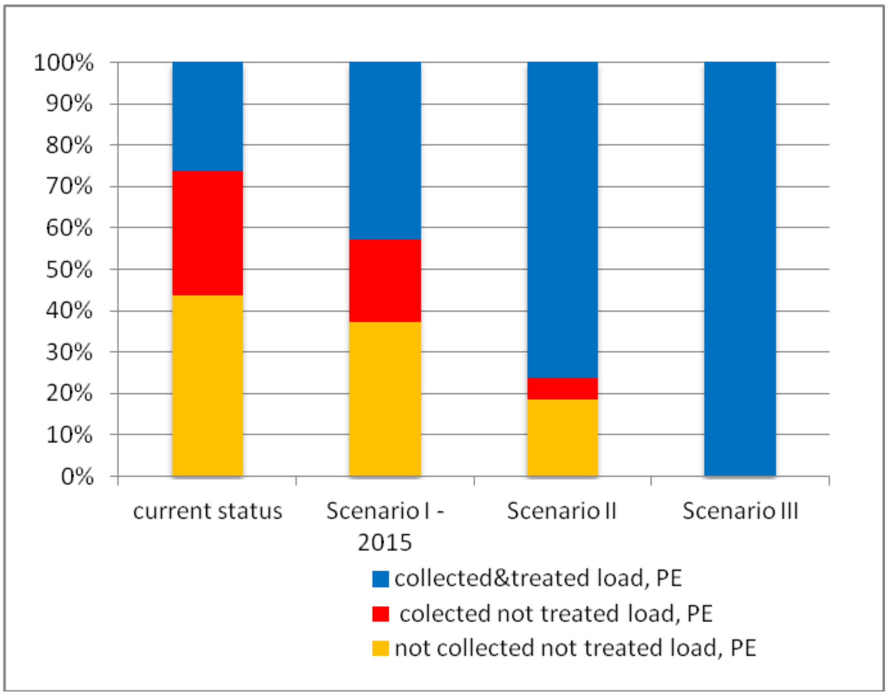
Figure 45: Development of nutrient pollution reduction



	Current status	Scenario I - 2015	Scenario II	Scenario III
Generated load Pt (t/a)	5150	5150	5150	5150
Emmisions Pt (t/a)	4868	4184	2063	1736
Discharged load Pt (t/a)	2642	2427	1186	1732
Generated load Nt (t/a)	22672	22672	22672	22672
Emmisions Nt (t/a)	20621	17480	10500	8659
Discharged load Nt (t/a)	11112	10039	6624	8640

Achievement of this effect will be achieved by the connection of municipalities and other polluters to sewage systems. Figure 46 illustrates the predicted development of urban wastewater disposal and treatment in the Sava RB. It shows a significant shift from discharging non-treated emissions into the environment to the application of secondary and tertiary treatment given that approx. 30.2% of urban wastewater was treated in the reference year 2007. Additional P reduction can be achieved by banning phosphate in detergents (laundry and dishwashers detergents).

Figure 46: Development of urban wastewater collection and treatment in the Sava RB in agglomerations above 2,000 PE



9.1.3 Hazardous substances pollution

9.1.3.1 Hazardous substances - measures

The management objectives (Chapter 7.1.3) will be achieved by the implementation of the following basic measures:

- Implementation of the Directive on industrial emissions – IPPC (2010/75/EC) which also relates to the Dangerous Substances Directive 2006/11/EC and Directive 2008/105/EC on environmental quality standards for water policy.

Given the specific situation in the non-EU countries, the following measures are to be implemented according to a timeframe which is realistic and acceptable to all non-EU countries (for Slovenia, an EU MS, the implementation deadline is 2015):

- 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.

9.1.3.2 PoM approach to management objectives

Reducing hazardous substances emissions is a complex task that requires specific strategies as the relevance of different input pathways is highly substance-specific and generally shows a high temporal and spatial variability.

Although there is insufficient information on the kinds of specific pollutants (priority substances) relevant for Sava countries, and on the magnitude and implications of problems associated with hazardous substances at a basin-wide level, it is clear that continued efforts are needed to ensure the reduction and elimination of discharges of these substances.

The Dangerous Substances Directive, the IPPC Directive and UWWTD implementation by the EU MS, as well as widespread application of BAT/BEP in the non-EU countries, will improve but not solve problems regarding hazardous substance pollution. Other relevant measures for substances released to the environment include chemical management measures. These are mostly based on EU regulations such as REACH (EU regulation on Registration, Evaluation, Authorization and Restriction of Chemicals) and the Pesticides Directive and involve, for example, bans/substitution of certain substances or measures which ensure the safe application of products (e.g. pesticides), often referred to as Best Environmental Practices (BEP).

In the light of recent industrial accidents and studies on carcinogens and substances dangerous for the environment, the Seveso II Directive 96/82/EC was extended by Directive 2003/105/EC of the European Parliament and of the Council of 16 December 2003 amending Council Directive 96/82/EC. The most important extensions of the scope of that Directive are to address risks arising from storage and processing activities in mining, from pyrotechnic and explosive substances and from the storage of ammonium nitrate and ammonium nitrate-based fertilizers.

In addition to the national system of civil protection, a trans-boundary system for accident prevention and control (Accident Emergency Warning System- AEWS) has been established by the Sava River Basin countries by the adoption of the Convention on Cooperation for the Protection and Sustainable Use of the Danube River (Danube River Protection Convention). The system was developed and is maintained by the ICPDR. The main purpose of the AEWS is to increase public safety and to protect the environment in the event of accidental pollution by providing early information for affected riparian countries.

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

In general, two scenarios can be distinguished that would imitate the operation of the AEWS:

- An incident that may cause serious water pollution is reported to a PIAC;
- Serious water pollution is observed and reported to a PIAC.

The main tasks of the PIACs are:

- Communication regarding a reported accident pollution;
- Expert involvement to assess the effects or impact;
- Decision-making on actions to be taken.

The PIACs initiate AEWS by sending a message. Four types of message may be sent:

- Warning Pollution or Standard Message - message is sent in the downstream direction;
- Request-for-Information - message is sent in the upstream direction;
- End-of-Alert - message is sent in the downstream and upstream direction;
- Test message is sent in the downstream and upstream direction.

The PIACs are operational 24/7 in SI and HR only where the PIACs are included into the national alert system 112. In BA and RS 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[16], Directive 2000/60/EC and Directive 96/82/EC on the control of major accident hazards involving dangerous substances, the members of the ISRBC 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 River Basin for extraordinary impacts to the water regime, such as sudden and accidental pollution;
- Operation of an Accident Emergency Warning System.

9.1.3.3 Summary of measures of basin-wide importance

In order to apply the approaches mentioned in chapter 9.1.3.2 it is essential:

- To set up monitoring programmes for the quantification of priority substances and the identification of other pollutants relevant for the Sava RB surface water bodies;
- To set up a monitoring programme for quantification of specific pollution of industrial wastewaters (priority and other relevant substances);
- To create legislative rules for the regulation and implementation of prevention and the control of discharges and leaks of these substances, including establishing a national central register of produced, used and discharged quantities of these substances in industrial and agricultural activities;
- To ensure the registration of applied pesticide products, including a national central register of quantities applied.

With regard to accidental pollution, the most important measures are the prevention of accidents and ensuring effective contingency planning in the event of an incident.

The Protocol on Emergency Situations to the Framework Agreement on the Sava River Basin will be an excellent base for the preparation of:

- An inventory of risk sites in the Sava RB and their prioritisation (hot spots);
- Monitoring of surface water according to WFD requirements including priority substances and relevant specific substances;
- Coordination of other measures.

[16] 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.

The reduction/elimination of the amount of hazardous substances entering the Sava River and its tributaries to levels consistent with good chemical status may not be possible by 2015, therefore further efforts will be needed in the future.

9.1.3.4 Estimated effects of national measures on a basin-wide scale

Proposed objectives up to 2015 are mainly of an organisational and/or legislative character and they focus on information collection. Due to a lack of reliable information, an assessment regarding whether the management objectives will be achieved by 2015 is not possible.

9.1.4 Hydromorphological alterations

9.1.4.1 Hydromorphological alterations - measures

The management objectives (Chapter 7.1.4) will be achieved by the implementation of measures focusing on:

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

9.1.4.2 Interruption 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 countries:

- 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 location, extent and measure 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[17] (the 2015 deadline applies to Slovenia as an EU MS).
- 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.

As for the Danube basin, the overall goal of the restoration of river and habitat continuum is to ensure free migration routes for the Sava RB, as this is crucial for achieving and maintaining *good ecological status/potential* in the future. It is, however,

[17] 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.

clear that exemptions will have to be made due to the high costs of constructions and technical limitations. In this case, less stringent objectives are set, i.e. to avoid a deterioration of river continuity as a result of future infrastructure projects.

9.1.4.2.1 Summary of measures of basin-wide importance

As of 2010, there were 30 interruptions of river and habitat continuity in all Sava RB countries equipped with four fish passes. HPP Mavčiče and HPP Vrhovo on the Sava River in Slovenia are not passable by fish, but are provided with the measures for compensation the habitant continuity (fish catch and transport).

By 2015, a fish pass will be constructed at Boštanj hydropower plant (Sava River) in Slovenia (Map 7). No measures were planned for 20 interruptions. As for the Danube and Tisza river basins, the numbers indicate that most restoration measures are not planned to be implemented until the second and subsequent WFD cycles.

Consequently, 20 interruptions of river continuity will remain impassable for fish migration in 2015, meaning good ecological status and good ecological potential will not be attained. None of the interruptions of river continuity are exemptions according to WFD Article 4(4).

Table 40: Overview of the number of river continuity interruptions for each Sava country; 2010 and 2015 restoration measures and exemptions according to WFD Article 4(4)

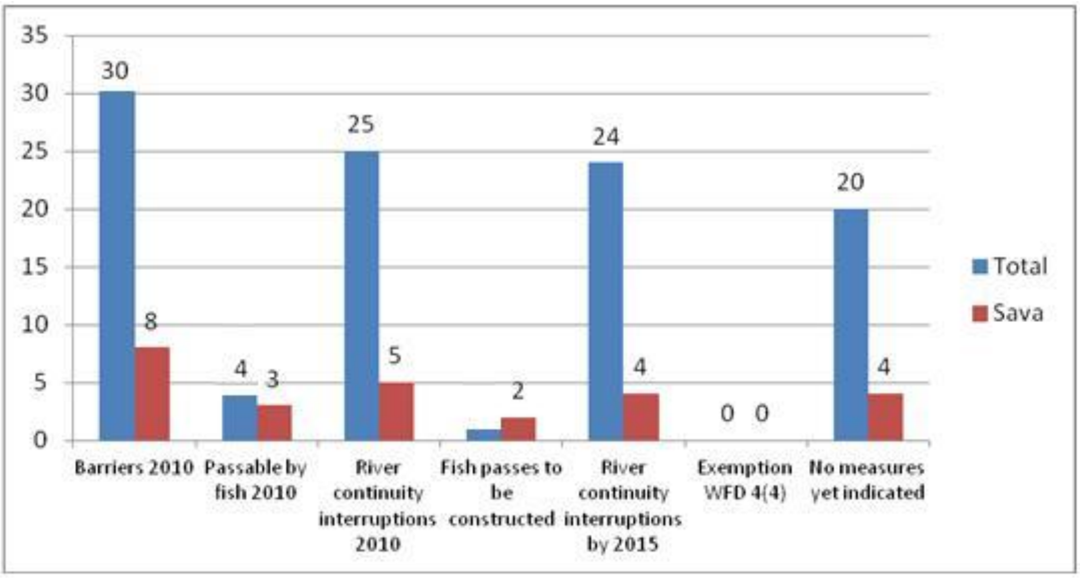
Country	Barriers 2010	Passable by fish 2010	River continuity interruptions 2010	Fish passes to be constructed	River continuity interruptions by 2015	Exemptions WFD 4(4)	Measures indicated
SI	6	1	5	1	4	0	4
HR	7	1	6	0	6	0	0
BA	9	1	8	0	8	0	0
RS	8	2	6	0	6	0	0
ME	2	0	2	0	2	0	0
Total[18]	30 (32)	4(5)[19]	25 (27)	1	24 (26)	0	4
Sava	7	2	5	1	4	0	4

Figure 47 shows the water bodies with fish migration barriers (interruption of river continuity in the Sava River Basin) as of 2010 and 2015, including the number of exemptions according to WFD Article 4(4). By 2015, one measure should have been implemented. No measures were proposed for 20 interruptions.

[18] Both BA and RS included in their lists HPP Zvornik and Bajina Basta, located on the trans-boundary river Drina.

[19] BA and RS included a fish pass at HPP Zvornik, located on the trans-boundary river Drina. Barriers on Sava in Zagreb (HR) and Krsko (SI) are not equipped with fish passes, but are passable for fish.

Figure 47: Expected interruption of river continuity in the Sava River Basin in 2015 (including the number of exemptions according to WFD Article 4(4)).



9.1.4.2.2 Estimated effect of national measures on a basin-wide scale

Taking into account that one fish pass is planned to be constructed by 2015, the WFD environmental objectives for river and habitat continuity interruption will not be achieved by 2015 on a basin-wide scale. The construction of fish passes on some rivers (e.g. Piva, Dobra) is not feasible because of the height of the dam and/or the high cost of work.

9.1.4.3 Hydrological alterations - measures

The management objectives will be achieved via implementation of the following measure by 2015:

- Elaboration of an analysis of the hydrological alterations in the Sava RB and the definition of operational management objectives.

This measure will also be implemented by the EU MS (Slovenia) as a part of the country's obligation with regard to WFD implementation.

9.1.4.3.1 Summary of measures of basin-wide importance

Measures which should have been implemented by 2015 are described in chapter 7.2 and relate to exemptions due to the construction of new hydropower plants in Slovenia in order to mitigate impacts on water bodies caused by hydrological alterations.

During the next cycle of WFD implementation which is intended to mitigate the negative impact of water level fluctuation upstream and downstream of dams, to adjust water abstraction to ensure good ecological conditions, to ensure an ecological water flow and reduce bank and bottom erosion, the following measures should be considered:

- Water abstractions: Ensuring sufficient residual flow below a water abstraction, meeting ecological flow requirements (i.e. for ensuring fish migration or for meeting good status in the section influenced by the water abstraction);
- Impoundments: Morphologically restructuring the headwater sections of impoundments;
- Hydro-peaking: Possible measures could include compensation reservoirs. The ecological status of the water body/bodies affected can be improved through operational modifications (e.g. downstream “buffer” reservoirs) that reduce the volume and frequency of artificially generated abrupt waves and avoid extreme water level fluctuations.

9.1.4.4 Morphological alterations - measures

The management objectives will be achieved via implementation of the following measure:

- Restoration of natural river morphology where possible and, if it is not possible, implementation of the “no net-loss” principle.

Given the specific situation in non-EU countries, the above measure is to be implemented according to a timeframe which is realistic and acceptable to all non-EU countries (the 2015 deadline applies to Slovenia as an EU MS).

For the 83% of water bodies which are “not at risk” measures should be aimed at their protection and maintenance and avoiding their deterioration. The measures may include:

- Law enforcement regarding riparian zone maintenance;
- Control over sand and gravel extraction;
- Avoiding reduction of floodplain size.

For the 16% of water bodies which are “possibly at risk” additional investigations are needed to define the causes of morphological quality deterioration. A final decision on whether a water body is defined as “at risk” or “not at risk” will depend on the results and the relevant measures should then be taken.

For the 1% water bodies which are “at risk” the relevant measures required to improve and restore their quality should be implemented.

Such actions include branch and floodplain reconnection. Obedska bara (9,500 ha), part of the Sava’s floodplain in Serbia, is at present the only officially planned project for floodplain reconnection in the entire Sava RB. According to estimation provided in the WWF report “Assessment of the restoration potential along the Danube and main tributaries”[20], there are 28 other floodplain sites with the potential for reconnection with the Sava River and its tributaries.

[20] Regarding the floodplain with potential for reconnection in the Sava RB the report of WWF “Assessment of the restoration potential along the Danube and main tributaries”, working paper for the Danube River Basin. This report is not considered by the Sava RB countries as an official document. http://assets.panda.org/downloads/wwf_restoration_potential_danube_1.pdf.

Other possible measures which should be encouraged are (i) restoration of the meandering character of the river, (ii) restoring and mitigating the effects of dredging and (iii) planting of natural vegetation along the river courses.

9.1.4.5 Future infrastructure projects - measures

The implementation of the following measures up to 2015 and beyond is proposed:

- Conduction of an Environmental Impact Assessment and/or a Strategic Environment Assessment 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 best environmental practices and best available techniques.

9.1.4.5.1 Summary of measures

For any future infrastructure projects (for an overview of the situation in the Sava RB, see Chapter 3.1.4.6), it is of particular importance that environmental impacts and requirements are considered as an integral part of the planning and implementation process from the beginning of the process. This issue has been addressed under the ICPDR for the whole area of the Danube River Basin with the goal of developing guidance for cooperation with different sectors. Such a process has already taken place in the navigation sector to reduce and prevent the effects of new projects and maintenance work. The ISRBC has taken an active role in the preparation of the "Joint Statement on Guiding Principles for the Development of Inland Navigation and Environmental Protection in the Danube River Basin" and currently provides strong support to its implementation. Similar approaches for cooperation with other sectors are currently underway in the framework of the ICPDR (e.g. BEP/BAT for hydropower generation) and the ISRBC will participate in these activities.

9.2 Groundwater

9.2.1 Groundwater quality - measures

The way towards the vision and management objectives will be achieved through the implementation of the following basic measures:

- Implementation of the prevention / limitation of pollutants inputs into groundwater according to the EU Groundwater Directive (GWD, 2006/118/EC);
- Implementation of the EU Nitrates Directive (91/676/EEC);
- Implementation of the Plant Protection Directive (91/414/EEC) and the Biocides Directive (98/8/EC);
- Implementation of the Urban Wastewater Treatment Directive (91/271/EEC);
- Implementation of the Integrated Pollution Prevention Control Directive (2008/1/EC), which also relates to the Dangerous Substances Directive

76/464/EEC, and Directive 2008/105/EC on environmental quality standards for water policy.

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 and in the EU MS (Slovenia) and an accession state (Croatia) these management objectives will be implemented according to the deadlines set down in the Accession Treaties.

Supplementary measures:

- 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.

9.2.1.1 Summary of measures

Basic measures, listed in Annex VI, Part A of WFD (or the corresponding national acts) are considered to be key instruments in achieving good chemical status of groundwater bodies in the Sava RB.

To prevent the pollution of GWBs by hazardous substances from point sources, an effective regulatory framework has to be put in place ensuring the prohibition of direct discharge of pollutants into groundwater and the definition of all necessary measures.

The main obstacle to reliable GW status assessment with regard to a large number of GWBs is the absence of GW monitoring. The upgrade of the existing national monitoring systems in Sava RB countries up to WFD standards, in order to provide reliable GW status assessment should be implemented.

Basic measures required to meet GW environmental objectives for groundwater (set down in the Art. 4 of WFD) are also required as measures that should be implemented to attain objectives regarding nutrient pollution, organic pollutants and hazardous substances. These measures are aimed to protect surface water resources and groundwater resources and therefore must be included in the Sava RBMP. An overview of measures planned to address poor groundwater chemical status is presented in Annex 12.

9.2.2 Groundwater quantity - measures

The management objectives will be achieved through the implementation of the following measures:

- 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 non-EU countries, these measures are to be implemented according to a timeframe which is realistic and acceptable for these countries. In the EU MS (Slovenia) and an Accession state (Croatia), these measures will be implemented according to the deadlines set down in the Accession Treaties.

9.2.2.1 Summary of measures

Measures addressing the poor quantitative status of groundwater bodies are based on so-called “other basic measures” (such as controls over the abstraction of groundwater including a register of water abstractions) and by a supplementary measure, listed in Article 11(3) of WFD. Those measures will be key instruments in achieving good quantitative status for certain GWBs in the Sava River Basin. Given the scale of the depletion of groundwater resources (which is a local rather than a widespread problem), the implementation of measures to address quantity issues are also considered as a local matter.

The slow and insufficient recharge of deep aquifers in some parts of the Sava River Basin, in connection with several decades of intensive public water supply, has resulted in local groundwater over-abstraction. Sustainable solutions for future water supply in such cases include the search for alternative water sources. An overview of measures planned to address poor chemical status is presented in Annex 12.

9.3 Other water management issues

9.3.1 Invasive alien species in the Sava River Basin

The way towards the vision and management objectives will be achieved through the implementation of the following measures:

- 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.

The problem of invasive alien species is a long-term issue and so the use of the following measures will be explored to prevent the introduction of harmful alien organisms and eliminate or reduce their adverse effects to acceptable levels:

- 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 of the impacts of harmful alien organisms and the steps that can be taken to prevent their introduction.

9.3.2 Quantity and quality aspects of sediments

The Protocol on Sediment Management to the FASRB, which is still under discussion among countries, stipulates the development of the Sediment Management Plan for the Sava River Basin and will probably include the following issues:

- 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.

The Sava River Basin Sediment Management Plan is intended to be adopted by the Parties no later than six years after the Protocol enters into force and to then be subsequently revised in six year cycles. Harmonized is also planned with the Sava RBMP and with the relevant plans and programmes of the Parties.

By this Protocol, the Parties will:

- Develop Dredging Programmes on a yearly basis;
- Establish a coordinated monitoring system;
- Develop Sediment Management Plan;
- Exchange information related to the implementation of the Protocol;
- Initiate and cooperate on research into technologies for sustainable sediment management.

A special effort was made in addressing the issue of acquiring sufficient knowledge on the quantitative aspects of sediment management by submitting an application for a project on Sediment Balance for the Sava River to the UNESCO IHP. Similar activities are also planned by the ICPDR.

9.4 Protected areas and ecosystem services

The following measures should be taken by Non EU countries to complete the registers of PA, as requested by the WFD:

- Step-by-step harmonisation 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 79/409/EEC 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 (Directive 78/659/EEC);
- Identification and characterisation of bathing waters (relevant for non-EU countries), harmonisation of national legislation with Bathing Water Directives 76/160/EEC and 2006/7/EC) (not relevant for SI and HR);
- Further work on the implementation of the Nitrates Directive 91/676/EEC and the Urban Wastewater Treatment Directive 91/271/EEC within the region;
- Finalisation of the delineation of drinking water protection zones in the region and the preparation of standardised 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);

For the protection of economically relevant ecosystem services, in particular those provided by lowland forests, floodplain wetlands and fishing waters, countries must identify and characterise these resources and evaluate their water requirements. Effective tools / databases will be required to implement this measure.

Cost benefit analyses of Future Infrastructure Projects (as, for example, required by Art. 4.7 assessments) or pre-planning approaches (e.g. for correct location of hydropower plants) will then give adequate consideration to the needs of PA and other ecosystems.

9.5 Financing the Programme of Measures

9.5.1 Investment costs for UWWTD

Compliance with the Urban Wastewater Treatment Directive will be the most costly component of the PoM, which comprises measures to tackle organic and nutrient pollution, as well as hazardous substances.

Implementation of the UWWD will require the construction of wastewater collection and treatment facilities in the Sava RB for all agglomerations above 2,000 PE.

The available information on the technical state of existing wastewater facilities in some of the Sava countries is currently insufficient; therefore the following financial estimate only represents a preliminary assessment. The forecast of investment costs required for full compliance with the UWWTD was made under the following assumptions:

General assumptions:

- Cost estimate is based on scenarios elaborated in chapter 9.1.1;
- The cost estimate only includes agglomerations larger than 2,000 PE;
- Investment costs of SI and HR are obtained from the national RBMPs, whereas the investment costs of BA, ME and RS are estimated;

- The investment costs assessment of wastewater treatment plants is based on unit costs in the Hungarian Guidance Document. In agglomerations of 2,000-10,000 PE secondary treatment is included and in agglomerations above 10,000 PE tertiary treatment with biogas production is included;
- The cost of sewer networks is based on two data sources: the average unit cost of EU projects and published Bavarian unit costs.

In order to handle the uncertainties due to limited information minimum and maximum costs were estimated.

Assumptions for estimate of minimum costs:

- The technical condition of existing WWTPs is satisfactory, restoration is not considered;
- The technical condition of existing networks is satisfactory, restoration is not considered;
- EU unit costs are applied for the cost estimate of a network (EU Cohesion Fund project average);
- Lower additional costs (25%) are applied for design, site preparation, and supervision of FIDIC contracts, project management, tendering, PR and contingency.

Assumptions for estimate of maximum costs:

- The technical condition of existing WWTPs is not satisfactory, full restoration is needed;
- Existing network is satisfactory, restoration is not considered;
- Bavarian unit costs are applied for networks;
- Higher additional costs (30%) are included in the calculations.

Table 41 shows the financial impact of full compliance with the UWWTD, Table 42 summarises the investment cost of the Baseline Scenario. For pollution details and related technical content of a particular scenario, see Chapter 9.1.1.

The full cost of compliance with the UWWTD for the Sava RB is estimated to be 5.3 to 6 billion €, which represents 100% sanitation for settlements above 2,000 PE.

The cost of the elaborated scenario for 2015 is approximately 1.2 billion €, the largest part of these costs would be for SI and HR in the national RBMPs.

Table 41: Total estimated investment cost for wastewater collection and treatment in the Sava River Basin, in M EUR

Cost Item	SI*		HR*		BA		SR		ME		Sava RB TOTAL	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
WWTP - direct, technical	64	64	338	338	572	581	151	169	19	20	1,143	1,172
Network - direct, technical	276	276	917	917	1,654	1,795	503	751	34	49	3,384	3,787
Additional costs %	20%	20%	0	0	25%	30%	25%	30%	25%	30%	25%	30%
Additional costs M EUR	85	85	0	0	556	713	164	276	13	21	818	1,094

Cost Item	SI*		HR*		BA		SR		ME		Sava RB TOTAL	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Total investment costs	**424**	**424**	**1,255**	**1,255**	**2,782**	**3,089**	**818**	**1,196**	**66**	**89**	**5,345**	**6,053**

**Costs included in the national RBMP of SI and Implementation Plan for UWWT Directive for HR.*

Table 42: Estimated investment cost for wastewater collection and treatment in the Sava River Basin under Baseline Scenario 2015, in M EUR

Cost item	SI*		HR**		BA		RS		ME		Sava RB TOTAL	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
WWTP - direct, technical	50	50	152	152	81	81	20	20	1	1	303	303
Network - direct, technical	215	215	319	319	155	169	19	25	4	7	712	735
Additional costs* %	20%	20%	0%	0%	25%	30%	25%	30%	25%	30%	25%	30%
Additional costs M EUR	66	66	0	0	59	75	10	14	1	2	136	157
Total investment costs	**331**	**331**	**471**	**471**	**295**	**325**	**48**	**59**	**7**	**10**	**1,151**	**1,195**

**Costs included in the national RBMP of SI.*

*** The Republic of Croatia plans the development of eight more agglomerations connected to smaller water bodies, in the Sava River Basin by the year 2015, the costs of which are included above (The planned costs for these eight agglomerations: WWTP 43 M €; sewerage 49 M €).*

9.5.2 Financing of investments

The total costs of measures required for the implementation of the wastewater collection and treatment programme identified in the Sava RBMP is estimated at between 5.3 - 6 billion €, of which the estimated investment cost of Baseline Scenario 2015 is approximately 1.2 billion €.

Case studies on the cost recovery of water services carried out as part of the project concluded that water tariffs are not sufficient to finance the necessary investment cost of wastewater collection and treatment in the Sava countries. The cost recovery level differs among the countries and this need to be taken into account when preparing financing programmes.

The following sources will be available for the financing of investments:

- Grants from European Funds (IPA, Cohesion Fund, European Regional Development Fund);
- Loans from International Financial Institutions (WB, EIB, KfZ, EBRD, etc.);
- National Budgets (state, municipal).

EU sources can be used for financing the PoM, in particular wastewater collection and treatment projects, according to the following legislation covering the period from 2007 to 2013:

Member State(s):

- COUNCIL REGULATION (EC) No 1083/2006 of 11 July 2006 laying down general provisions on the European Regional Development Fund, the European Social Fund and the Cohesion Fund and repealing Regulation (EC) No 1260/1999
- COUNCIL REGULATION (EC) No 1084/2006 of 11 July 2006 establishing a Cohesion Fund and repealing Regulation (EC) No 1164/94

Non-Member State(s):

- COUNCIL REGULATION (EC) No 1085/2006 of 17 July 2006 establishing an Instrument for Pre-Accession Assistance (IPA)

  The following components related to the PoM:

  (a) Transition Assistance and Institution Building;

  (b) Cross-Border Cooperation;

  (c) Regional Development.

  Item (c) "Regional Development" is intended to support countries listed in Annex I with regard to policy development as well as for preparation for the implementation and management of the Community's cohesion policy, in particular in their preparation for the European Regional Development Fund and the Cohesion Fund. The following Sava RB countries are listed in the referred Annex I: Croatia.

  The countries listed in Annex II are eligible for items (a) and (b): Bosnia and Herzegovina, Montenegro, and Serbia.

Countries are currently taking decisions, inter alia, on:

- Which financial sources they will utilize;
- Who will be the beneficiary of projects;
- The priorities of projects for implementation according to pollution scenarios.

Support from international financial sources needs to consider the following:

- Wastewater collection and treatment projects are revenue generating projects, therefore the financial sustainability of these projects is a long-term co-financing criterion (25-30 years).
- An essential precondition of international financing is the provision of own equity by the project beneficiary, i.e. approximately 15-20% of the total investment cost of the project.

An application documentation package for financing from EU sources requires the following documents:

- Application form: Summary description of project beneficiary, project objective, technical content of the project, financial and economic analysis, output indicators, public procurement data with regard to contracts;
- Feasibility Study: Detailed description of project's technical content, elaboration of option analysis, detailed demand analysis;

- Financial analysis: Justification of investment costs, operation and maintenance costs, revenues, co-financing rate of the given EU fund and financing plan, financial indicators;
- Economic analysis (Cost-Benefit Analysis): Financial corrections of costs and revenues, monetization of external benefits of the project, economic indicators;
- Environmental Impact Assessment (if required by national legislation).

In spite of the fact that the measures planned the are the national responsibility, the Sava Commission can have an important role in providing the Parties all necessary assistance in contacts with relevant international institutions to draw attention to the priorities defined in the PoM and find more opportunities and mechanisms to finance priority projects of the Parties.

10 Integration of water protection in developments in the Sava River Basin

10.1 Introduction

The Water Framework Directive's goal is the introduction of integrated water management practise in order to achieve environmental goals and to ensure sustainable water use. Thus, it interacts closely with issues relating to development sectors such as hydropower, navigation, flood protection and agriculture. Many future sectoral development activities in the Sava River Basin may have negative impacts on water status up to 2015 and beyond and should therefore be addressed in this Plan. Furthermore, they should be integrated into transboundary multisectoral and multimodal solutions, seeking for multiple functions with minimised impact on environment, covering also measures originating from the EU climate energy package (e.g. utilisation of sustainable energy sources, decreasing flood risk, accumulating water for use in drought periods, navigation etc.).

10.2 Flood protection

10.2.1 Priority pressures and related impacts in connection to floods

Although flooding is a natural occurrence, changes to flood frequency, duration, timing and water quality (e.g. runoff pollution) as a consequence of management practice can significantly affect the ecological status by influencing the biological and hydromorphological quality elements. In the context of the WFD, the key issue is to recognise the links between flood management and the factors influencing water quality objectives such as hydromorphological alterations and changes in longitudinal and lateral connectivity. If this is taken into consideration, future flood management plans can include the concept of ecological status and propose integrated solutions, such as providing areas with a diversity of habitats for organisms that will also act as flood storage. When looking for synergies between flood risk management and river basin management, it is necessary to point out that in the Sava RB there is a system of preserved retention areas (especially in the middle and lower part of the Sava River Basin), which is unique in Europe. Correct management of these areas will provide a win-win solution by achieving the WFD environmental objectives and also ensuring an effective flood protection system in the Sava River Basin. The existence of flood protection dykes compromises the attainment of good water status and the possible measures will have to be carefully considered taking into account the principles of better environmental options, disproportionate costs and overriding public interest.

10.2.2 Best practices to achieve the environmental objectives

The Sava RB countries, except ME, are signatories to the FASRB, and they undertake coordinated sustainable flood protection at the Sava River Basin level. Flood risk management and water quality management are both part of integrated river basin management, based on the WFD and EU Floods Directive. Both documents recommend joint approaches to flood risk management, coordinated planning and measures within river basins and sub-basins, while considering the interests of all the partners involved.

The Sava River valley, especially its middle part from Zagreb to Županja, and the lower part downstream of Županja, as well as the lower parts of the Sava tributaries are prone to flooding. The floods generally occur in spring after the snow melt and in autumn after the heavy rainfall. The wide floodplains and the natural lowland areas retain flood water.

The flood protection system in the middle and lower Sava RB relies mostly on natural retention areas and the flood protection levees. Generally, the main levees are designed for the 100-year return period floods, with freeboard of 0.5 - 1.2 m, while in some urban settlements (Zagreb) for the 1000-year flood. 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 downstream countries. The nature park and the Ramsar site, Lonjsko Polje, with an area of around 500 km^2 is of great ecological value. In general, the large retention areas of the Sava are among the most effective flood control systems in Europe. Their management can be considered as an excellent international model for sustainable flood management.

It should be possible to develop sustainable flood protection in the Sava River Basin without compromising the environmental objectives of the WFD. All flood risk management activities should be planned and carried out in line with Article 9 of Directive 2007/60/EC, which requires taking appropriate steps to coordinate the application of the EFD with the WFD, focusing on opportunities for improving efficiency, information exchange and for achieving common synergies and benefits with regard to the environmental objectives of the WFD.

Specific proposals for the Sava RB include the following:

Flood protection is one of the main causes of river and habitat continuity interruption. A normal part of flood action plans are technical flood defence measures (construction of new dykes and consolidation of the banks). These plans must however be combined with the restoration of river and habitat continuity interruptions. Appropriate regulations regarding land use and spatial planning (e.g. limitations related to land use in flood-prone areas) must be adopted in parallel with flood protection activities.

Accidental pollution due to flooding is an important issue. Accidental pollution can originate from industrial facilities and also from sites contaminated by former industrial activities or waste disposal. Pollution from rivers during flooding can reach protected retention areas (e.g. from the Sava River into Lonjsko polje). Consideration should also be given to treatment plants if they are located in a floodplain. Flood events should be managed in such a way that water surplus related pollution is reduced via suitable preventive measures taking into consideration the land use management of floodplain / wetlands. Wetlands can play an important role in flood and drought mitigation as well as in nutrient reduction. They act as sponges, soaking up rain and storing floodwater and runoff. Wetlands slowly release flood waters back into streams, lakes and groundwater, making the impact of flooding less damaging. The specific measures are in conformity with the Flood Action Plan for the Sava River Basin and address the following:

Land use and spatial planning regulations

Measures in floodplains and areas designated for flood water storage help retain space for flood expansion, thus decreasing the need for structural measures. Conservation and / or restoration of agricultural and forestry activities leads to an elevated retention time for water. Key activities in this regard include:

- Decree on conditions and limitations regarding constructions and activities in flood risk areas in Slovenia;
- Criteria for identification & zoning of terrain and for limitation restrictions regarding the use of water in Croatia;
- Application of agro-technical measures, forest management measures and land in accordance with natural protection in Bosnia and Herzegovina;
- Land use limitations applied in Serbia.

Improvement of efficiency of existent and/or creation of new retention and detention capacities

Making space for rivers in areas with minimal human and economic activities reduces risks in highly populated and industrial areas downstream. Key activities in this regard include:

- Reducing flood risk in the area southwest of Ljubljana where detention reservoirs are planned on the current floodplains;
- Preservation of the existing large lowland retention storages on the Sava River Basin (Lonjsko polje, Mokro polje, Zelenik, Kupčina and Jantak with a total volume of 1,590 hm3) as well as the existing natural retention areas along the Sava and Drina in Serbia.

The long-term goal for flood issues is the development of sustainable flood protection in the Sava River Basin without compromising the environmental objectives of the WFD. This will also require that:

- Flood management follows the entire cycle of risk assessment (prevention, protection, mitigation and restoration) and is performed in an integrated way to ensure flood protection and the good status of water bodies.
- The negative effects of the natural phenomena (floods, flash floods and soil erosion) on life, property and human activities as well as on water quality are reduced or mitigated.
- Climate change and its hydrological impacts (floods and flash floods) are fully addressed in decision-making to ensure the sustainability of ecosystems.

The long term goal will be achieved by the implementation of the following measures:

- Development of the flood risk management plan for the Sava River Basin in accordance with Directive 2007/60/EC in coordination with the reviews of the river basin management plans provided for in Article 13(7) of Directive 2000/60/EC.
- In compliance with the management objectives for hydromorphological alterations, protection, conservation and restoration of wetlands/floodplains, increase of flood protection potential while ensuring biodiversity, good status in the connected river and pollution reduction;

- Measures required for the implementation of Directive 2007/60/EC (updating reviews and reports) taking into consideration Article 9 therein.

Detailed information on floods is given in Background paper No. 9.

10.3 Navigation

10.3.1 Priority pressures and related impacts in connection to navigation

Inland waterway transport is, in comparison to road transport, seen as more environmentally friendly and energy efficient, and can therefore contribute to sustainable socio-economic development of the region. On the other hand, navigation is a significant pressure from an ecological point of view. River engineering works aimed at the maintenance and improvement of navigation affects riverine processes (e.g. bed-load transport, morpho-dynamic development of the channel network, groundwater regime, etc). In addition, navigation can also have other impacts on the water environment, such as pollution. The legal framework for navigation and environmental issues in the Sava River Basin includes international conventions between countries as well as the relevant EU legislation, policies and action plans.
A particularly important issue for the development of navigation on the Sava River is the development of the River Information System. In this regard, the ISRBC has passed two decisions complying with EU requirements – *Decision 03/09* on the adoption of *Vessel Tracking and Tracing Standard* and *Decision 04/09* on the adoption of *the Inland ECDIS Standard.*

10.3.2 Best practices to achieve environmental objectives

An integrated planning approach is necessary for the improvement of navigation and river system protection in the Sava RB. A joint approach that can be implemented by all countries via various disciplines is essential. An interdisciplinary approach must include the environment, water management, transport, river engineering, ecology, spatial planning, tourism, economics, as well as the involvement of stakeholders.

Actions to improve the current situation should focus on the following:

- River sections that require fairway development and the related effect on ecological and water status;
- River sections that require ecological preservation/restoration and related effects on navigability.

An environmental assessment must be undertaken prior to decision making. This is required by the Strategic Environmental (SEA) Directive (2001/42/EC) for qualifying plans, programmes and policies and is required by the Environmental Impact Assessment (EIA) Directive (85/337/EEC) for qualifying projects. This should govern actions with regard to future projects and studies of the waterways of the Sava RB.

Recognising the potential conflict between the development of inland waterway transport and WFD implementation, the ICPDR has collaborated with the Danube Navigation Commission, and the ISRBC to initiate a cross-sector discussion process, which led to the adoption of the 'Joint Statement on Guiding Principles on the Development of Inland Navigation and Environmental in the Danube River Basin'.

The Joint Statement summarises 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 EU Water Framework Directive;
- 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 effect 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 PoM for the Sava RB. Detailed information on navigation is given in Background paper No. 9.

10.4 Hydropower

Hydropower has been identified in the first implementation report of the WFD as one of several causes of hydromorphological alterations and there is a risk that significant water system degradation and biodiversity loss will continue in the future if infrastructure developments are implemented without fully taking WFD requirements into account.

There are 20 hydropower plants in the Sava RB with installed capacity exceeding 10 MW. 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. Basic information on existing power plants and on their impacts is given in Background paper No. 9.

10.4.1 Best practices to achieve environmental objectives

Hydropower is one of the main hydromorphological driving forces identified in the risk analyses. It is therefore essential to organize a broad discussion process in close cooperation with the hydro-power sector and all relevant stakeholders with the aim of agreeing on guiding principles on integrating environmental principles into the use of existing hydropower plants, including a possible increase of their efficiency, as well as in the planning and construction of new hydropower plants. At present, a stakeholder dialogue and the development of guiding principles on hydropower generation and the WFD is under preparation at the ICPDR. The aim of this activity is to facilitate a dialogue between the hydropower and environmental sector in order to achieve a common understanding of the topic with the objective of developing common guiding principles on hydropower development and the WFD, as stated in the Danube Declaration 2010. The key challenge is to get the key players from water and energy sectors from all countries in the basin on board as active and broad participation is considered to be a prerequisite for achieving a joint understanding of challenges and for achieving a joint agreement. The main outcomes of this ICPDR activity will be a Status Report on Hydropower in the Danube region and Guiding Principles on Hydropower Development in the Danube region. As all FASRB signatories have also adopted the Danube Declaration, the guiding principles under development should be considered for application within the ISRBC.

The recently published Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the European Union Strategy for the Danube Region is accompanied by an Action Plan, which includes actions and examples for projects to be implemented during the implementation of the strategy. Chapter 2 "To Encourage More Sustainable Energy" includes, inter alia, the following two measures directly addressing hydro power generation:

- "To develop a pre-planning mechanism for the allocation of suitable areas for new hydro power projects". This pre-planning mechanism and its criteria would pave the way for new hydropower plants by identifying the best sites and balancing economic benefits and water protection. It should also take into account climate change impacts (e.g. lower or higher water levels). This should be based on a dialogue between the different competent authorities, stakeholders and NGOs. The licensing process could be streamlined in areas deemed suitable.
- "To develop a comprehensive action plan for the sustainable development of the hydropower generation potential of the Danube River and its tributaries (e.g. Sava, Tisza and Mura Rivers)". This plan would pave the way for the coordinated and sustainable development of new power stations in the future and the retrofitting of existing power stations such that the environmental impact and the impact on the transportation function of the rivers (navigation) is minimised. The options for using hydropower to respond to fluctuations in the electricity demand should be explored – using dams to maintain a high water level in preparation for the demand peak.

These activities which are part of the Danube Strategy will offer an important framework for the ISRBC to achieve the goals regarding sustainable hydropower.

In addition to the above mentioned targeted activities, the following key recommendations should be adopted with regard to hydropower development and to ensure the environmental objectives of the WFD are met:

- Pre-planning mechanisms allocating "no-go" areas for new hydro-power projects should be developed. This designation should be based on a dialogue between the different competent authorities, stakeholders and NGOs.
- In order to minimize the need for new sites, the development of hydropower capacities could be supported by the modernisation and upgrading of existing infrastructure.
- The development of hydropower should be accompanied by the measures that ensure the sustainable development of water dependent ecosystems, by applying clear ecological standards for new facilities, or for existing facilities by their modernisation as well as the improvement of operating conditions. New hydropower plants should, for example, all have fish migration aids and should respect a minimum ecological flow.

- An analysis of the costs and benefits of a project is necessary to enable a judgement on whether the benefits to the environment and to society of preventing the deterioration of status or restoring a water body to good status are outweighed by the benefits of new modifications. This does not mean that it will be necessary to monetise or even quantify all costs and benefits to make such a judgement.
- The size of the project is not the relevant criteria to trigger Article 4.7. The relevant approach is to assess if a given project will result in deterioration of the status of a water body. Thus, projects of any size may fall under Article 4.7.

10.5 Agriculture

Agriculture is one of important, cause of the deterioration of the status of water bodies according to the WFD. The pressure generated from the agricultural sector affects both surface and groundwater bodies in terms of quality and quantity. Water quality is negatively affected by the presence of pesticide residues, nutrients from fertilizers, and sediments from soil erosion. With regard to water quantity, on average, 44 % of total water abstraction in Europe is used for agriculture.

Changes to farming practices will take time to deliver environmental benefits, so action on improving agricultural management via regulatory, voluntary and incentive schemes must begin now in order to meet WFD objectives. The WFD will have implications for farming practices and land management as well as water management. Farmers will need to manage their land carefully to meet the WFD requirements.

The pressures on water caused by agricultural practices are as follows:

- Pollution - a distinction can be made between point sources of pollution such as direct spillage from a farm slurry store into a river and diffuse sources such as the application of nitrogen and phosphorous or pesticides to agricultural land;
- Alterations of hydrological regimes - activities such as irrigation, drainage and land reclamation can cause the disturbance of the natural water balance or magnify the effects of pollution;
- Hydromorphological modification - the intensification of farming practices and inappropriate grazing regimes have contributed to the loss of wetlands and floodplains, resulting in hydromorphological modification of surface water. Such modifications aggravate various extreme events such as floods;
- Soil erosion - soil erosion and the delivery of contaminants to water influences the quality of surface water, groundwater, and freshwater ecosystems and human health. 52% of total P inputs are derived from erosion in some Danube basin countries according to the Danube River Basin Management Plan.

In the Sava RB the agricultural area comprises 42.36% of the total basin area. Of the 97,713,200 km^2 of the basin area, 6,162.43 km^2 (6.3%) comprises non-irrigated arable land; around 6% comprises pasture, 17% comprises complex cultivated areas, 12% comprises land primarily used for agriculture with significant areas of natural vegetation and 2% comprises natural grassland[21].

[21] Sava River Basin Analysis Report 2009.

The most significant agricultural activities are, in order of importance: corn and wheat production, oil plant production (soy and sunflower), orchards and vineyards. Another major agricultural activity is livestock production, where small production units predominate, especially for cattle, pigs, sheep, goats and horses. Poultry production on the other hand is characterized by large-scale production units.

The agricultural sector contributes around 11% of the total national exports of Croatia (1.4 billion of USD) and around 25% for Serbia (2.24 billion of USD). The Gross Value Added of agriculture in the total GDP of the Sava countries is 1.5% in Slovenia, 7% in Croatia, around 10% for Bosnia and Herzegovina and Montenegro and around 20% in Serbia. For the entire basin the value is 6%. Agriculture in total employs less than 4% of the working population in Bosnia and Herzegovina and around 24% in Serbia. For the entire basin the average is 11%.

More than 85% of the total agricultural area in the basin is owned by small farmers. The average size of the arable land of each owner is around 2 ha, the economic importance of the agricultural sector is high.

Livestock manure is rich in nutrients, especially nitrogen. The total number of livestock in the Sava countries is presented in Background paper No. 9. Since precise data on the number of animals per national share of the Sava RB is not available, the total number of livestock for a country was divided by the percentage of each country's territory which belongs to the Sava RB (SI – 52.8%, HR – 45.2%, BA – 75.8%, SR – 17.4% and ME – 49.6%) and then multiplied by the input numbers. Detailed information on agriculture in the Sava RB and proposed measures are given in Background paper No. 9.

The proposed measures are of varied type: legislative enforcement, changes of practice, investigations, metering and tariffs, awareness raising, education, codes of good practice, voluntary agreements, etc. As a priority, the BAP should be applied as a uniform concept across the whole Sava RB.

Technical measures include the application of input reductions, hydromorphology related measures, soil erosion control measures, and water saving measures.
The most commonly used measures are:

- Buffer strips/zones along a water body (this is a multi-objective measure and can include one or more of the following restrictions: restrictions to the fertiliser applied, plant protection products, no cultivation, no livestock grazing, no farming at all, particular plants or types of plant must be grown/allowed to grow, etc.);
- Training & advisory of farmers (other measures);
- Reduction in spraying (input reduction measures);
- Storage capacity for manure (input reduction measures);
- Creation of wetlands (multi-objective measures);
- Catch crops (input reduction measures);
- Re-meandering of streams (morphology measures);
- Spraying technologies (input reduction measures);
- Water saving irrigation practices (water savings measures);

- Water storage capacity increases (water savings measures);
- Group of measures to address diffuse pollution from agriculture.

Non-technical measures include measures related to the implementation, enforcement and transposition of existing EU laws related to the water management:

1. Directive 2000/60/EC (WFD).
2. Directive 91/676/EEC on the protection of water from nitrate pollution from agricultural sources - Nitrates Directive (Fully transposed in national legislation in Slovenia where the Action Programme has been adopted for the entire country. In Croatia, the deadline for full implementation is 2019. Currently, the identification of vulnerable zones is being undertaken. In Serbia, the preparation of a Strategy and Action plan for transposition is being undertaken. In Bosnia and Herzegovina the deadline for the identification of vulnerable zones is the end of 2012 and full implementation is expected by the end of 2021).
3. Directive 90/642 on the setting of maximum residue levels for pesticides in products of plant origin, including fruit and vegetables.
4. Directive 91/414/EEC concerning the placing of plant protection products on the market.
5. Directive 98/83/EC on the quality of water intended for human consumption.
6. Directive 86/278/EEC on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture.

Economic instruments:

To achieve environmental objectives and promote integrated river basin management, the WFD calls for the application of economic principles (e.g. the polluter 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 programme of measures for each river basin district on the basis of cost effectiveness criteria;
- Assess the potential role of pricing in these programmes of measures – implications for cost recovery;
- Evaluate the costs of process and control measures to identify a cost effective way to control priority substances.

Measures at this level includes compensation for land cover, cooperative agreements, water pricing, nutrient trading, a tax on pollution emissions (charges per kg of emission), tax on fertiliser inputs (inorganic fertiliser taxes) and linkage between agriculture measures and national/regional rural development programmes.

11 Climate change and RBM planning

11.1 Introduction

Several existing EU policies and initiatives contribute to adaptation to climate change with regard to water issues. The most important ones are the WFD, the EU Floods Directive, the EU Policy on Water Scarcity and Droughts and the EC's White Paper on Adaptation.

Although climate change is not explicitly included in the text of the WFD, the expected impacts may have a significant influence on RBM planning and therefore must be carefully considered in all aspects of WFD implementation. The step-by-step and cyclical approach of WFD river basin management makes it well suited to correctly incorporating climate change issues.

On 29 June 2007 the European Commission adopted a Green Paper "Adapting to climate change in Europe – options for EU action"(COM/2007/354). This document defines the following priority options for actions in order to reduce the effects of climate change:

- Early action to develop adaptation strategies in areas where current knowledge is sufficient;
- Integrating global adaptation needs into the EU's external relations policy and building a new alliance with partners around the world;
- Filling knowledge gaps on adaptation by EU-level research and the exchange of information;
- Setting up of a European advisory group on adaptation to climate change to analyze coordinated strategies and actions.

The European Commission white paper "Adapting to climate change: Towards a European framework for action" (COM/2009/147) was issued in April 2009 and sets out a framework to reduce the EU's vulnerability to the impact of climate change.

At present, the Sava countries are at different stages of preparing, developing and implementing national adaptation strategies. The extent of development depends on the magnitude and nature of the observed impacts, assessments of current and future vulnerability and the capacity for adaptation.

The priority in dealing with climate change in the first cycle of implementing the WFD in the Sava RB will be to propose a set of guiding principles to assist Sava River Basin managers to establish a strategy for building adaptive capacity to manage the Sava River Basin with regard to climate change, such as:

- Consideration of changes in risk, due to climate change, due to not achieving the WFD objectives (e.g. good status of water bodies) as a consequence of the identified pressures (e.g. organic pollution);
- Looking for opportunities in the monitoring programmes, and in ongoing and future projects which will support decisions on these issues in the second RBMP cycle to improve the understanding of climate change trends.

11.2 Recommendations for further steps regarding climate change in the Sava RBMP

According to the recommendations of the EU CIS on Climate change, the issue of climate change is recognized on a basin-wide scale. When the results of on-going projects are available, a more detailed analysis of the effects of climate change on the Sava River Basin and on water management will be possible. Based on these results, it will be possible to address climate change in the next cycles of the Sava RBMP.

Implementing the following activities will be required with regard to addressing climate change with regard to the WFD:

- Assessment of the vulnerability of groundwater resources to climate change focussing on water quantity and quality, and the recharging of aquifers;
- Assessment of resilience to climate change of water management practices planned by the institutions for trans-boundary, national and regional/local water management;
- Estimate of the scale of the impacts of climate change on pressures and risks according to WFD - both primary and secondary (arising from human responses to climate change) pressures should be taken into account;
- Review of the robustness of the WFD programme of measures with regard to projected climate conditions:
  - Taking account of likely or possible future changes in climate when planning measures today, especially when these measures will have a long lifetime and are cost intensive, and assess whether these measures will still be effective given likely or possible climate changes;
  - Designing measures on the basis of the pressures assessment carried out previously including climate projections;
  - Selecting sustainable adaptation measures, especially those with cross-sector benefits and which have the least environmental impact, including greenhouse gas emissions;
- Required revisions of monitoring programmes to detect climate change impacts;
- Analysis of water scarcity probability on a river basin scale based on past and current water demands and on future trends incorporating climate change projections. Assessment of how the potential negative changes will affect the socioeconomic system behind the water resources system.

A list of projects addressing climate change impacts in the Sava RB is provided in Background paper No. 10.

12 Summary of public participation activities

Public Participation is one of core principle in sustainable water management as required by the WFD and FASRB. Two public participation related lines of activities were carried out in the framework of preparation of the Sava RBMP:

1. Activities for the preparation of the Sava RBMP aiming to active public participation and facilitating input by the stakeholders to secure enhanced quality of the plan using the knowledge they hold. Specific outcomes and conclusions from the implemented activities have been incorporated in the current Sava RBMP and the proposed Programme of Measures.

2. Activities for the establishment of a mechanism to secure public participation in the monitoring of implementation of the Sava RBM Plan under development as well as its review and updating / preparation of the next RBMPs.

12.1 Informing general public, consultation and active involvement of the stakeholders

12.1.1 Providing information to general public

A number of activities to raise awareness about the Sava RBM Plan were implemented aiming at enhanced transparency about the RBMP and its preparation process as well as increased engagement of stakeholders. These included:

Internet based activities

- Information about the development of the RBMP, its preparation phases and the consultation activities implemented has been publicly accessible throughout the preparation period through the ISRBC official website – www.savacommission.org (e.g. Sava River Basin Analysis, draft Sava River Basin Management Plan).

Publications

Different materials have been prepared and presented to the public:

- Sava NewsFlash: The Sava NewsFlash is a periodic publication produced by the ISRBC in 500 copies in English and one of the languages of the Parties to the ISRBC (on a rotating basis). It is sent to more than 200 stakeholders directly while the rest of the copies are distributed on different workshops and meetings organized by the ISRBC or other institutions. To ensure availability to wider public the Sava NewsFlash is put on the official web site of the ISRBC as well. Articles related to all phases of the Sava RBM Plan preparations were regularly published in the Sava NewsFlash.
- Brochures and leaflets: Sava River Basin Analysis report was published in 50 copies and distributed to the main institutions in the Parties to the FASRB (ministries, Directorates for Water, Water Agencies etc.). A Summary of the SRBA report was prepared and distributed in 100 copies to the stakeholders at

different meetings and workshops. Both publications have been put to the official web site of the ISRBC to ensure the information to wider public as well.

Presentations

- Presentations on development of the Sava RBM Plan were conducted on the occasion of meetings of stakeholders groups in the Parties to the FASRB and Montenegro organized by the ISRBC or other institutions (e.g. ICPDR, Zelena Akcija, REC, Nature Park Lonjsko Polje, etc.) as well as on various other events (organized by UNECE etc.).

12.1.2 Consultation activities

Consultation activities undertaken during preparation of the Sava RBM Plan can be summarized into three main categories:

Through Meetings with institutions and organizations of the concerned countries

- The preparation of the Sava RBM Plan was marked by a number of meetings of the staff of the Secretariat of the ISRBC as well as of the experts preparing the Sava RBM Plan with national authorities, research institutions, national and international NGOs. The meetings aimed at collecting information and data, as well as discussing issues related to the management of the basin. The meetings constituted a valuable consultation process through which the stakeholders have contributed in the formulation of the RBMP.

Through consultation workshops at the transboundary level

Three major consultation workshops have been carried out to mark important milestones in the draft RBMP development:

- Workshop on the significant water management issues with the objectives to introduce a wide circle of stakeholders to the integrated water management concept and the requirements of the WFD and get input on the subject (SWMIs) (Zagreb (HR), September 27-28, 2010).
- Workshop on the Programme of Measures with the objective to introduce the proposed Programme of Measures to stakeholders and collect feedback (Sarajevo (BA), June 28-30, 2011).
- Stakeholder Forum (Belgrade (RS), November 9-10, 2011) which was organized to present the Draft Sava RBMP and collect comments on its content from all related stakeholders, before start of the web based consultation process. Stakeholders' participation in the implementation of the RBMP and later on in the development of the revised RBMP was also discussed.

Web based consultation

The draft Sava RBMP, along with all background documents produced during preparation of the Plan) has been available to the wide public for comments from December 21, 2011 until April 21 2012 via the ISRBC website. A valuable comments and suggestions collected during the consultation process were evaluated and incorporated to the most possible extent into the final draft Sava RBMP, submitted to the ISRBC for adoption as a proposal prior to distribution to the Parties to FASRB and Montenegro for final adoption.

12.1.3 Active involvement of stakeholders

The overall process of the RBMP preparation has been led by the ISRBC's Permanent Expert Group for River Basin Management (PEG RBM). Certain issues touching upon the RBMP have been subject to *ad-hoc* discussions of other expert groups, in accordance to their competence. A major stakeholders /stakeholder groups have an opportunity to actively participate in this process as well as in all other activities of the ISRBC by gaining the observer status. This opportunity is well-utilized by organizations already holding this status to actively participate at the meetings of the ISRBC and its PEG RBM. This sort of the two-way communication was a valuable asset during the preparation of the Plan.

A summary of the public information and consultation measures taken, their results and the changes to the plan made as a consequence can be found at:
http://www.savacommission.org/srbmp.

12.2 Stakeholder analysis

In order to enhance the process of establishment of a mechanism to secure an efficient public participation in the monitoring of implementation of the Sava RBM Plan under development as well as in the subsequent planning cycles, identification and a comprehensive analysis of stakeholders was performed.

During the course of this activity the list of main stakeholders at national and transboundary level (which include all relevant stakeholders in the Parties of the FASRB and in Montenegro as well) was compiled. Two workshops (organized back to back with the above mentioned PoM workshop and Stakeholder Forum) were used to ensure that the list was inclusive and representative. This activity also resulted with a detailed plan of forthcoming activities which presents a very good basis for further enhancement of the stakeholder involvement in the process of implementing the Sava RBM Plan, as well as in the process of implementing the FASRB itself.

13 Key findings

The key findings focus on aspects of water management and the implementation of the WFD at the Sava River Basin-wide scale. Gaps and uncertainties with regard to the Sava RBMP are also addressed. Complementary information on the considerable and important work taking place at the national level can be obtained from the national RBMPs. Significant further efforts for the next RBM cycles will still be necessary.

Surface water status assessment

The assessment of the ecological status requiring WFD compliant methods for the analysis of biological quality elements had to be applied for a number of water bodies in the Sava RB for the first time. In order to achieve this, a harmonised approach for assessment of the surface water status has been applied in all Sava RB countries. Despite of that, most of the Sava countries have not so far managed to use all the biological quality elements for ecological status assessment as required by the WFD. The key missing data is for macrophytes and/or phytobenthos as well as for fish. This situation was also influenced by the fact that only Slovenia as the EU MS took part in the first round of the intercalibration exercise, whose goal was international harmonisation and comparability of status class boundaries.

As 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. It was the first ever exercise of this kind in the basin and it has identified a number of gaps to be addressed in next RBM planning periods. Most significantly, there is a general lack of monitoring data on the WFD priority substances. 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 fully compliant with the Directives 2009/90/EC and 2008/105/EC.

These results indicate that achieving a fully coherent and WFD compliant ecological status assessment in the Sava RB requires additional time and effort. Similarly, the final HMWB designation still needs validation based on high confidence assessment results regarding the ecological status.

At this stage, the status assessment of water bodies is not yet directly linked to the measures and the effects of the measures at the basin-wide scale. A follow-up is needed in order to better understand the linkage between the effects of the measures and the water status at a basin-wide scale.

The assessment of biological quality elements needs to be further improved to enable complete intercalibration as well as an assessment of the ecological status and potential.

An improvement in status assessment would also increase confidence levels for 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.

Using the collected data, scenarios for organic pollution reduction from urban wastewater treatment were developed. Measures identified for the Baseline scenario regarding organic pollution would result in a considerable reduction of emissions of BOD_5 by 26.4% and those of COD by 25.6%, but this would not ensure the achievement of the WFD environmental objectives at a basin-wide scale by 2015. Measures in EU MS (SI) and accession country (HR) will be implemented in line with the results of negotiations with the EC by 2015 by realization of wastewater collection and treatment systems in national operational programmes for implementation of the UWWTD. In Non-EU MS (BA, RS, ME) implementation of measures will be carried out according to the national strategies – taking into consideration reported number of wastewater treatment plants with secondary or more stringent treatment to be constructed by 2015.

A different situation is with the assessment of pressures by industrial organic pollution. Over the past two decades, the political situation has caused changes in industrial activities in the Sava RB countries, causing either an increase or a decrease of production. This process has influenced the generated pollution load and discharges of industrial wastewater into the environment. A large 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. Due to the lack of information on industrial pollution sources in the Sava River Basin, only significant industrial pollution sources which meet the requirements of the IPPC Directive for reporting to the E-PRTR have been taken into account in the assessment of pressures. This drawback has to be eliminated in future plans and more detailed inventory has to take place.

Nutrient pollution

Analysis of nutrient pollution from point sources was based on data collected in countries and it provides a good insight into the current state-of-the-matter and a proper basis for preparing the programme of measures. In support of this, scenarios for nutrient pollution reduction from urban wastewater treatment were developed.

The main measures contributing to nutrient reduction are (i) basic measures (compliance with the UWWTD, IPPC Directive and EU Nitrates Directive) for the EU MS (ii) implementation of the ICPDR Best Agricultural Practices (BAP) Recommendation for the non-EU MS, (iii) construction of the agreed number of UWWTPs for the non-EU MS and (iv) phasing out phosphates in laundry and dishwashing detergents in line with amended EU regulation.

The estimated effects of the implementation of national measures on a basin-wide scale indicate a high potential to reduce N_t and P_t emissions by treating the generated pollution load to wastewater treatment plants.

Quantifying the pressure from diffuse pollution sources would be assessed ideally by using the monitoring data. Due to missing data on diffuse pollution sources (application of fertilisers to arable land and others) a risk analysis has been carried out. This approach used alternative information to quantify the pressure from the diffuse pollution sources. The risk analysis was based on GIS using five main categories of land use: intensive agricultural use; meadows and pastures; urban areas; forest; and semi-natural areas, considered as natural areas without anthropogenic or other pollution. The risk assessment was carried out in areas of specified land uses and it did not cover any other factors which are significant with regard to pollution from diffuse sources. Therefore, the results of this assessment have a relatively low confidence level.

The use of MONERIS model for calculation of nutrient emissions was an interesting exercise as the original model in the past did not provide acceptable results for certain areas of the Sava RB (karst regions). The adjustment of the model improved its performance; there was however still 30% difference with the results of the calculation method for nitrogen. It is recommended to further test the application of the MONERIS model in the Sava RB in cooperation with the ICPDR.

Hazardous substances pollution

The implementation of the Dangerous Substances Directive, the IPPC Directive, the UWWT Directive and the widespread application of BAT/BEP will improve, but not solve the problem of hazardous substances.

It is expected that the management objectives and WFD environmental objectives concerning hazardous substances will not be achieved by 2015 and that there is a need to collect additional monitoring data on hazardous substances, as well as additional information on their sources and relevant pathways.

Further measures which need to be taken are the appropriate treatment of priority substances from industrial discharges and further strengthening of prevention and safety measures at contaminated sites. In addition, the continued upgrade of WWTPs to include biological treatment (which results in some hazardous substances accumulating in the sewage sludge) as well as increases in the number of WWTPs will contribute to reducing the load of hazardous substances. Finally, additional reduction by product related measures should be considered.

The present lack of knowledge on the sources, pathways, discharges and losses of hazardous substances will be reduced by monitoring, PRTR reports and reporting on EU REACH, and by the inventory based on the Directive 2008/105/EC. For the Sava RB, this inventory should be the basis for ISRBC actions to achieve comparable results.

Hydromorphological alterations

The assessment of hydromorphological pressures focused on river and habitat continuity interruption, disconnection of adjacent wetlands/floodplains, hydrological alterations and future infrastructure projects. It has also introduced the pressures from morphological alterations as a novel approach enabling a more comprehensive evaluation of available pressures. The analysis has been based on the available data and compared to the Sava River Basin Analysis Report, in which the data have been provided in different scales or have not been provided at all, the present analysis is based on a harmonized assessment.

No measures were reported for HYMO alterations except of fish passes and habitat continuity. Pressures to hydromorphology were identified, there are 30 barriers in the Sava RB with 7 barriers on the Sava River itself and 23 on the tributaries, but only two measures were proposed.

The data on HYMO alterations were in general incomplete (hydropeaking, alteration of the flow regime, floodplains with potential for reconnection). It is therefore recommended to introduce a monitoring of river hydromorphology in the basin according to the WFD in order to receive a coherent dataset. The harmonisation of HYMO assessment for the transboundary water bodies should be carried out.

Future infrastructure projects

For any future infrastructure projects, 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. Such a process has already been initiated by the ICPDR in the navigation sector to reduce and prevent the negative effects of new projects and also maintenance work. Similar approaches for cooperation with other sectors are currently underway as part of the ICPDR (e.g. BEP/BAT for hydropower production) and the ISRBC will participate in these activities. It has to be pointed out that there is a general lack of relevant databases required for the identification of future infrastructure projects at the country level.

Groundwater

Groundwater in the Sava RB is of major importance and is 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.

Groundwater quality

- Results of the chemical status assessment clearly show that contamination by nitrates and ammonium from diffuse sources is the main reason for the poor status of GWBs in the Sava River Basin (11 important GWBs or 30%).
- Problems should be addressed primarily by prevention measures which may influence various legitimate uses of groundwater and can also affect dependent aquatic and terrestrial ecosystems.
- Basic measures and other supplementary measures (listed in Annex VI Part A and Article 11(3) of WFD), are considered to be key instruments in achieving good chemical status in SI and HR, while in BA and RS measures according to national laws corresponding to EU Directives are planned to be implemented.
- Monitoring results concerning the chemical and quantitative status of GWBs are very limited or missing in some parts of the Sava River Basin, which is the main obstacle to a reliable GW status assessment.
- 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 is not a severe problem, but the lowering of GW levels due to lowering of surface water levels (as a consequence of the deepening of the river bed 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

As national legislation in non-EU Sava countries is not fully harmonized with EU standards, a complete inventory of protected areas as required by WFD could not be prepared for the whole of the Sava River 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.

Invasive alien species

Establishing a coordination platform for cooperation on IAS issues within the Sava RB is needed. The measures recommended for the next RBMP period are provided in Chapter 9.3.1.

Quantity and quality aspects for sediments

The adoption of the Protocol on Sediment Management to the Framework on the Sava River Basin is expected in near future. The Protocol 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.

Integration of water protection in developments in the Sava River Basin

Any kind of development in the Sava River Basin should be integrated into transboundary multisectoral and multimodal solutions. Utilisation of sustainable energy sources, decreasing flood risk, accumulating water for use in drought periods and navigation should seek for multiple functions with minimised impact on environment, covering also measures originating from the EU climate energy package.

Flood protection - it is envisaged that sustainable flood protection in the Sava River Basin will be developed without compromising the environmental objectives of the WFD. All flood risk management activities will be planned and carried out in line with Article 9 of Directive 2007/60/EC, which requires appropriate steps to coordinate the application of the FD with the WFD, focusing on opportunities for improving efficiency, information exchange and achieving common synergies and benefits while taking into consideration the environmental objectives of the WFD.
In compliance with the management objectives for hydromorphological alterations, protection, conservation and restoration of wetlands/floodplains is required with the goal of increasing flood protection potential while ensuring biodiversity, good status in the connected river and pollution reduction. Flood management should follow the entire cycle of risk assessment (prevention, protection, mitigation and restoration) and should be performed in an integrated way to ensure flood protection and the good status of water bodies.

Navigation - an integrated planning approach is necessary for the improvement of navigation and rivers protection in the Sava RB. An interdisciplinary approach must include the environment, water management, transport, river engineering, ecology, spatial planning, tourism, economics, as well as the involvement of stakeholders from the start. The Protocol on the Navigation Regime to the Framework Agreement on the Sava RB creates a good basis for integrated planning, while taking into account the Joint Statement on Guiding Principles on the Development of Inland Navigation and Environmental Protection in the DRB, especially the ecological measures required to achieve and ensure environmental objective/sustainability.

The EU Strategy for the Danube Region, Priority Area 1 "To improve mobility and multimodality" will be an excellent driver for fostering integrated planning concerning inland navigation and environmental protection.

Hydropower - it is of the utmost importance to organise a broad discussion process with the close cooperation of the hydropower sector and all relevant stakeholders with the aim of agreeing guiding principles on integrating environmental aspects into the use of existing hydropower plants, including a possible increase of their efficiency, as well as in the planning and construction of new hydropower plants. The current stakeholder dialogue and the development of guiding principles on hydropower generation and the WFD organized by the ICPDR aims to involve key players from the water and energy sectors to achieve mutual understanding. The ISRBC will benefit from this process enabling it to use the Guiding Principles on Hydropower Development in the Sava RB.

Particular consideration has to be given to the impact of the operation of the Sava HPPs on the downstream water regime (e.g. on the Sava water regime which belongs to Croatia and where there is a transboundary impact of the HPPs in Slovenia). The existing HPPs are not uniformly distributed in the basin. At present, the energy potential of only the most upstream section in the part of the Sava River which belongs to Slovenia has been exploited or is planned to be exploited.

Implementation of EU Strategy for the Danube Region, Priority Area 2 "To encourage more sustainable energy" would pave the way for the coordinated and sustainable development of new power stations in the future and retrofitting the existing ones in the way that would minimize the environmental impact and the impact on the transportation function of the rivers (navigation).

Agriculture - coping with the pressures on water caused by agricultural activities is one of the main challenges in meeting the WFD environmental objectives. The pressures on water bodies caused by agricultural practices include pollution from diffuse and point sources; alterations of the hydrological regime; hydromorphological modifications and soil erosion.

The measures recommended to be applied in the Sava RB to tackle the adverse impacts from agriculture include enforcement of legislation, changes of common practices, introduction of water metering and tariffs, awareness raising, promotion of education, application of codes of good practices, etc. As a priority, the best agricultural practices should be applied.

Technical measures include the application of input reductions, hydromorphology related measures, soil erosion control, and water saving measures.

14 References

Alcamo, J., J.M. Moreno, B. Nováky, M. Bindi, R. Corobov, R.J.N. Devoy, C. Giannakopoulos, E. Martin, J.E. Olesen, A. Shvidenko, 2007: Europe. Climate Change (2007). *Impacts, Adaptation and Vulnerability.* Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK, 541-580.

AQEM consortium (2002). *Manual for the application of the AQEM system*. A comprehensive method to assess European streams using benthic macroinvertebrates, developed for the purpose of the Water Framework Directive. Version 1.0, February 2002.

CEN (2002). A guidance standard for assessing the hydromorphological features of rivers.

CEN TC 230/WG 2/TG 5: N30. Fifth revision: March 2002

COM/2010/0047 final. Report from the Commission to the Council and the European Parliament on implementation of Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources based on Member State reports for the period 2004-2007 SEC(2010)118.

COMMISSION DECISION of 13 November 2007 adopting, pursuant to Council Directive 92/43/EEC, a first updated list of sites of Community importance for the Continental biogeographical region (2008/25/EC)

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Official Journal L 206 , 22/07/1992

De Wilde, A.J. &. Knoben, R. A.E. (2001). *Setting class boundaries for the classification of rivers and lakes in Europe*. REFCOND discussion paper for evaluation of techniques. Royal Haskoning, The Netherlands.

Dimkić M., Stevanović Z., Đurić D. (2007): "*Utilization, Protection and Status of Groundwater in Serbia",* Regional IWA Conference on "Groundwater Management in the Danube River Basin and Other Large River Basins", 7-9 June 2007, Belgrade, Serbia.

Directive 2006/44/EC of the European Parliament and of the Council of 6 September 2006 on the quality of fresh waters needing protection or improvement in order to support fish life.

Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 on the management of bathing water quality and repealing Directive 76/160/EEC.

Directive 2009/147/EC of the European Parliament and the Council of 30 November 2009 on the conservation of wild birds.

Directive 76/160/EEC on the quality of bathing waters.

Directive 91/271/EEC on urban waste-water treatment was adopted on 21 May 1991.

Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

European Commission, 2000. *Directive 2000/60/EC of the European Parliament and of the Council – Establishing a framework for Community action in the field of water policy*. Brussels, Belgium, 23 October 2000.

Fozzard, I., Doughty, R., Ferrier, R.C., Leatherland, T., and Owen, R. (1999) *A quality classification for management of Scottish standing waters*. Hydrobiologia 395/396 pp 433-453

Govedič M., M. Bedjanič, V. Grobelnik, A. Kapla, J. Kus Veenvliet, A. Šalamun, P. Veenvliet & A. Vrezec, (2007). *Dodatne raziskave kvalifikacijskih vrst Natura 2000 s predlogom spremljanja stanja – raki (končno poročilo)*. Naročnik: Ministrstvo za okolje in prostor, Ljubljana, Slovenia. Center za kartografijo favne in flore, Miklavž na Dravskem polju. 127 str.

ICPDR (2011). *Integrated Tisza River Basin Management Plan*. Vienna, Austria. http://www.icpdr.org/icpdr-pages/item20100621095910.htm

ICPDR (2010). Danube River Basin Management Plan, Vienna, Austria. http://www.icpdr.org/icpdr-pages/danube_rbm_plan_ready.htm

ISRBC (2009). *Sava River Basin Analysis.* Zagreb, Croatia. http://www.savacommission.org/ .

Johnson, R.K. (2001). *Defining reference conditions and setting class boundaries in ecological monitoring and assessment. – REFCOND discussion paper for evaluation of techniques*. University of Agricultural Sciences, Department of Environmental Assessment, Sweden.

Jolović, B., Merdan, S. (2007). *General Status Of Groundwater Management In Danube Basin And Other River Basins-Bosnia and Herzegovina*, Regional IWA Conference on Groundwater Management in the Danube River Basin and Other Large River Basins, 7-9 June 2007, Belgrade, Serbia.

Krajnc, U. (2007). *The Problems With Groundwater As A Main Source Of Potable Water In The Republic Of Slovenia.* Regional IWA Conference on Groundwater Management in the Danube River Basin and Other Large River Basins, 7-9 June 2007, Belgrade, Serbia.

Ministarstvo regionalnog razvoja, šumarstva i vodnog gospodarstva Republike Hrvatske, *Nacrt plana upravljanja vodnim područjima*, Zagreb, Croatia. http://www.mrrsvg.hr/default.aspx?id=691

Owen, R., Duncan, W. & Pollard, P. (2001). *Definition and Establishment of Reference Conditions. - REFCOND discussion paper for evaluation of techniques*. Scottish Environment Protection Agency, Aberdeen, Scotland.

Pekaš, Ž., Čupić, D. (2007). *General Status Of Groundwater Management In Croatia*, Regional IWA Conference on Groundwater Management in the Danube River Basin and Other Large River Basins, The Drinking Water Directive (98/83/EC), 7-9 June 2007, Belgrade, Serbia.

Uradni list RS, *Slovenian national RBMP*. Št. 61/2011z dne 29. 7. 2011, Ljubljana, Slovenia. http://www.uradni-list.si/1/objava.jsp?urlid=201161&stevilka=2891.

Vlada Republike Hrvatske, *Uredba o proglašenju ekološke mreže,* NN (109/07)

WFD CIS Guidance Document No. 1 (2003).*Common Implementation Strategy for the Water Framework Directive (2000/60/EC) Economics and the Environment The Implementation Challenge of the Water Framework Directive WATECO.* Directorate General Environment of the European Commission, Brussels, Belgium.

WFD CIS Guidance Document No. 5 (2003). *Transitional and Coastal Waters – Typology, Reference Conditions and Classification Systems (2000/60/EC).* Directorate General Environment of the European Commission, Brussels, Belgium.

WFD CIS Guidance Document No. 8 (2003). *Public Participation in Relation to the Water Framework Directive (2000/60/EC).* Directorate General Environment of the European Commission, Brussels, Belgium.

WFD CIS Guidance Document No. 10 (2003). *Rivers and Lakes – Typology, Reference Conditions and Classification Systems* (2000/60/EC). Working Group 2.3 – REFCOND. Directorate General Environment of the European Commission, Brussels, Belgium.

WFD CIS Guidance Document No. 13 (2003). *Overall Approach to the Classification of Ecological Status and Ecological Potential (2000/60/EC).* Working Group 2A, Directorate General Environment of the European Commission, Brussels, Belgium.

WFD CIS Guidance Document No. 19 (2000). *Guidance on surface water chemical monitoring under the water framework directive (2000/60/EC).* Directorate General Environment of the European Commission, Brussels, Belgium.

WFD CIS REFCOND Guidance. *Guidance on establishing reference conditions and ecological status class boundaries for inland surface waters (2000/60/EC).* CIS Working Group 2.3. Directorate General Environment of the European Commission, Brussels, Belgium.

WFD CIS Guidance Document No. 20 (2009). *Common Implementation Strategy for the Water Framework Directive (2000/60/EC).* Guidance document on exemptions to the environmental objectives. Directorate General Environment of the European Commission, Brussels, Belgium

Annexes

Annex 1

List of the Sava River Basin competent authorities and national institutions responsible for implementation of the FASRB

List of the Sava River Basin competent authorities and national institutions responsible for implementation of the FASRB

Bosnia and Herzegovina
Ministry of Communications and Transport of Bosnia and Herzegovina
Trg Bosne i Herzegovine 1
71 000 Sarajevo
Web link: www.mkt.gov.ba

Ministry of Foreign Trade and Economic Relations of Bosnia and Herzegovina
Musala 9
71 000 Sarajevo
Web link: www.mvteo.gov.ba

Federal Ministry of Agriculture, Water Management and Forestry
Marsala Tita 15
71 000 Sarajevo
Web link: www.fmpvs.gov.ba

Ministry of Agriculture, Forestry and Water Management of the Republika Srpska
Trg Republike Srpske 1
78 000 Banja Luka
Web link: www.vladars.net

Ministry of Transport and Communications of the Republika Srpska
Trg Republike Srpske 1
78 000 Banja Luka
Web link: www.vladars.net

Federal Ministry of Transport and Communications
Brace Fejica bb
88 000 Mostar
Web link: www.fmpik.gov.ba

Ministry of Spatial Planning, Civil Engineering and Ecology of the Republika Srpska
Trg Republike Srpske 1
78 000 Banjaluka
Web link: www.vladars.net

Federal Ministry of Environment and Tourism
Alipasina 41
78 000 Sarajevo
Web link: *www.fmoit.gov.ba*

The Government of Brcko District
Bulevar Mira 1
76 100 Brcko
Web link: www.bdcentral.net

Croatia
Ministry of Agriculture
(competent authority for implementation of the Water Framework Directive also)
Ulica grada Vukovara 78
10 000 Zagreb
Web link: www.mps.hr
Web link to national RBM plan: www.voda.hr/puvp/

Ministry of Maritime Affairs, Transport and Infrastructure
Prisavlje 14
10 000 Zagreb
Web link: www.mmpi.hr

Serbia
Ministry of Agriculture, Forestry and Water Management
Nemanjina 22-26
11 000 Belgrade
Web link: www.mpt.gov.rs

Ministry of Energy, Development and Environmental Protection
Omladinskih brigada 1
11 070 Belgrade
Web link: www.merz.gov.rs/en

Ministry of Transport
Nemanjina 22 - 26
11 000 Belgrade
Web link: www.ms.gov.rs

Ministry of Foreign Affairs
Kneza Milosa 24 – 26
11 000 Belgrade
Web link: www.mfa.gov.rs

Republic Hydrometeorological Service of Serbia
Kneza Viseslava 66
11 000 Belgrade
Web link: www.hidmet.gov.rs

Republic Geodetic Authority
Bulevar Vojvode Misica 39
11 000 Belgrade
Web link: www.rgz.gov.rs

Slovenia
Ministry of Foreign Affairs
Presernova cesta 25
1001 Ljubljana
Web link: www.mzz.gov.si

Ministry of the Agriculture and the Environment
(competent authority for implementation of the Water Framework Directive also)
Dunajska cesta 22
1000 Ljubljana
Web link: www.mko.gov.si
Web link to national RBM plan:
www.arhiv.mop.gov.si/si/delovna_podrocja/voda/nacrt_upravljanja_voda_za_vodni_obmocji_donave_in_jadranskega_morja_2009_2015/nuv_besedilni_in_kartografski_del

Ministry of Economic Development and Technology
Kotnikova 5
1001 Ljubljana
Web link: www.mgrt.gov.si

Ministry of Infrastructure and Spatial Planning
Langusova 4
1535 Ljubljana
Web link: www.mzip.gov.si

Montenegro*
Ministry of Agriculture and Rural Developmentt
Rimski trg 46
81 000 Podgorica
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: Multilateral treaties and agreements relevant for the Sava River Basin

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)	•				•				•
15	***Framework Agreement on the Sava River Basin*** (Kranjska Gora, 2002)	•		•		•		•		•
16	***Protocol on the navigation regime to the Framework Agreement on the Sava River Basin*** (Kranjska Gora, 2002)	•		•		•		•		•
17	***Protocol on prevention of the water pollution caused by navigation to the Framework Agreement on the Sava River Basin*** (Beograd 2009)	–	•			•		•	•	
18	***Protocol on flood protection to the Framework Agreement on the Sava River Basin*** (Gradiška 2010)	–	•		•		•	•	•	

Notes: S – signed; R – ratified

Bilateral agreements of importance for the Sava River Basin in the light of the Article 29 paragraph 3 of the *FASRB* are listed in Table 2 – Table 5.

Table 2: 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	Oct. 25, 1996		Mar. 19, 1998
Rulebook of the Permanent Croatian – Slovenian Commission for water management	Oct. 25, 1996		Mar. 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 civic disasters	Sept. 22, 1997		Nov. 1, 1999

Table 3: 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		Jan. 31, 1997
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	Feb. 20, 2004		Nov. 6, 2009

Table 4: Bilateral agreements between 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 Serbia on navigation on the inland waterways and its maintenance	October 13, 2009		July 30, 2010

Table 5: Bilateral agreements between the Republic of Croatia and the Republic of Montenegro

Title	Signed	Provisional enforcement	Entered into force
Agreement between the Government of the Republic of Croatia and the Government of Republic of Montenegro on water management relations	Sep. 4, 2007		Apr. 12, 2008

Annex 3

List of delineated surface water bodies and status assessment

Table 1: List of delineated surface water bodies

Name of river	Water body code	Lenght (km)	Natural Water Body	HMWB (x/c-Candidate)
SAVA	SI111VT5	23.73	x	
SAVA	SI111VT7	10.73		x
SAVA	SI1VT137	25.2	x	
SAVA	SI1VT150	9.4	x	
SAVA	SI1VT170	13		x
SAVA	SI1VT310	22.1	x	
Ljubljanica	SI14VT77	23.1	x	
Ljubljanica	SI14VT93	4.6		x
Ljubljanica	SI14VT97	12.3	x	
SAVA	SI1VT519	25.7	x	
SAVA	SI1VT557	31.2	x	
Savinja	SI16VT17	44.6	x	
Savinja	SI16VT70	24.5	x	
Savinja	SI16VT97	24.5	x	
SAVA	SI1VT713	17.2		x
SAVA	SI1VT739	17	x	
SAVA	SI1VT913	21.6	x	
SAVA	SI1VT930	3.7	x	
Krka	SI18VT31	29.3	x	
Krka	SI18VT77	26.1	x	
Krka	SI18VT97	39.3	x	
Sotla/Sutla	SI192VT1	31.1	x	
	DSRI190002	11.27		c
	DSRI190003	21.74	x	
Sotla/Sutla	SI192VT5	58.60	x	
	DSRI190001	55.11	x	
Krapina	DSRN180003	22.35	x	
Krapina	DSRN180002	15.39		c
Krapina	DSRN180001	22.13		c
SAVA	DSRI010010	4.64	x	
SAVA	DSRN010009	9.48	x	
SAVA	DSRN010008	41.09		c
SAVA	DSRN010007	66.47		c
SAVA	DSRN010006	51.03		c
Kupa/Kolpa	SI21VT13	21.3	x	
	DSRI020003	19.86	x	
Kupa/Kolpa	SI21VT50	103.34	x	
	DSRI020004	85	x	
Kupa/Kolpa	SI21VT70	12	x	
Kupa/Kolpa	DSRN020002	10.54	x	
Kupa/Kolpa	DSRN020001	28.68	x	
Kupa/Kolpa	DSRN935009	133.41	x	
Dobra	DSRN420001	44.47	x	
Dobra	DSRN340001	29.12	x	
Dobra	DSRN020001	22.86	x	
Korana	DSRI330004	23.36	x	
	BA_KOR_1	23.36	x	
Korana	DSRN330003	45.25	x	
Korana	DSRN330002	24.37	x	

Name of river	Water body code	Lenght (km)	Natural Water Body	HMWB (x/c-Candidate)
Korana	DSRN330001	26.93	x	
Glina	DSRN320006	7.98	x	
Glina	DSRN320005	20.11	x	
Glina	DSRN320004	2.55	x	
Glina	DSRI320003	27.94	x	
Glina	DSRN320002	26.85	x	
Glina	DSRN320001	26.88	x	
SAVA	DSRN010005	25.56		c
SAVA	DSRI010004	89.00		c
	BA_SA_3	89.00	x	
Ilova	DSRN155046	4.52	x	
Ilova	DSRN155020	31.61		c
Ilova	DSRN150001	43.39		c
Una	BA_UNA_4	12.00	x	
	DSRI030004	15.26	x	
Una	BA_UNA_3	55.70	x	
	DSRI030003	35.91	x	
Una	BA_UNA_2	57.34	x	
	DSRI030002	12.92	x	
Una	BA_UNA_1	70.54	x	
	DSRI030001	70.87	x	
Sana	BA_UNA_SAN_5	16.50	x	
Sana	BA_UNA_SAN_4	35.8	x	
Sana	BA_UNA_SAN_3	17.8	x	
Sana	BA_UNA_SAN_2	36.4	x	
Sana	BA_UNA_SAN_1	34.68	x	
Lonja	DSRN160001	33.73	x	
Česma	DSRN165051	32.78	x	
Česma	DSRN165034	21.05		c
Česma	DSRN165011	26.83		c
Glogovnica	DSRN165080	24.00	x	
Glogovnica	DSRN165042	25.75	x	
Vrbas	BA_VRB_8	12	x	
Vrbas	BA_VRB_7	51	x	
Vrbas	BA_VRB_6	27	x	
Vrbas	BA_VRB_5	17		x
Vrbas	BA_VRB_4	18		x
Vrbas	BA_VRB_3	26.79		x
Vrbas	BA_VRB_2	17.27	x	
Vrbas	BA_VRB_1	73.68		x
Pliva	BA_VRB_PLIVA_4	9.78	x	
Pliva	BA_VRB_PLIVA_3	11.96	x	
Pliva	BA_VRB_PLIVA_2	6.81		x
Pliva	BA_VRB_PLIVA_1	2.9	x	
Orljava	DSRN130003	6.79	x	
Orljava	DSRN130002	37.32	x	
Orljava	DSRN130001	31.01	x	
SAVA	DSRI010003	50.48		c
	BA_SA_2	89.75		x/c
SAVA	DSRI010002	62.72		c
SAVA	DSRI010001	105.33		c
	BA_SA_1	141.00		x/c
SAVA	RS_SA_3	34.08		c

Name of river	Water body code	Lenght (km)	Natural Water Body	HMWB (x/c-Candidate)
Ukrina	BA_UKR_2	17.74	x	
Ukrina	BA_UKR_1	63.16	x	
Bosna	BA_BOS_7	7	x	
Bosna	BA_BOS_6	22.7	x	
Bosna	BA_BOS_5	48.2	x	
Bosna	BA_BOS_4	34.5	x	
Bosna	BA_BOS_3	36.9	x	
Bosna	BA_BOS_2	46.4	x	
Bosna	BA_BOS_1	79.63	x	
Lašva	BA_BOS_LAS_5	2.1	x	
Lašva	BA_BOS_LAS_4	22.3	x	
Lašva	BA_BOS_LAS_3	11.7	x	
Lašva	BA_BOS_LAS_2	8.8	x	
Lašva	BA_BOS_LAS_1	10.3	x	
Tinja	BA_SA_TIN_4	25.2	x	
Tinja	BA_SA_TIN_3	18.6	x	
Tinja	BA_SA_TIN_2	20.6	x	
Tinja	BA_SA_TIN_1	23.7	x	
Krivaja	BA_BOS_KRI_4	4.7	x	
Krivaja	BA_BOS_KRI_3	7.4	x	
Krivaja	BA_BOS_KRI_2	59	x	
Krivaja	BA_BOS_KRI_1	3.82	x	
Spreča	BA_BOS_SPR_4	11.53	x	
Spreča	BA_BOS_SPR_3	50.3	x	
Spreča	BA_BOS_SPR_2	6.6		x
Spreča	BA_BOS_SPR_1	73.1	x	
Bosut	DSRN110005	14.27	x	
Bosut	DSRN110004	10.92	x	
Bosut	DSRN110003	47.31	x	
Bosut	DSRI110002	22.19	x	
	DSRI110001	7.83	x	
	RS_BOS	38		x
Drina	BA_DR_7	21.08	x	
Drina	BA_DR_6	27.5		x/c
Drina	BA_DR_5	42.5		x
Drina	BA_DR_4	56.8		x
	RS_DR_4	56.8		x
Drina	BA_DR_3	79.5		x
	RS_DR_3	79.5		x
Drina	BA_DR_2	29		x
	RS_DR_2	29		x
Drina	BA_DR_1	91		x
	RS_DR_1	91		x
Piva	ME_PIV_2	34	x	
Piva	ME_PIV_1	9.5	x	
Tara	ME_TAR_2	109.76	x	
Tara	ME_TAR_1	24.44	x	
	BA_DR_TAR_1	24.44	x	
Ćehotina	ME_CECH_3	27.5	x	
Ćehotina	ME_CECH_2	10.5	x	
Ćehotina	ME_CECH_1	55	x	
Ćehotina	BA_DR_CECH_1	25.66	x	
Prača	BA_DR_PRA_5	13.76	x	

Name of river	Water body code	Lenght (km)	Natural Water Body	HMWB (x/c-Candidate)
Prača	BA_DR_PRA_4	18.35	x	
Prača	BA_DR_PRA_3	12.55	x	
Prača	BA_DR_PRA_2	3.33	x	
Prača	BA_DR_PRA_1	14.68	x	
Lim	ME_LIM_1	42	x	
Lim	ME_LIM_2	43.5	x	
Lim	RS_LIM_4	82	x	
Lim	RS_LIM_3	40		x
Lim	RS_LIM_2	26.23	x	
Lim	RS_LIM_1	44.77	x	
	BA_LIM_1	44.77	x	
Uvac	RS_UV_7	21.8	x	
Uvac	RS_UV_6	22		x
Uvac	RS_UV_5	18.1		x
Uvac	RS_UV_4	12		x
Uvac	RS_UV_3	8.3	x	
Uvac	RS_UV_2	27.33	x	
Uvac	RS_UV_1	8.17	x	
	BA_DR_LIM_UVA_1	8.17	x	
Drinjača	BA_DRNJ_7	3.4	x	
Drinjača	BA_DRNJ_6	17.2	x	
Drinjača	BA_DRNJ_5	10.8	x	
Drinjača	BA_DRNJ_4	13.31	x	
Drinjača	BA_DRNJ_3	33.5	x	
Drinjača	BA_DRNJ_2	7.5	x	
Drinjača	BA_DRNJ_1	4.29	x	
SAVA	RS_SA_2	77	x	
SAVA	RS_SA_1	102		x
Kolubara	RS_KOL_6	5.2		x
Kolubara	RS_KOL_5	7.1	x	
Kolubara	RS_KOL_4	24.6	x	
Kolubara	RS_KOL_3	25.6		x
Kolubara	RS_KOL_2	11.2	x	
Kolubara	RS_KOL_1	13		x

Table 2: Status assessment of surface water bodies

		Biological Quality Elements						HyMo		Specific pollutants				Artificial and HMWB			Chemical Status Class		Main Pressure			
River	**Water body code**	**Fish**	**Benthic invertebrates**	**Phytobenthos and Macrophytes**	**Phytoplankton**	**Overall Biological Status**	Confidence (Overall Biological Status)	**Hydromorphology - High Status (Y/N)**	**General Physical and Chemical conditions**	**Other WB Specific pollutants** (for Ecological Status Evaluation)	Confidence (Specific pollutants)	**OVERALL ECOLOGICAL STATUS**	Confidence class (Overall Ecol.Status)	**Artificial Water Body (Y/N)**	**HMWB (Y/N/Candidate (C))**	**Ecological Potential Class**	**CHEMICAL STATUS CLASS**	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations
SAVA	SI111VT5		2	2		2	L		1	2	H	2	L				2	H				
SAVA	SI111VT7		3	4		4	L		2	2	H				Y	3	2	H				
SAVA	SI1VT137		3	1		3	L		2	2	H	3	L				2	M				
SAVA	SI1VT150		1	2		2	L		2	2	H	2	L				2	M				
SAVA	SI1VT170		3	2		3	L		2	2	M				Y	3	2	H				x
SAVA	SI1VT310		3	2		3	L		2	2	H	3	L				2	H				
Ljubljanica	SI14VT77		2	2		2	L		2	2	H	2	L				2	M				
Ljubljanica	SI14VT93		2	3		3	L		2	2	H				Y	3	2	M				x
Ljubljanica	SI14VT97		2	3		2	L		2	2	H	3	L				2	H				
SAVA	SI1VT519		2	3		3	L		2	2	H	3	L				2	H				
SAVA	SI1VT557		1	3		3	L		2	2	H	3	L				2	H				
Savinja	SI16VT17		2	1		2	L		1	2	H	2	L				2	M				
Savinja	SI16VT70		2	1		2	L		2	2	H	2	L				2	M				
Savinja	SI16VT97		2	1		2	L		2	2	H	2	L				2	H				
SAVA	SI1VT713		3	2		3	L		2	2	M				Y	3	3	H				x
SAVA	SI1VT739		1	2		2	L		2	2	H	2	L				2	M				x
SAVA	SI1VT913		2	2		2	L		2	2	H	2	L				2	M				

River	Water body code	Biological Quality Elements: Fish	Benthic invertebrates	Phytobenthos and Macrophytes	Phytoplankton	Overall Biological Status	Confidence (Overall Biological Status)	HyMo: Hydromorphology - High Status (Y/N)	General Physical and Chemical conditions	Specific pollutants: Other WB Specific pollutants (for Ecological Status Evaluation)	Confidence (Specific pollutants)	OVERALL ECOLOGICAL STATUS	Confidence class (Overall Ecol.Status)	Artificial and HMWB: Artificial Water Body (Y/N)	HMWB (Y/N/Candidate (C))	Ecological Potential Class	Chemical Status Class: CHEMICAL STATUS CLASS	Confidence class (Chemical Status)	Main Pressure: Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations
SAVA	SI1VT930		2	2		2	L		2	2	H	2	L				2	M				
Krka	SI18VT31		1	1		1	L		2	2	H	2	L				2	M				
Krka	SI18VT77		1	1		1	L		1	2	H	1	L				3	H				
Krka	SI18VT97		1	2		2	L		2	2	H	2	L				2	H				
Sotla/Sutla	SI192VT1		4	3		4	L		2	3	H	4	L				2	M				
	DSRI190002							N	2**			3*	**L**	N	C***		2*	L				x
	DSRI190003							N	2**			2*	**L**	N	N		2*	L				
Sotla/Sutla	SI192VT5		2	1		2	L		2	2	H	2	L				2	H				
	DSRI190001							N	2**			2*	**L**	N	N		2*	L				
Krapina	DSRN180003							N	3**			3*	**L**	N	N		2*	L		x		
Krapina	DSRN180002							N	3**			3*	**L**	N	C***		3*	L		x	x	
Krapina	DSRN180001							N	2**			2*	L	N	C***		2*	L				
SAVA	DSRI010010							N	3**			3*	L	N	N		2	L		x		
SAVA	DSRN010009							N	2**			2*	L	N	N		2	L				
SAVA	DSRN010008							N	2**			3*	L	N	C***		2	L				x
SAVA	DSRN010007							N	2**			4*	L	N	C***		2	L				x
SAVA	DSRN010006							N	2**			3*	L	N	C***		2	L				x
Kupa/Kolpa	SI21VT13		1	1		1	L		1	2	H	1	L				2	H				
	DSRI020003							N	1**			1*	L	N	N		3*	L			x	

		Biological Quality Elements						HyMo		Specific pollutants				Artificial and HMWB			Chemical Status Class		Main Pressure			
River	**Water body code**	**Fish**	**Benthic invertebrates**	**Phytobenthos and Macrophytes**	**Phytoplankton**	**Overall Biological Status**	Confidence (Overall Biological Status)	**Hydromorphology - High Status (Y/N)**	**General Physical and Chemical conditions**	**Other WB Specific pollutants** (for Ecological Status Evaluation)	Confidence (Specific pollutants)	**OVERALL ECOLOGICAL STATUS**	Confidence class (Overall Ecol.Status)	**Artificial Water Body (Y/N)**	**HMWB (Y/N/Candidate (C))**	**Ecological Potential Class**	**CHEMICAL STATUS CLASS**	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations
Kupa/Kolpa	SI21VT50		1	3		3	L		2	2	H	3	L				2	H				
	DSRI020004							N	1**			2*	L	N	N		2*	L				
Kupa/Kolpa	SI21VT70		2	2		2	L		2	2	H	2	L				2	H				
Kupa/Kolpa	DSRN020002							N	1**			1*	L				3*	L			x	
Kupa/Kolpa	DSRN020001							N	1**			1*	L				3*	L			x	
Kupa/Kolpa	DSRN935009							N	1**			2*	L	N	N		2*	L				
Dobra	DSRN420001							N	1**			2*	L	N	N		2*	L				
Dobra	DSRN340001							N	1**			4*	L	N	N		3*	L			x	x
Dobra	DSRN020001							N	1**			1*	L	N	N		3*	L			x	
Korana	DSRI330004							N	1**			1*	L				2*	L				
	BA_KOR_1																					
Korana	DSRN330003							N	1**			1*	L	N	N		2*	L				
Korana	DSRN330002							N	1**			2*	L	N	N		2*	L				
Korana	DSRN330001							N	1**			1*	L	N	N		2*	L				
Glina	DSRN320006							N	2**			2*	L	N	N		2*	L				
Glina	DSRN320005							N	2**			2*	L	N	N		2*	L				
Glina	DSRN320004							N	2**			2*	L	N	N		2*	L				
Glina	DSRI320003							N	2**			2*	L	N	N		2*	L				
Glina	DSRN320002							N	2**			2*	L	N	N		2*	L				

		Biological Quality Elements						HyMo		Specific pollutants				Artificial and HMWB			Chemical Status Class		Main Pressure			
River	**Water body code**	**Fish**	**Benthic invertebrates**	**Phytobenthos and Macrophytes**	**Phytoplankton**	**Overall Biological Status**	Confidence (Overall Biological Status)	**Hydromorphology - High Status (Y/N)**	**General Physical and Chemical conditions**	**Other WB Specific pollutants** (for Ecological Status Evaluation)	Confidence (Specific pollutants)	**OVERALL ECOLOGICAL STATUS**	Confidence class (Overall Ecol.Status)	**Artificial Water Body (Y/N)**	**HMWB (Y/N/Candidate (C))**	**Ecological Potential Class**	**CHEMICAL STATUS CLASS**	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations
Glina	DSRN320001							N	2**			2*	L	N	N		2*	L				
SAVA	DSRN010005							N	2**			3*	L	N	C***		3*	L			x	x
SAVA	DSRI010004							N	2**			3*	L	N	C***		2*	L				x
	BA_SA_3		2		2	2	M	N	3	1	M	2	M	N	N		2	M				
Ilova	DSRN155046							N	2**			2*	L	N	N		2*	L				
Ilova	DSRN155020							N	2**			3*	L	N	C***		2*	L				x
Ilova	DSRN150001							N	3**			3*	L	N	C***		2*	L	x	x		
Una	BA_UNA_4											1	L	N	N		2	L				
	DSRI030004							N	1**			1*	L	N	N		2*	L				
Una	BA_UNA_3											2	L	N	N		2	L	R	R		
	DSRI030003							N	1**			1*	L	N	N		2*	L				
Una	BA_UNA_2		2		2	2	M	N	2	1	M	2	M	N	N		2	L		x		
	DSRI030002							N	2**			2*	L	N	N		2*	L				
Una	BA_UNA_1		2		2	2	M	N	2	3	M	3	M	N	N		2	M			x	
	DSRI030001							N	1**			2*	L	N	N		2*	L				
Sana	BA_UNA_SAN_5		3		2	3	M	N	2	1	M	3	M	N	N		2	M	x			
Sana	BA_UNA_SAN_4		3		2	3	M	N	2	1	M	3	M	N	N		2	M	x			
Sana	BA_UNA_SAN_3											2	L				2	L				
Sana	BA_UNA_SAN_2		2		2	2	M	N	3	1	M	2	M	N	N		2	M	x	x		

		Biological Quality Elements						HyMo		Specific pollutants				Artificial and HMWB			Chemical Status Class		Main Pressure			
River	**Water body code**	**Fish**	**Benthic invertebrates**	**Phytobenthos and Macrophytes**	**Phytoplankton**	**Overall Biological Status**	Confidence (Overall Biological Status)	**Hydromorphology - High Status (Y/N)**	**General Physical and Chemical conditions**	**Other WB Specific pollutants** (for Ecological Status Evaluation)	Confidence (Specific pollutants)	**OVERALL ECOLOGICAL STATUS**	Confidence class (Overall Ecol.Status)	**Artificial Water Body (Y/N)**	**HMWB (Y/N/Candidate (C))**	**Ecological Potential Class**	**CHEMICAL STATUS CLASS**	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations
Sana	BA_UNA_SAN_1		2		2	2	M	N	3	1	M	2	M	N	N		2	M	x	x		
Lonja	DSRN160001							N	3**			3*	L	N	N		2*	L	x	x		
Česma	DSRN165051							N	3**			3*	L	N	N		2*	L	x	x		
Česma	DSRN165034							N	3**			3*	L	N	C***		2*	L	x	x		x
Česma	DSRN165011							N	3**			3*	L	N	C***		2*	L	x	x		x
Glogovnica	DSRN165080							N	2**			2*	L	N	N		2*	L				
Glogovnica	DSRN165042							N	4**			4*	L	N	N		2*	L		x		x
Vrbas	BA_VRB_8											2	L				2	L				x
Vrbas	BA_VRB_7											3	L				3	L		x	x	
Vrbas	BA_VRB_6											3	L				2	L		x		
Vrbas	BA_VRB_5											1	L		Y		2	L				x
Vrbas	BA_VRB_4		3		2	3	L	N	2	1	L	3	L		Y		2	L	x	x		x
Vrbas	BA_VRB_3		3		2	3	M	N	2	1	M	3	M		Y	2	2	M	x			x
Vrbas	BA_VRB_2		3		2	3	M	N	2	1	M	3	M		N		2	M	x			x
Vrbas	BA_VRB_1		3		2	3	M	N	3	1	M	3	M		Y	3	2	M	x	x		x
Pliva	BA_VRB_PLIVA_4		3		2	3	M	N	2	1	M	3	M		N		2	M	x			
Pliva	BA_VRB_PLIVA_3		3		2	3	M	N	2	1	M	3	M		N		2	M	x			
Pliva	BA_VRB_PLIVA_2											2	L		Y		2	L				x
Pliva	BA_VRB_PLIVA_1											3	L				2	L		x		

		Biological Quality Elements						HyMo		Specific pollutants				Artificial and HMWB			Chemical Status Class		Main Pressure			
River	**Water body code**	**Fish**	**Benthic invertebrates**	**Phytobenthos and Macrophytes**	**Phytoplankton**	**Overall Biological Status**	Confidence (Overall Biological Status)	**Hydromorphology - High Status (Y/N)**	**General Physical and Chemical conditions**	**Other WB Specific pollutants** (for Ecological Status Evaluation)	Confidence (Specific pollutants)	**OVERALL ECOLOGICAL STATUS**	Confidence class (Overall Ecol.Status)	**Artificial Water Body (Y/N)**	**HMWB (Y/N/Candidate (C))**	**Ecological Potential Class**	**CHEMICAL STATUS CLASS**	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations
Orliava	DSRN130003							N	1**			1*	L	N	N		2*	L				
Orliava	DSRN130002							N	2**			2*	L	N	N		2*	L				
Orliava	DSRN130001							N	3**			3*	L	N	N		2*	L	x	x		
SAVA	DSRI010003							N	2**			4*	L	N	C***		2*	L				x
	BA_SA_2		3		2	3	M	N	3	1	M	3	M	N	C		2	M	x	x	x	X
SAVA	DSRI010002							N	2**			4*	L	N	C***		2*	L				x
SAVA	DSRI010001							N	2**			4*	L	N	C***		2*	L				x
	BA_SA_1		3		2	3	M	N	3	1	M	3	M	N	C		2	M	x	x	x	X
SAVA	RS_SA_3		3		2	3	M	N	2	3	M	3	M	N	C	2	3	M	x	x	x	X
Ukrina	BA_UKR_2		3		2	3	M	N	3	2	M	3	M	N	N		2	M	x	x		
Ukrina	BA_UKR_1		3		2	3	M	N	3	2	M	3	M	N	N		2	M	x	x		x
Bosna	BA_BOS_7											3	L				2	L	x	x		
Bosna	BA_BOS_6											3	L				2	L	x	x		
Bosna	BA_BOS_5											3	L				3	L	x	x	x	
Bosna	BA_BOS_4											3	L				3	L		x	x	
Bosna	BA_BOS_3											3	L				2	L		x		
Bosna	BA_BOS_2											3	L				2	L	x	x		
Bosna	BA_BOS_1		3		2	3	M	N	3	2	M	3	M	N	N		2	M	x	x	x	x
Lašva	BA_BOS_LAS_5											2	L				2	L				

		Biological Quality Elements						HyMo	General Physical and Chemical conditions	Specific pollutants		OVERALL ECOLOGICAL STATUS	Confidence class (Overall Ecol.Status)	Artificial and HMWB			Chemical Status Class		Main Pressure			
River	Water body code	Fish	Benthic invertebrates	Phytobenthos and Macrophytes	Phytoplankton	Overall Biological Status	Confidence (Overall Biological Status)	Hydromorphology - High Status (Y/N)		Other WB Specific pollutants (for Ecological Status Evaluation)	Confidence (Specific pollutants)			Artificial Water Body (Y/N)	HMWB (Y/N/Candidate (C))	Ecological Potential Class	CHEMICAL STATUS CLASS	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations
Lašva	BA_BOS_LAS_4											2	L				2	L	x	x		
Lašva	BA_BOS_LAS_3											2	L				2	L				
Lašva	BA_BOS_LAS_2											2	L				2	L				
Lašva	BA_BOS_LAS_1											2	L				2	L				
Tinja	BA_SA_TIN_4																					
Tinja	BA_SA_TIN_3																					
Tinja	BA_SA_TIN_2																					
Tinja	BA_SA_TIN_1																					
Krivaja	BA_BOS_KRI_4											3	L				2	L		x		
Krivaja	BA_BOS_KRI_3											2	L				2	L				
Krivaja	BA_BOS_KRI_2											2	L				2	L				
Krivaja	BA_BOS_KRI_1											1	L				2	L				
Spreča	BA_BOS_SPR_4																					
Spreča	BA_BOS_SPR_3											4	L				3	L	x	x	x	
Spreča	BA_BOS_SPR_2		3		2	3	L	N	3	3	M	3	L		Y		2	L	x	x		x
Spreča	BA_BOS_SPR_1		3		2	3	M	N	3	3	M	3	M	N	N		2	M	x	x	x	
Bosut	DSRN110005							N	3**			3*	L	Y	N		2*	L	x			
Bosut	DSRN110004							N	4**			4*	L	N	N		2*	L	x	x		
Bosut	DSRN110003							N	4**			4*	L	N	N		2*	L	x	x		

		Biological Quality Elements						HyMo		Specific pollutants				Artificial and HMWB			Chemical Status Class		Main Pressure			
River	**Water body code**	**Fish**	**Benthic invertebrates**	**Phytobenthos and Macrophytes**	**Phytoplankton**	**Overall Biological Status**	Confidence (Overall Biological Status)	**Hydromorphology - High Status (Y/N)**	**General Physical and Chemical conditions**	**Other WB Specific pollutants** (for Ecological Status Evaluation)	Confidence (Specific pollutants)	**OVERALL ECOLOGICAL STATUS**	Confidence class (Overall Ecol.Status)	**Artificial Water Body (Y/N)**	**HMWB (Y/N/Candidate (C))**	**Ecological Potential Class**	**CHEMICAL STATUS CLASS**	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations
Bosut	DSRI110002							N	4**			4*	L	N	N		2*	L	x	x		
	DSRI110001							N	4**			4*	L	N	N		2*	L	x	x		
	RS_BOS		4		2	4	L	N	3			4	L	N	Y	2	3	L	x	x		x
Drina	BA_DR_7		3		2	3	M	N	3	1	M	3	M		N		2	M	x	x		x
Drina	BA_DR_6		2		2	2	L	N	3	1	M	3	L		C		2	L				x
Drina	BA_DR_5		2		2	2	L	N	3	1	M	3	L		Y		2	L			x	x
Drina	BA_DR_4		2		2	2	M	N	3	1	M	2	M		Y	2	2	M	x			x
	RS_DR_4		3		3	2	L	N	2			3	L	N	Y	2	3	L	x	x		x
Drina	BA_DR_3		2		2	2	M	N	3	1	M	2	M		Y	2	2	M	x			x
	RS_DR_3		3		2	3	L	N	2			3	L	N	Y	2	2	L				x
Drina	BA_DR_2		2		2	2	M	N	3	1	M	2	M		Y	2	2	M	x			x
	RS_DR_2		3		2	3	L	N	2			3	L	N	Y	2	2	L		x		x
Drina	BA_DR_1		2		2	2	M	N	3	1	M	2	M		Y	2	3	L	x	x	x	x
	RS_DR_1		3		2	3	L	N	2			3	L	N	Y	2	2	L		x		x
Piva	ME_PIV_2											2	L				2	L	R			
Piva	ME_PIV_1											2	L				2	L	R			
Tara	ME_TAR_2											2	L				2	L	R			
Tara	ME_TAR_1											2	L				2	L	R			
	BA_DR_TAR_1		1		1	1	M	Y	2	1	M	1	M	N	N		2	M				

		Biological Quality Elements						HyMo		Specific pollutants				Artificial and HMWB			Chemical Status Class		Main Pressure			
River	**Water body code**	**Fish**	**Benthic invertebrates**	**Phytobenthos and Macrophytes**	**Phytoplankton**	**Overall Biological Status**	Confidence (Overall Biological Status)	**Hydromorphology - High Status (Y/N)**	**General Physical and Chemical conditions**	**Other WB Specific pollutants** (for Ecological Status Evaluation)	Confidence (Specific pollutants)	**OVERALL ECOLOGICAL STATUS**	Confidence class (Overall Ecol.Status)	**Artificial Water Body (Y/N)**	**HMWB (Y/N/Candidate (C))**	**Ecological Potential Class**	**CHEMICAL STATUS CLASS**	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations
Ćehotina	ME_CECH_3											2	L				2	L				
Ćehotina	ME_CECH_2											3	L				3	L	P	P	P	R
Ćehotina	ME_CECH_1											3	L				3	L	R	P	P	R
Ćehotina	BA_DR_CECH_1		2		2	2	M	Y	3	1	M	2	M	N	N		3	M	x	x	x	
Prača	BA_DR_PRA_5		3		2	3	M	N	4	1	M	4	M	N	N		2	M	x	x		
Prača	BA_DR_PRA_4		3		2	3	L	N	4	1	M	4	L				2	L	x	x		
Prača	BA_DR_PRA_3		2		2	2	L	N	1	1	M	2	L				2	L				
Prača	BA_DR_PRA_2		2		2	2	M	N	1	1	M	2	M	N	N		2	M				
Prača	BA_DR_PRA_1		2		2	2	M	N	1	1	M	2	M	N	N		2	M				
Lim	ME_LIM_1											2	L				2	L	R	R		R
Lim	ME_LIM_2											3	L				3	L	P	P	P	
Lim	RS_LIM_4		2	2		2	L	N				2	L	N	N		3	L	x		x	
Lim	RS_LIM_3		3	2		3	L	N	2			3	L	N	N		3	L	x		x	x
Lim	RS_LIM_2		3		2	3	L	N				3	L	N	Y	2	3	L	x			
Lim	RS_LIM_1		3	2		3	L	N	2			3	L	N	N		3	L	x		x	
	BA_LIM_1		3		2	3	M	N	3	1	M	3	M	N	N		2	M	x	x		
Uvac	RS_UV_7		2	2		2	L		2			2	L	N	N							
Uvac	RS_UV_6		3		2	3	L	N	2			3	L	N	Y	2			x			x
Uvac	RS_UV_5		4		2	4	L	N	2			4	L	N	Y	3			x	x		x

		Biological Quality Elements						HyMo		Specific pollutants				Artificial and HMWB			Chemical Status Class		Main Pressure			
River	**Water body code**	**Fish**	**Benthic invertebrates**	**Phytobenthos and Macrophytes**	**Phytoplankton**	**Overall Biological Status**	Confidence (Overall Biological Status)	**Hydromorphology - High Status (Y/N)**	**General Physical and Chemical conditions**	**Other WB Specific pollutants** (for Ecological Status Evaluation)	Confidence (Specific pollutants)	**OVERALL ECOLOGICAL STATUS**	Confidence class (Overall Ecol.Status)	**Artificial Water Body (Y/N)**	**HMWB (Y/N/Candidate (C))**	**Ecological Potential Class**	**CHEMICAL STATUS CLASS**	Confidence class (Chemical Status)	Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations
Uvac	RS_UV_4		3		2	3	L	N	2			3	L	N	Y	3			x	x		x
Uvac	RS_UV_3		3			3	L	N	2			3	L	N	N				x	x		x
Uvac	RS_UV_2		3			3	L		2			3	L	N	N				x	x		
Uvac	RS_UV_1		4	2		4	L	N	2			4	L	N	N		2	L	x			
Uvac	BA_DR_LIM_UVA_1											3	L				2	L	P	R	R	
Drinjača	BA_DRNJ_7											2	L				2	L	R	R	R	
Drinjača	BA_DRNJ_6											2	L				2	L	R	R	R	
Drinjača	BA_DRNJ_5											2	L				2	L	R	R	R	
Drinjača	BA_DRNJ_4											2	L				2	L	R	R	R	
Drinjača	BA_DRNJ_3		2		2	2	M	N	3	1	M	2	M	N	N		2	M	x	x		
Drinjača	BA_DRNJ_2		2		2	2	M	N	3	1	M	2	M	N	N		2	M	x	x		
Drinjača	BA_DRNJ_1		2		2	2	M	N	3	1	M	2	M	N	N		2	M	x	x		
SAVA	RS_SA_2		3		2	3	M	N	2	3	M	3	M	N	N		3	M	x	x	x	x
SAVA	RS_SA_1		3	2	2	2	M	N	2	3	M	3	M	N	Y	2	3	M	x	x	x	x
Kolubara	RS_KOL_6		3	2		3	M	N	2			3	M	N	Y	2	2	M	x			x
Kolubara	RS_KOL_5		3	2		3	M	N	2			3	M	N	N		2	M	x			x
Kolubara	RS_KOL_4		3	2		3	M	N	3			3	M	N	N		3	M	x		x	x
Kolubara	RS_KOL_3		3	2		3	M	N	3			3	M	N	Y	2	3	M	x		x	x
Kolubara	RS_KOL_2		3	2		3	M	N	3			3	M	N	N		3	M	x		x	x

River	Water body code	Biological Quality Elements: Fish	Benthic invertebrates	Phytobenthos and Macrophytes	Phytoplankton	Overall Biological Status	Confidence (Overall Biological Status)	HyMo: Hydromorphology - High Status (Y/N)	General Physical and Chemical conditions	Specific pollutants: Other WB Specific pollutants (for Ecological Status Evaluation)	Confidence (Specific pollutants)	OVERALL ECOLOGICAL STATUS	Confidence class (Overall Ecol.Status)	Artificial and HMWB: Artificial Water Body (Y/N)	HMWB (Y/N/Candidate (C))	Ecological Potential Class	Chemical Status Class: CHEMICAL STATUS CLASS	Confidence class (Chemical Status)	Main Pressure: Organic Pollution	Nutrient Pollution	Hazardous Substances	Hydromorphological Alterations
Kolubara	RS_KOL_1		4	2	2	3	M	N	3			4	M	N	Y	2	3	M	x	x	x	x

Notes:

Ecological status assessment

Bad status (5)
Poor status (4)
Moderate status (3)
Good status (2)
High status (1)

* HR - the result corresponds to the lower of the two individual assessments (assessments of the general hydromorphological status and of the general physical-chemical status, obtained by modelling)
** Oxygenation condition (only BOD_5 and COD) and for nutrient conditions (total N and total P)
***Candidate for HMWB

Chemical status class

Failure to reach good chemical status (3)
Good chemical status (2)

For more detailed explanation of colour codes and numbers in the "Overall ecological status" and "Chemical status" see Background paper No.1.

Note:* In Croatia specific pollutants are included in the assessment of chemical status (obtained by modelling).

Main pressure

Y -at risk
P-possibly at risk
R- possibly not at risk
N-not at risk

Annex 4

List of delineated groundwater bodies and status assessment

List of delineated groundwater bodies and status assessment

No.	Country	GWB name	Code	Transboundary (Y/N)	Size [km²]	Main use	Overlying strata [m]	Risk		Status		Exemptions (Art4.4 i Art4.5)
								Quality	Quantity	Quality	Quantity	
1	SI (11)	Savska kotlina in Ljubljansko Barje	VTPodV_1001	N	774.00	DRW, IND		-	-	good	good	n/a
2		Savinjska kotlina	VTPodV_1002	N	109.00	DRW, IND		at risk	-	poor	good	n/a
3		Krška kotlina	VTPodV_1003	Y	97.00	DRW, IND		-	-	good	good	n/a
4		Julijske Alpe v porečju Save	VTPodV_1004	Y	772.00	DRW, IND		-	-	good	good	n/a
5		Karavanke	VTPodV_1005	Y	414.00	DRW, IND		-	-	good	good	n/a
6		Kamniško-Savinjske Alpe	VTPodV_1006	Y	1113.00	DRW, IND		-	-	good	good	n/a
7		Cerkljansko, Škofjeloško in Polhograjsko	VTPodV_1007	N	850.00	DRW, IND		-	-	good	good	n/a
8		Posavsko hribovje do osrednje Sotle	VTPodV_1008	Y	1792.00	DRW, IND		-	-	good	good	n/a
9		Spodnji del Savinje do Sotle	VTPodV_1009	Y	1397.00	DRW, IND		-	-	good	good	n/a
10		Kraška Ljubljanica	VTPodV_1010	Y	1307.00	DRW, IND		-	-	good	good	n/a
11		Dolenjski kras	VTPodV_1011	Y	3355.00	DRW, IND		-	-	good	good	n/a
12	HR (14)	Sliv Sutle i Krapine	DSGIKCPV_24	Y	1405.44	DRW, IND	0-600	No	No	-	-	No
13		Zagreb	DSGIKCPV_27	Y	987.52	DRW, IND	0-20	Poss	Poss	-	-	-
14		Lekenik - Lužani	DSGIKCPV_28	Y	3444.26	DRW, IND	5-80		No	good		No
15		Istočna Slavonija - Sliv Save	DSGIKCPV_29	Y	3328.12	DRW, IND	5-50		No	good		No
16		Kupa-krš	DSGIKCPV_13	Y	1026.70	DRW, IND				good	good	No
17		Sliv Korane	DSGIKCPV_16	Y	1244.71	DRW		No	No	good	good	No
18		Una-krš	DSGIKCPV_17	Y	1574.79	DRW, IND		No	No	probably good	good	No
19		Sliv Lonja - Ilova - Pakra	DSGNKCPV_25	N	5186.09	DRW, IND	7-60	No	No	-	-	No
20		Sliv Orljave	DSGNKCPV_26	N	1575.03	DRW, IND	2-13	No	No	-	-	No
21		Žumberak - Samoborsko Gorje	DSGIKCPV_30	Y	443.30	DRW		No	No	-	-	No
22		Kupa	DSGNKCPV_31	N	2870.29	DRW, IND	2-45	No	No	-	-	No
23		Una	DSGIKCPV_32	Y	540.57	DRW	5-20	No	No	-	-	No
24		Sliv Dobre	DSGNKCPV_14	N	754.55	DRW, IND		No	No	good	good	No
25		Sliv Mrežnice	DSGNKCPV_15	N	1370.92	DRW, IND		No	No	good	good	No
26	BA (7)	Plješevica	BAGW_UNA_2	Y	120.00	DRW		Poss	No	-	-	No
27		Posavina II	BAGW_SAV_2	N	1350.00	DRW,IND	5-10	Poss	No	-	-	No
28		Romanija-Devetak-Sjemeč	BAGW_BO_DRN_1	N	2050.00	DRW	<2	Poss	No	-	-	No
29		Treskavica-Zelengora-Lelija-Maglić	BAGW_DRN_1	N	1240.00	DRW	<2	Poss	No	-	-	No
30		Manjača-Čemernica-Vlašić	BAGW_VRB_1	N	1800.00	DRW	<2	Poss	No	-	-	No

No.	Country	GWB name	Code	Transboundary (Y/N)	Size [km^2]	Main use	Overlying strata [m]	Risk		Status		Exemptions (Art4.4 i Art4.5)
								Quality	Quantity	Quality	Quantity	
31		Grmeč-Srnetica-Lunjevača-Vitorog	BAGW_VRB_UNA_7	N	3770.00	DRW	<2	Poss	No	-	-	No
32		Unac	BA_UNAC_UNA_1	N	1720.00	DRW		Poss	No	-	-	No
33	RS (5)	Istocni Srem - OVK	RS_SA_GW_I_2	N	1593.65	DRW, IND, IRR	2-50	Poss	No	-	-	n/a
34		Macva - OVK	RS_SA_GW_I_3	N	763.41	DRW, IND, IRR	1-22	Poss	No	-	-	n/a
35		Zapadni Srem - pliocen	RS_SA_GW_I_6	Y	1172.92	DRW, IND, IRR	5-90	No	Poss	-	-	n/a
36		Istocni Srem - pliocen	RS_SA_GW_I_7	N	2248.99	DRW, IND, IRR	20-90	No	Poss	-	-	n/a
37		Macva - pliocen	RS_SA_GW_I_8	N	1577.53	DRW, IND, IRR	50-190	No	No	-	-	n/a
38	ME (4)*	Sliv rijeke Pive	n/a	Y	1500.00	CAL		No	No	-	-	n/a
39		sliv rijeke Tare	n/a	Y	2000	DRW		No	No	-	-	n/a
40		sliv rijeke Ćehotine	n/a	Y	800,00	IND		No	No	-	-	n/a
41		sliv rijeke Lim	n/a	Y	2000,00	DRW		No	No	-	-	n/a

Legend:

Aquifer characterisation, aquifer type: P = porous, K = karst, F = fissured (combinations are possible)

Main use: DRW = drinking water, AGR = agriculture, IRR = irrigation, IND = industry, SPA = balneology CAL = caloric energy, OTH = other

*In ME, karstic aquifers are predominantly elevated and deep, with significant fragmentation of water bodies within them. In the scope of the preparation of Sava RBMP, the identification of GWBs in Montenegrin portion of Sava River Basin was done in a manner that groups of karstic water bodies in the river basins of Piva, Tara, Ćehotina and Lim were delineated. The boundaries of group of water bodies correspond to the boundaries of respective river basins.

COUNTRY CODE

GWB NAME: Name of the important groundwater body

CODE: Member State Code which is a unique identifier.

Transboundary GWB: Yes/No

Total size (km^2): Whole area of the groundwater body covering all countries concerned (just in case of the transboundary groundwater body)

National size (km^2): Country indicates the size on the national territory

Aquifer characterisation, aquifer type: P = porous, K = karst, F = fissured (combinations are possible)

Confined: Yes, No or Yes/No

Main use: DRW = drinking water, AGR = agriculture, IRR = irrigation, IND = industry, SPA = balneology CAL = caloric energy, OTH = other

Overlying strata (m): Range of thickness of overlaying strata in metres.

Risk: Indicates whether a groundwater body is at risk of failing good status. Quantitative (Yes, No, Poss), Chemical (Yes, No, Poss)

Status: Assessment of GWB status. Quantitative (Good, Poor, Unknown), Chemical (God, Poor, Unknown)

Annex 5

List of agglomerations in the Sava River Basin

List of agglomerations in the Sava River Basin

COUNTRY	NUMBER OF AGGLOMERATIONS	GENERATED LOAD, PE	POLLUTION, %
SIZE KATEGORY OF AGGLOMERATIONS: > 2000 PE			
SI	89	964,966	14.15
HR	104	2,442,741	35.83
BA	248	2,634,237	38.64
RS	108	698,663	0.25
ME	7	76,750	1.13
Sava RB - total	**556**	**6,817,357**	**100.00**
SIZE KATEGORY OF AGGLOMERATIONS 2000 - 10 000 PE			
SI	71	296,574	17.39
HR	76	303,212	17.78
BA	196	743,507	43.59
RS	93	345,546	20.26
ME	4	16,750	0.98
Sava RB - total	**440**	**1,705,589**	**100.00**
SIZE KATEGORY OF AGGLOMERATIONS > 10 000 PE			
SI	18	668,392	13.08
HR	28	2,139,529	41.85
BA	52	1,890,730	36.99
RS	15	353,117	6.91
ME	3	60,000	1.17
Sava RB - total	**116**	**5,111,768**	**100.00**
SIZE KATEGORY OF AGGLOMERATIONS 10 001 - 100 000 PE			
SI	17	366,099	13.78
HR	25	726,120	27.33
BA	49	1,151,230	43.34
RS	15	353,117	13.29
ME	3	60,000	2.26
Sava RB - total	**109**	**2,389,368**	**100.00**
SIZE KATEGORY OF AGGLOMERATIONS > 100 000 PE			
SI	1	302,293	12.31
HR	3	1,413,409	57.57
BA	3	739,500	30.12
RS	0	0	0.00
ME	0	0	0.00
Sava RB - total	**7**	**2,455,202**	**100.00**

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	Nain production processes	Wastewater treatment (YES/NOT)	Release to surface water (direct/indirect)	WB code	Name of recipient (river)	Pollution release to surface water, t/a				
										COD	BOD	P total	N total	Sulphates
SI	11157	Livar d.d., Obrat Črnomelj	Črnomelj	2.(d)	Production and processing of metals	Y&N	I		VT Lahinja	0.287	0.075	0.001		0.450
SI	83293	Javno podjetje komunala Črnomelj d.o.o., Odlagališče nenevarnih odpadkov Vranoviči	Črnomelj	5.(d)	Waste and waste water management				VT Lahinja	0.011	0.003			0.026
SI	83290	Javno komunalno podjetje Komunala Kočevje d.o.o., Odlagališče nenevarnih odpadkov Mozelj	Kočevje	5.(d)	Waste and waste water management				VT Rinža	12.158	0.323		1.500	3.151
SI	83223	Melamin d.d. Kočevje	Kočevje	4.(a)	Chemical industry	Y&N	I		VT Rinža	7.374	1.881	0.037	3.121	2.206
SI	83291	Komunala Metlika, javno podjetje d.o.o., Odlagališče nenevarni odpadkov Bočka	Metlika	5.(d)	Waste and waste water management				VT Kolpa Primostek – Kamanje					
SI	8880	Farme Ihan d.d., Farma Klinja vas	Kočevje	7.(a)	Intensive livestock production and aquaculture				VT Krka povirje – Soteska					
SI	10369	Kovinoplastika Lož d.d.	Stari trg pri Ložu	2.(f)	Productiona and processing of metals				VT Jezerski Obrh					
SI	83239	Liv hidravlika in kolesa, d.o.o.	Postojna	2.(f)	Productiona and processing of metals				VT Pivka Prestranek – Postojnska jama					
SI	8586	Opekarna Novo mesto d.o.o.	Novo mesto	3.1/3.3/3.4/3.5	Mineral Industry				VT Krka Soteska – Otočec					
SI	83298	ONM ENERGIJA d.o.o.	Novo mesto	5.(a)	Waste and waste water management				VT Krka Soteska – Otočec					
SI	83267	Ekosistemi d.o.o., PE Zalog	Novo mesto	5.(c)	Waste and waste water management				VT Krka Soteska – Otočec					
SI	10433	REVOZ Podjetje za proizvodnjo in komercializacijo avtomobilov d.d.	Novo mesto	9.(c)	Other activities	Y&N	I		VT Krka Soteska – Otočec	55.702	20.221	0.604	0.879	
SI	7669	URSA Slovenija, d.o.o.	Novo mesto	3.(e)	Mineral industry	N	D		VT Krka Soteska – Otočec	0.574	0.114			
SI	8591	KRKA, d.d., Novo mesto	Novo mesto	4.(e)	Chemical industry	N	D		VT Krka Soteska – Otočec	67.690	4.413	0.791	14.645	138.368
SI	83284	CEROD, center za	Novo mesto	5.(d)	Waste and waste water				VT Krka Soteska					

Country	Code of industrial installation	Name of industrial installation/plant	Location	Code EPER	Nain production processes	Wastewater treatment (YES/NOT)	Release to surface water (direct/indirect)	WB code	Name of recipient (river)	Pollution release to surface water, t/a				
										COD	BOD	P total	N total	Sulphates
		ravnanje z odpadki, d.o.o., javno podjetje, Odlagališče nenevarnih odpadkov Leskovec			management				– Otočec					
SI	83294	Javno podjetje komunala Cerknica d.o.o., Odlagališče nenevarnih odpadkov Rakek Pretržje	Cerknica	5.(d)	Waste and waste water management	Y	I		VT Unica	4.813	2.225	0.009	0.397	1.305
SI	8942	Farme Ihan d.d., Farma Pristava	Leskovec pri Krškem	7.(a)	Intensive livestock production and aquaculture				VT Krka Otočec – Brežice					
SI	83246	AKRIPOL proizvodnja in predelava polimerov d.d.	Trebnje	4.(a)	Chemical industry	Y	I		VT Temenica I	1.797	1.423	0.018	0.029	4.816
SI	83231	Komunala Trebnje d.o.o., Odlagališče nenevarnih odpadkov Cviblje	Trebnje	5.(d)	Waste and waste water management				VT Temenica I					
SI	83265	TPV proizvodnja in trženje vozil d.d., PE Velika Loka	Velika Loka	2.(f)	Productiona and processing of metals				VT Temenica I					
SI	83242	FENOLIT d.d., Sintetične smole in mase	Borovnica	4.(a)	Chemical industry	N	D		VT Ljubljanica povirje – Ljubljana			0.002	0.038	
SI	83288	KOSTAK komunalno stavbno podjetje, d.d., Odlagališče nenevarnih odpadkov Spodnji Stari Grad	Krško	5.(d)	Waste and waste water management				VT Sava Krško – Vrbina					
SI	11143	Livar, d.d., Obrat Ivančna Gorica	Ivančna Gorica	2.(d)	Productiona and processing of metals	Y	I		VT Krka povirje – Soteska					
SI	83299	Javno komunalno podjetje Grosuplje d.o.o., CERO Špaja Dolina	Grosuplje	5.(d)	Waste and waste water management				VT Krka povirje – Soteska					
SI	7784	VIPAP VIDEM KRŠKO d.d.	Krško	6.(b)	Paper and wood production processing	N	D		VT Sava Krško – Vrbina	618.028	3.708	0.956	30.285	1116.880
SI	83222	Gabrijel AS d.o.o.	Grosuplje	2.(f)	Productiona and processing of metals	Y	I		VT Krka povirje – Soteska		0.063		0.029	
SI	10477	Iskra TELA d.d.	Škofljica	2.(f)	Production and processing of metals	Y	I		VT Iščica				0.574	35.813
SI	83289	Javno podjetje Komunalno podjetje Vrhnika, d.o.o.,	Vrhnika	5.(d)	Waste and waste water management				VT Ljubljanica povirje – Ljubljana					

Country	Code of industrial installation	Name of industrial installation/plant	Location	Code EPER	Nain production processes	Wastewater treatment (YES/NOT)	Release to surface water (direct/indirect)	WB code	Name of recipient (river)	Pollution release to surface water, t/a				
										COD	BOD	P total	N total	Sulphates
		Odlagališče nenevarnih odpadkov Tojnice												
SI	83264	DOGA d.o.o.	Krmelj	2.(f)	Productiona and processing of metals				VT Mirna					
SI	83275	Termoelektrarna Brestanica d.o.o.	Brestanica	1.(c)	Energy sector				VT Sava Boštanj – Krško					
SI	9970	SNAGA Javno podjetje d.o.o., Odlagališče nenevarnih odpadkov Barje	Ljubljana	5.(d)	Waste and waste water management				VT Ljubljanica povirje – Ljubljana					
SI	83254	BLISK d.o.o.	Ljubljana	2.(f)	Productiona and processing of metals	Y	I		VT Ljubljanica povirje – Ljubljana	1.263		0.022	0.031	0.832
SI	10126	Papirnica Vevče d.o.o.	Ljubljana-Dobrunje	6.(b)	Paper and wood production processing	N			VT Ljubljanica Moste – Podgrad		122.682	0.359	7.057	
SI	7229	Termoelektrarna Toplarna Ljubljana, d.o.o.	Ljubljana	1.(c)	Energy sector	Y&N	I		kMPVT Mestna Ljubljanica	2.436				0.657
SI	10391	Pivovarna Union d.d.	Ljubljana	8.(b)	Animal and vegetable products from the food and beverage sector	Y	I		kMPVT Mestna Ljubljanica	1560.115	913.079	14.386	36.447	100.528
SI	83277	Orka d.o.o.	Ljubljana	4.(a)	Chemical industry	Y	I		kMPVT Mestna Ljubljanica	2.970	0.568	0.024	0.446	10.750
SI	83221	Perutnina Ptuj Mesna industrija Zalog d.o.o.	Ljubljana	8.(a)	Animal and vegetable products from the food and beverage sector	Y	I		VT Ljubljanica Moste – Podgrad	25.313	10.670	0.842	3.075	
SI	83196	JULON, d.d., Ljubljana	Ljubljana	4.(a)	Chemical industry				VT Ljubljanica Moste – Podgrad					
SI	83209	Radeče papir d.d.	Radeče	6.(b)	Paper and wood production processing	N	D		kMPVT Sava Vrhovo – Boštanj		57.747		5.796	
SI	83248	KOTO proizvodno in trgovsko podjetje, d.d. Ljubljana	Ljubljana	5.(e)	Waste and waste water management	Y	I		VT Ljubljanica Moste – Podgrad	33.026	4.039	0.735	2.407	1.277
SI	83224	JP vodovod-kanalizacija d.o.o., CČN Ljubljana	Ljubljana	5.(f)	Waste and waste water management				VT Ljubljanica Moste – Podgrad					
SI	83274	Javno podjetje Energetika Ljubljana, d.o.o.	Ljubljana	1.(c)	Energy sector				VT Ljubljanica Moste – Podgrad					
SI	83234	Litostroj Ulitki d.o.o.	Ljubljana	2.(d)	Productiona and processing of metals				VT Ljubljanica Moste – Podgrad					
SI	10417	Ljubljanske mlekarne	Ljubljana	8.(c)	Animal and vegetable	Y	I		VT Ljubljanica	414.412	253.832	2.224	12.291	

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										COD	BOD	P total	N total	Sulphates
		d.d., Obrat Ljubljana			products from the food and beverage sector				Moste – Podgrad					
SI	83243	TCG UNITECH Lth-ol d.o.o., Obrat Ljubljana	Ljubljana	2.(e)	Productiona and processing of metals	Y	I		VT Ljubljanica Moste – Podgrad	92.540	38.511	0.016		12.066
SI	83236	Belinka Perkemija, d.o.o.	Ljubljana	4.(a), 4.b)	Chemical industry	N	D		VT Sava Medvode – Podgrad	35.824	13.575	0.312	6.890	
SI	83232	IAK, Industrija apna Kresnice, d.o.o.	Kresnice	3.(c)	Mineral industry				VT Sava Podgrad – Litija					
SI	10957	Jata Emona d.d., Farma Ihan	Ihan	6.6	Other Annex I activities				VT Kamniška Bistrica Študa – Dol					
SI	8809	Farme Ihan d.d., Farma Ihan	Domžale	7.(a)	Intensive livestock production and aquaculture	N	D		VT Kamniška Bistrica Študa – Dol		47.433		117.797	
SI	83282	FI-EKO, Ekološke storitve d.o.o., čistilna naprava FI-EKO	Domžale	5.(e)	Waste and waste water management				VT Kamniška Bistrica Študa – Dol					
SI	83206	JP Centralna čistilna naprava Domžale-Kamnik d.o.o.	Domžale	5.(f)	Waste and waste water management				VT Kamniška Bistrica Študa – Dol					
SI	83247	TKI Hrastnik d.d.	Hrastnik	4.(b)	Chemical industry	N	D		VT Sava Litija – Zidani Most		0.021	0.000		0.044
SI	83233	Steklarna Hrastnik d.d., PE Special (Opal)	Hrastnik	3.(e)	Mineral industry	N	D		VT Sava Litija – Zidani Most			0.001		0.436
SI	83261	IGM Zagorje, d.o.o.	Zagorje ob Savi	3.(c)	Mineral industry				VT Sava Litija – Zidani Most					
SI	7333	Termoelektrarna Trbovlje, d.o.o.	Trbovlje	1.(c)	Energy sector	N	D		VT Sava Litija – Zidani Most		0.737	0.058	1.097	9.270
SI	6245	Steklarna Hrastnik d.d., PE Vitrum	Hrastnik	3.(e)	Mineral industry	N	D		VT Sava Litija – Zidani Most		0.538			
SI	7450	Lafarge Cement d.d.	Trbovlje	3.(c)	Mineral industry	N	D		VT Sava Litija – Zidani Most		0.077			
SI	11093	Color d.d.	Medvode	4.(a)	Chemical industry	N	D		VT Sora	1.102	0.135			0.848
SI	9241	Javno Komunalno Podjetje Prodnik d.o.o., Odlagališče nenevarnih odpadkov Dob	Domžale	5.(d)	Waste and waste water management				VT Rača z Radomljo		0.000			
SI	10328	Goričane, tovarna papirja	Medvode	6.(b)	Paper and wood production	N	D		VT Sora		18.839	0.029	6.021	

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										COD	BOD	P total	N total	Sulphates
		Medvode, d.d.			processing									
SI	7946	Termo d.d., Obrat Bodovlje	Škofja Loka	3.1/3.3/3.4/3.5	Mineral Industry				VT Poljanska Sora					
SI	83241	ETI Elektroelement d.d.	Izlake	3.(g)	Mineral industry				VT Sava Litija – Zidani Most					
SI	11134	HELIOS, tovarna barv, lakov in umetnih smol, Količevo d.o.o.	Domžale	4.(a)	Chemical industry	Y	I		VT Kamniška Bistrica Stahovica – Študa	6.712	3.339			8.521
SI	83201	Kemis d.o.o.	Domžale	5.(a)	Waste and waste water management				VT Kamniška Bistrica Stahovica – Študa					
SI	10568	Količevo Karton, d.o.o.	Domžale	6.(b)	Paper and wood production processing	N			VT Kamniška Bistrica Stahovica – Študa	129.590	11.767	1.096	22.276	
SI	83244	TCG UNITECH Lth-ol d.o.o., Obrat Škofja Loka	Škofja Loka	2.(e)	Productiona and processing of metals	Y	I		VT Selška Sora	36.073	21.434	0.184		3.982
SI	8483	LEK farmacevtska družba d.d., Proizvodnja Mengeš	Menges	4.(e)	Chemical industry	Y&N	I		VT Pšata	520.247	318.924	3.261	22.485	57.397
SI	83226	Galma d.o.o.	Radomlje	2.(f)	Productiona and processing of metals				VT Kamniška Bistrica Stahovica – Študa					
SI	6999	Termo, d.d., Obrat Škofja Loka	Škofja Loka	EPER_3.1/3.3/3.4/3.5	Mineral Industry				VT Sora					
SI	6999	Knauf insulation d.d., obrat Škofja Loka	Škofja Loka	3.(f)	Mineral industry				VT Sora					
SI	83280	Meso Kamnik Mesna industrija d.d.	Kamnik	8.(a)	Animal and vegetable products from the food and beverage sector	Y	I		VT Pšata	22.416	15.397	0.035	2.438	
SI	10948	Jata Emona d.o.o., Farma Duplica	Kamnik	7.(a)	Intensive livestock production and aquaculture	Y	I		VT Pšata	0.864	0.482	0.014		2.940
SI	83255	Martin Ambrož s.p.	Kamnik	2.(f)	Productiona and processing of metals				VT Kamniška Bistrica Stahovica – Študa					
SI	5269	Perutninska zadruga Ptuj	Šmarje Pri	7.(a)	Intensive livestock				VT Mestinjščica					

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										COD	BOD	P total	N total	Sulphates
		PZP z.o.o., Farma Hajnsko	Jelšah		production and aquaculture									
SI	83263	Cimos Titan, d.o.o.	Kamnik	2.(d)	Productiona and processing of metals	Y	I		VT Kamniška Bistrica Stahovica – Študa	3.847	1.817	0.058		6.021
SI	83237	Titan d.d.	Kamnik	2.(f)	Productiona and processing of metals	Y	I		VT Kamniška Bistrica Stahovica – Študa	0.591	0.212		0.051	0.021
SI	83268	Komunala Kranj, javno podjetje d.o.o., CČN Kranj	Kranj	5.(f)	Waste and waste water management				VT Sora					
SI	10541	Marjan Grašič s.p.	Kranj	2.(f)	Productiona and processing of metals	Y	I		VT Sora		0.091	0.048		8.098
SI	8668	Steklarna Rogaška d.d.	Rogaška Slatina	3.(e)	Mineral industry	Y	I		VT Sotla Dobovec – Podčetrtek	4.050				
SI	83240	Niko, d.d., Železniki	Železniki	2.(f)	Productiona and processing of metals	N			VT Selška Sora	2.540	0.866			
SI	83235	Savatech d.o.o.	Kranj	9.(c)	Other activities	Y	I		VT Sora	9.577	5.600	0.114		13.740
SI	10355	ISKRA Industrija sestavnih delov Galvanika d.o.o.	Kranj	2.(f)	Productiona and processing of metals	N	D		VT Sora	1.123	0.425	0.005	0.468	15.338
SI	10526	OKP Javno podjetje za komunalne storitve Rogaška Slatina, d.o.o., Odlagališče nenevarnih odpadkov Tuncovec	Rogaška Slatina	5.(d)	Waste and waste water management				VT Sotla Dobovec – Podčetrtek					
SI	83219	Aquasava, d.o.o., Kranj	Kranj	9.(a)	Other activities	Y&N	I		VT Sava Podbrezje – Kranj	33.946	5.914	0.577	2.566	
SI	9600	Komunala Kranj, javno podjetje d.o.o., Odlagališče nenevarnih odpadkov Tenetiše	Kranj	5.(d)	Waste and waste water management				VT Kokra Preddvor – Kranj					
SI	9395	Javno podjetje Komunala Tržič d.o.o., Odlagališče nenevarnih odpadkov Kovor	Tržič	5.(d)	Waste and waste water management	N	D		VT Sava HE Moste – Podbrezje					

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										COD	BOD	P total	N total	Sulphates
SI	83212	CMC Galvanika d.o.o.	Lesce	2.(f)	Productiona and processing of metals				VT Sava HE Moste – Podbrezje					
SI	8255	Acroni d.o.o.	Jesenice	2.(b)	Productiona and processing of metals				kMPVT Sava Dolinka HE Moste		0.741	0.448		114.000
SI	9479	JEKO-IN, javno komunalno podjetje, d.o.o., Jesenice, Odlagališče za nenevarne odpadke Mala Mežakla	Jesenice	5.(d)	Waste and waste water management				kMPVT Sava Dolinka HE Moste					
Number IPS - SI		**89**								3,709.010	1,903.942	27.268	301.136	1,669.782
HR	080469030	PLIVA HRVATSKA d.o.o. Pogon održavanje i energetika Savski Marof - tehnološka jedinica 2540	Savski Marof	4	Manufacture of pharmaceuticals, medicinal chemicals and botanical products	Y	I	DSRN180001	Sava	859.400	449.000	1.670	37.400	
HR		Sladorana	Županja	8	Animal and vegetable products from the food and beverage sector		D	DSRI010001	Sava	783.800	686.800	1.500		
HR		PAN PAPIRNA INDUSTRIJA d.o.o.	Zagreb	6	Paper and wood production and processing	Y	I	DSRN010008	Sava	875.800	396.000			
HR		HEP-PROIZVODNJA d.o.o. TE-TO ZAGREB	Zagreb	1	Energy sector		D	DSRN010008	Savica and Sava	28.700	8.900			
HR		INKOP KOŽA D.O.O.	Poznanovec	9	Other activities		D	DSRN180002	Jezerščak	5.600	1.600	0.005	0.220	
Number IPS - HR		**5**								2,553.300	1,542.300	3.175	37.620	
BA (fed)	DG2461	UNIS GINEX	Goražde	4	Manufacture of explosives	Y	D	BA_DR_5	Drina	2.700	0.570	0.002	0.125	
BA (fed)	DK2960	POBJEDA RUDET	Goražde	2	Manufacture of weapons and ammunition	Y	D	BA_DR_5	Drina	2.050	0.570	0.002	0.065	
BA (fed)	DC19	DONNIA TRADE doo	Bugojno	9b	Tanning and dressing of leather	Y	I	BA_VRB_7	Vrbas	3.170	1.620	0.007	0.128	
BA (fed)	DC19	DD za proizvodnju kože Bugojno	Bugojno	9b	Tanning and dressing of leather	Y	I	BA_VRB_7	Vrbas	34.560	16.090	0.072	1.709	
BA (fed)	DC19	KTK Fabrika krupne kože i krzna	Visoko	9b	Tanning and dressing of leather	Y	D	BA_BOS_5	Bosna	16.688	8.448		0.396	
BA (fed)	DC20	Fabrika Sitne kože	Visoko	9	Manufacture of luggage, handbags etc	Y	D	BA_BOS_5	Bosna	27.720	12.936	0.026	1.399	
BA (fed)	DE211	NATRON HAYAT	Maglaj	6	Manufacture of pulp,paper	Y	D	BA_BOS_2	Bosna	447.120	275.650	0.480	10.695	

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										COD	BOD	P total	N total	Sulphates
					and paperboard									
BA (fed)	CA10	RMU Zenica	Zenica	3	Mining of coal	Y	D	BA_BOS_4	Bosna	68.620	39.780	0.329	6.570	
BA (fed)	DJ27	ARCELOR MITTAL STEEL	Zenica	2	Manufacture of basic metals	Y	D	BA_BOS_4	Bosna	405.515	196.735	2.373	7.665	
BA (fed)	E4010	JP Elektroprivreda BiH TE KAKANJ	Kakanj	1	Production and distribution of electricity	Y	D	BA_BOS_5	Bosna	279.225	12.410	2.482	24.455	
BA (fed)	DC19	PREVENT GBR LEDER	Visoko	9b	Tanning and dressing of leather	Y	D	BA_BOS_5	Bosna	98.050	33.655	0.636	29.150	
BA (fed)	DA1596	SARAJEVSKA PIVARA	Sarajevo	8b	Manufacture of beer	N	I	BA_BOS_7	Bosna	330.096	204.672	1.248	7.488	
BA (fed)	DG2413	SICECAM SODA INVEST	Lukavac	4b	Manufacture of other inorganic basic camicals	N	D	BA_BOS_SPR_1	Spreča	422.670	124.830	2.810	160.965	
BA (fed)	DF2310	GLOBAL ISPAT KOKSNA INDUSTRIJA	Lukavac	1	Manufacture of coke oven prodacts	Y	D	BA_BOS_SPR_1	Spreča	476.325	250.755	0.876	31.390	
BA (fed)	E4010	JP Elektroprivreda BiH TE TUZLA	Tuzla	1	Production and distribution of electricity	N	D	BA_BOS_SPR_1	Spreča	190.890	78.840	0.584	32.120	
BA (fed)	DA155	PRERADA I PROMET MLIJEKA	Tuzla	8c	Manifacture of dairy prodacts	N	I	BA_BOS_SPR_1	Spreča	71.750	50.005	0.073	0.438	
BA (fed)	DA1596	PIVARA TUZLA	Tuzla	8b	Manufacture of beer	N	I	BA_BOS_SPR_1	Spreča	388.800	139.800	0.210	8.700	
BA (fed)	CA10	RMU ĐUĐEVIK	Živinice	3	Mining of coal	Y	D	BA_BOS_SPR_3	Spreča	151.840	7.300	0.037	4.015	
BA (fed)	DA155	IN MER doo	Gradačac	8c	Manifacture of dairy prodacts	Y	I	BA_SA_1	Sava	120.231	70.518	0.526	0.646	
BA (RS)	DA_15.96	Banjalucka pivara AD	Banja Luka	8b	Production of beer; 300000 hl/year	N	D	BA_VRB_1	Vrbas	449.570	331.130	16.128	9.072	
BA (RS)	DB_17.1	Devic tekstil	Teslic	9a	Processing of cotton fibber(staining, spinning) into final product-clothing	N	D		Usora	23.474	10.890	0.048	0.726	
BA (RS)	DE_21.22	Celex	Banja Luka	6	Treatment of cellulose(deciduous and conifers) and old paper for producing paper product; 22775 t/year of tissue paper; 7347 t/year of toilet paper; 718 t/year of tissues; 2344 t/year of paper napkins	N	D	BA_VRB_1	Vrbanja	408.114	150.962	0.287	2.583	
BA (RS)	DJ_27.42	Glinica Birac	Zvornik	2	production of Al_2O_3	N	D	BA_DR_1	Drina	85.140	22.220	0.506	2.860	

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										COD	BOD	P total	N total	Sulphates
BA (RS)		Destilacija	Teslic	1	production of charcoal	N	D		Velika Usora	74.438	28.938	0.055	2.730	
BA (RS)	DA_15.51	Mljekoprodukt	Kozarska Dubica	8c	Production of UHT milk, pasteurized milk, cheese, yogurt, milk cream; 33096 t/year of UHT milk; 6704 t/year of fermented product; 902 t/year of pasteurized milk	N	D	BA_UNA_1	Una	341.640	170.820	0.350	2.830	
BA (RS)	DA_15.31	Marbo	Laktasi	8b	Production of nibbles/chips from potato by using potato, spices, NaCl, oil ; 1515 t/year	N	D	BA_VRB_1	Vrbas	94.940	50.170	0.371	5.440	
BA (RS)		Rafinerija ulja	Modrica	1	Production of lubricants, paraffin through process of distillation, deparaffining, refinery and bleaching; 9696t/year	Y	D	BA_BOS_1	Bosna	5.366	1.810	0.046	1.920	
BA (RS)		Rafinerija nafte	Brod	1	Production of petrol	Y	D	BA_SA_2	Sava					
BA (RS)	DA_15.51	Natura Vita	Teslic	8c	Production of UHT milk, pasteurized milk, cheese, yogurt, milk cream, whey; 9371 t/year of fermented product; 399 t/year of pasteurized milk; whey 18t/year	N	D		Usora	430.680	18.486	0.250	0.853	
BA (RS)		TE Ugljevik	Ugljevik	1	Thermal power	Y	D	BA_DR_1	Mezgrajica	83.520	25.600	0.362	8.320	
BA (RS)		3(b) Mittal rudnici	Omarska	3	Opencast mining; Opencast mining average capacity 53% of 1000t/h, GMS average capacity 67% of 606t/h	Y	I	BA_UNA_SAN_2	Gomjenica	32.885	21.055	0.135	5.867	
Number IPS -BA		**31**								**5,567.787**	**2,357.265**	**31.310**	**371.321**	
RS	1	TENT A	Obrenovac	1.c	Combustion installations > 50 MW	Y	D	RS_SA_1	Sava	87.3				8,304.000
RS	2	TENT B	Usce	1.c	Combustion installations > 50 MW	Y	D	RS_SA_1	Sava	60.4				7,212.000
RS	3	AD Vrenje	Beograd	8.b	8.b	N	I	RS_SA_1	Sava	1,774.080	1,912.378		58.900	32.558
RS	4	AD Fabrika kartona	Umka	6.b	6.b	Y	D	RS_SA_1	Sava	860.000	644.000			

Country	Code of industrial installation	Name of industrial installation/plant	Location	Code EPER	Nain production processes	Wastewater treatment (YES/NOT)	Release to surface water (direct/indirect)	WB code	Name of recipient (river)	Pollution release to surface water, t/a				
										COD	BOD	P total	N total	Sulphates
RS	5	JPPEU Resavica, Rudnik Stavalj	Stavalj	3.b	3.b	N	D	RS_VAP	Vapa	11.000				
RS	6	Kolubara Prerada	Vreoci	1.d	1.d	Y	D	RS_KOL_3	Turija_Kolubara	1,247.000	78.400			
RS	7	TE Kolubara	Veliki Crljeni	1.c	Combustion installations > 50 MW	Y	D	RS_KOL_3	Turija_Kolubara	16.070	2.030			154.000
RS	8	USSS, ogranak Sabac	Sabac	2.f	2.f	Y	D	RS_SA_2	Cerski kanal_Sava	7.900				
RS	9	Secerana Donji Srem	Pecinci	8.b	8.b	N	I	RS_SA_1	Kanal Galovica_Sava	354.000	216.000	0.080	9.260	
RS	10	Zorka Keramika Novi Sad	Sabac	3.g	3.g	Y	D	RS_SA_2	Cerski kanal_Sava	6.400	2.800			
Number IPS -RS*		**10**								**4,424**	**2,855.608**	**0.080**	**68.160**	**15,702.558**
ME	1	Coal mine	Pljevlja	3	open pit for exploatation of coal	N	D	ME_CECH_2	Cehotina	1165.080	96.360		17.310	2023.560
ME	2	Thermal power plant	Pljevlja	1	production electric energy	N	D	ME_CECH_2	Cehotina	788.400	639.480			1585.560
ME	3	Ash/slag landfill for power plant	Pljevlja	5	disposle of ash and slag from power plant	N	D	ME_CECH_2	Cehotina					8.200
ME	4	"Velimir Jakic"	Pljevlja	6	wood factory	N	D	ME_CECH_2	Cehotina	140.160	70.080		0.500	
Number IPS -ME		**4**								**2,093.640**	**805.920**		**17.810**	**3,617.320**
Number IPS - Total SRB		**139**								**18,348**	**9,465**	**62**	**796**	**20,990**

Legend: Y- wastewaters are treated, N -wastewaters are not treated, Y&N - wasterwaters are partialy treated
*Avaiable data not complete

Annex 7

Overview of the Sava River Basin rivers continuity interruptions

Overview of the number of river continuity interruptions 2010 and 2015 restoration measures and exemptions according to the WFD Article 4(4) for each Sava country

Country	Barriers 2010	Passable by fish 2010	River continuity interruptions 2010	Fish passes to be constructed	River continuity interruptions by 2015	Exemptions WFD 4(4)	Measures indicated
SI	6	1	5	1	4	0	4
HR	7	1	6	0	6	0	0
BA	9	1	8	0	8	0	0
RS	8	2	6	0	6	0	0
ME	2	0	2	0	2	0	0
Total[22]	**30 (32)**	**4 (5)**	**26 (27)**	**1**	**25 (26)**	**0**	**4**
Sava	7	2	5	1	4	0	4

Slovenia							
Name/Location	Barriers 2010	Passable by fish 2010	River continuity interruptions 2010	Fish passes to be constructed	River continuity interruptions by 2015	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	---	---

* Combination of measures foreseen in national RBMP, based on the fact, that current assesssment 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

[22] Both BA and RS include in their lists HPP Zvornik and Bajina Basta, located on the trans-boundary river Drina.

Croatia							
Name/Location	Barriers 2010	Passable by fish 2010	River continuity interruptions 2010	Fish passes to be constructed	River continuity interruptions by 2015	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
Pregrada Lipovac	Yes	No	Yes	No	Yes	No	No
Akumulacija Bukovnik	Yes	No	Yes	No	Yes	No	No
Ustava Trebez	Yes	No*	Yes	---	Yes	No	---
Pregrada TE TO Zagreb	Yes	Yes	No	---	No	No	----

* Limited connectivity (depending on water regime of the Sava River and on manipulation of the Trebez gate during flood events)

Bosnia and Herzegovina							
Name/Location	Barriers 2010	Passable by fish 2010	River continuity interruptions 2010	Fish passes to be constructed	River continuity interruptions by 2015	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
MHE_Vitez1	yes	No	yes	No	yes	No	No

Serbia							
Name/Location	Barriers 2010	Passable by fish 2010	River continuity interruptions 2010	Fish passes to be constructed	River continuity interruptions by 2015	Exemption s WFD 4(4)	Measures indicated
HE Zvornik	Yes	Yes	No	---	No	---	---
Bajina Basta	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
Potpec	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 2010	Passable by fish 2010	River continuity interruptions 2010	Fish passes to be constructed	River continuity interruptions by 2015	Exemption s 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)

No.	Country Code	GW abstraction location	GWB National Code	Mean annual abstraction (Mio.m3/yr)	Main Use	Safeguard protection zones established
1	SI	Ljubečna Celje D.D.	SI1688VT2	252,3*	IND	No
2	SI	Ljubečna Celje D.D.	SI1688VT2	189,2*	IND	No
3	SI	Ljubečna Celje D.D.	SI1688VT2	126,1*	IND	No
4	SI	Goričane tovarna papirja Medvode, D.D.	SI123VT	3,3	IND	No
5	SI	Belinka holding, D.D.	SI1VT310	5,6*	IND	No
6	SI	Aquasava, tekstilna industrija in trgovina, D.O.O., Kranj	SI1VT150	1,3	IND	No
7	SI	Iskra vzdrževanje, podjetje za izdelavo in vzdrževanje naprav, stavb in opreme D.D., Kranj	SI1VT150	0,96	IND	No
8	HR	Mala Mlaka	DSGIKCPV_27	90,950	DRW	Yes
9	HR	Sašnjak				
10	HR	Stara Loza				
11	HR	Zapruđe				
12	HR	Žitnjak				
13	HR	Bregana				
14	HR	Strmec				
15	HR	Petruševec				
16	HR	Šibice	DSGIKCPV_27	14,200	DRW	Yes
17	HR	Velika Gorica	DSGIKCPV_27	27,000	DRW	Yes
18	HR	Ravnik	DSGIKCPV_28	2,500	DRW	Yes
19	HR	Drenov Bok	DSGIKCPV_28	2,370	DRW, IND	Yes
20	HR	Sikirevci	DSGIKCPV_29	6,31	DRW	New abstraction site
21	HR	Jelas	DSGIKCPV_29	5,000	DRW	Yes
22	HR	Bošnjaci	DSGIKCPV_29	2,208	DRW	Yes
23	HR	Kanovci	DSGIKCPV_29	2,250	DRW	Yes
24	HR	Vratno	DSGNKCPV_25	1,892	DRW	Yes
25	HR	Švarča	DSGNKCPV_31	2,200	DRW	Yes
26	HR	Gaza III	DSGNKCPV_31	2,800	DRW	Yes
27	HR	Gaza II	DSGNKCPV_31	4,700	DRW	Yes
28	HR	Gaza I	DSGNKCPV_31	4,400	DRW	Yes
29	HR	Mekušje	DSGNKCPV_31	3,000	DRW	Yes
30	HR	Zapadno polje	DSGNKCPV_26	2,827	DRW	Yes
31	HR	Izvor Obrh	DSGIKCPV_13	1,892	DRW	Yes
32	HR	Izvor Žižići	DSGNKCPV_15	2,523	DRW	Yes
33	HR	Izvor Zagorska Mrežnica	DSGNKCPV_15	6,100	DRW	Yes
34	BA	Karstic sources close to major cities: Martin Brod and Drvar	BA_UNAC_UNA_1	72	DRW	
35	BA	Karstic sources close to	BA_UNA_2	71,27	DRW, IND	Zones of

No.	Country Code	GW abstraction location	GWB National Code	Mean annual abstraction (Mio.m3/yr)	Main Use	Safeguard protection zones established
		major cities: Bihać, Donji Lapac, Vakuf				sanitary protection of sources Klokot and Privilica
36	BA	Karstic sources close to major cities: Bosanski Petrovac, Ključ,	BAGW_VRB_UNA_1	70	DRW, IND	Zones of sanitary protection of sources Zdena and Sanica
37	BA	Karst springs near follow settlements: Milići, Vlasenica, Han Pijesak, Sokolac, Rogatica	GW_BO_DRN_1	14	DRW, IND, Hydo-power production (smaller facilities)	Yes in 6 abstraction location, in 4 abstraction location no
38	BA	Karst springs near follow settlements: Foča, Trnovo	GW_DRN_1	3,15	DRW, IND	Yes in 1 abstraction location, in 1 abstraction location no
39	BA	Karst springs near follow settlements:Kotor Varoš, Čelinac, Kneževo, Mrkonjić Grad, Travnik, Jajce and one abstraction location in intergranullar medium (9 wells near Banja Luka)	GW_VRB_1	14,2	DRW, IND	Just in one case - Banja Luka
40	BA	Well systems near follow settlements: Doboj, Modriča, Šamac, Brčko	GW_SAV_2	12,9	DRW, IND	Not yet
41	RS	Sabac-Tabanovic	RS_SA_GW_I_3	6,94	DRW	Yes
42	RS	Sabac-Bogatic	RS_SA_GW_I_3	4,73	DRW	Yes
43	RS	Ruma-Jarak	RS_SA_GW_I_2	4,73	DRW	Yes
44	RS	Ruma-Fiserov salas	RS_SA_GW_I_7	2,21	DRW	Yes
45	RS	Sid-Batrovci	RS_SA_GW_I_6	2,05	DRW	
46	RS	Sjenica-Zarudine	RS_UV_GW_K_1	6,31	DRW	
47	RS	Ljig-Vrelo	RS_KOL_GW_K_2	1,51	DRW	
48	RS	Valjevo-Paklje	RS_KOL_GW_K_2	3,78-31,54	DRW	Yes
49	RS	Krupanj-Goricko vrelo	RS_DR_GW_P_3	6,31	DRW	
50	RS	Lazarevac-Pestan	RS_KOL_GW_I_1	4,73	DRW	
51	RS	Lazarevac-Nepricava	RS_KOL_GW_K_1	1,26-2,87	DRW	Yes
52	RS	Ub-Takovo	RS_KOL_GW_I_1	1,26-2,87	DRW	
53	RS	Koceljeva-Svileuva	RS_KOL_GW_K_1	1,42	DRW	
54	RS	Loznica-Zelenica i Gornje polje	RS_DR_GW_I_1	14,35	DRW	Yes
55	RS	Obrenovac-Vic bare	RS_SA_GW_I_5	13,25	DRW	Yes
56	RS	Sabac-Mali Zabran	RS_SA_GW_I_3	1,89-2,84	DRW	Yes
57	RS	Beograd-Usce	RS_SA_GW_I_4	11,67	DRW	Yes

No.	Country Code	GW abstraction location	GWB National Code	Mean annual abstraction (Mio.m3/yr)	Main Use	Safeguard protection zones established
58	RS	Beograd-Leva obala Save	RS_SA_GW_I_4	81,99	DRW	Yes
59	RS	Beograd-Desna obala Save	RS_SA_GW_I_5	53,61	DRW	Yes
60	RS	Stara Pazova	RS_SA_GW_I_7	3,78	DRW	
61	RS	Sremska Mitrovica-Martinci	RS_SA_GW_I_2	4,89	DRW	Yes
62	RS	Indjija	RS_SA_GW_I_7	1,26-3,78	DRW	Yes
63	ME	Mušovića vrelo	Sliv rijeke Tara	3,1536	DRW	Yes
64	ME	Ljutica izvor	Sliv rijeke Tara	31,536	DRW	Yes
65	ME	Bijela vrela	Sliv rijeke Tara	31,536	DRW	Yes
66	ME	Sige	Sliv rijeke Tara	3,1536	DRW	Yes
67	ME	Ravnjak	Sliv rijeke Tara	15,768	DRW	Yes
68	ME	Mušovi bukovi	Sliv rijeke Tara	3,1536	DRW	Yes
69	ME	Kaludjerovo vrelo	Sliv rijeke Tara	3,1536	DRW	Yes
70	ME	Bukovičko vrelo	Sliv rijeke Pive	3,1536	DRW	Yes
71	ME	Boanska vrela	Sliv rijeke Pive	1,5768	DRW	Yes
72	ME	Sutulija	Sliv rijeke Pive	1,5768	DRW	Yes
73	ME	Dubrovska vrela	Sliv rijeke Pive	9,4608	DRW	Yes
74	ME	Nozdruć	Sliv rijeke Pive	6,3072	DRW	Yes
75	ME	Jakšića vrelo	Sliv rijeke Pive	3,1536	DRW	Yes
76	ME	Medjedjak	Sliv rijeke Pive	1,5768	DRW	Yes
77	ME	Rastioci	Sliv rijeke Pive	6,3072	DRW	Yes
78	ME	Pivsko oko - Sinjac	Sliv rijeke Pive	31,536	DRW	Yes
79	ME	Breznica - Bezdan	Sliv rijeke Ćehotine	1,5768	DRW	Yes
80	ME	Tvrdaš	Sliv rijeke Ćehotine	2,0498	DRW	Yes
81	ME	Alipašini izvori	Sliv rijeke Lim	31,536	DRW	Yes
82	ME	Krkori	Sliv rijeke Lim	3,1536	DRW	Yes
83	ME	Manastirsko vrelo	Sliv rijeke Lim	2,5228	DRW	Yes
84	ME	Merića izvori	Sliv rijeke Lim	3,1536	DRW	Yes
85	ME	Bistrica	Sliv rijeke Lim	6,3072	DRW	Yes

Legend:

Main use: DRW = drinking water, AGR = agriculture, IRR = irrigation, IND = industry,

SPA = balneology CAL = caloric energy, OTH = other

Annex 9

Register of protected areas in the Sava River Basin

Table 1: The register of protected areas relevant from the aspect of nature conservation

COUNTRY	CODE	PA NAME	AREA_HA	TYPE
SI	SI3000005	Mateča voda in Bistrica	193.24	H
SI	SI3000007	Potočnikov potok	406.59	H
SI	SI3000008	Dolgi potok na Rudnici	174.01	H
SI	SI3000015	Medvedje Brdo	189.00	H
SI	SI3000016	Zaplana	216.28	H
SI	SI3000237	Poljanska sora log-Škofja Loka	157.72	H
SI	SI3000017	Ligojna	139.73	H
SI	SI3000021	Podreber - Dvor	191.90	H
SI	SI3000026	Ribniška dolina	431.44	H
SI	SI3000046	Bela Krajina	538.00	H
SI	SI3000048	Dobličica	382.26	H
SI	SI3000049	Temenica	156.03	H
SI	SI3000051, SI5000012	Krakovski gozd, Krakovski gozd – Šentjernejsko	9,533.00	H,B
SI	SI3000055	Stobe - Breg	101.80	H
SI	SI3000056	Vejar	226.01	H
SI	SI3000057	Vrhtrebnje - Sv. Ana	691.00	H
SI	SI3000059	Mirna	517.00	H
SI	SI3000062	Gradac	1,491.03	H
SI	SI3000067	Savinja -Letuš	225.01	H
SI	SI3000075	Lahinja	824.00	H
SI	SI3000079	Prevoje	313.40	H
SI	SI3000094	Bidovčeva jama	155.66	H
SI	SI3000099	Ihan	184.00	H
SI	SI3000100	Gozd Kranj - Škofja Loka	1,951.00	H
SI	SI3000101	Gozd Olševek - Adergas	833.00	H
SI	SI3000111	Savinja pri Šentjanžu	141.64	H
SI	SI3000118	Boč - Haloze - Donačka gora	10818.12	H
SI	SI3000120	Šmarna gora	1680.96	H
SI	SI3000126, SI5000017	Nanoščica, Nanoščica porečje	1,941.00	H,B
SI	SI3000129	Rinža	235.11	H, B
SI	SI3000155	Sora Škofja Loka - jezero Goričane	170.56	H
SI	SI3000166	Razbor	1,467.00	H
SI	SI3000170	Krška jama	436.39	H
SI	SI3000171	Radensko polje - Viršnica	500.00	H
SI	SI3000173	Bloščica	785.00	H
SI	SI3000175	Kolpa	850.00	H
SI	SI3000181	Kum	5,852.00	H
SI	SI3000188	Ajdovska planota	2,411.00	H
SI	SI3000191	Ajdovska jama	1,706.00	H
SI	SI3000192	Radulja	1,229.00	H
SI	SI3000201	Nakelska Sava	116.62	H
SI	SI3000203	Kompoljska jama - Potiskavec	157.18	H
SI	SI3000204	Globočec	105.90	H
SI	SI3000205	Kandrše	1,329.00	H
SI	SI3000206	Marijino brezno	1,248.00	H
SI	SI3000219	Grad Brdo - Preddvor	580.00	H
	SI3000224	Huda luknja	3014.79	H
SI	SI3000227	Krka	1,339.13	H
SI	SI3000231	Javorniki - Snežnik	43,821.00	H
SI	SI3000232	Notranjski trikotnik	15,202.00	H
SI	SI3000253, SI5000019	Julijske Alpe , Triglav*	84,550.00	H, B,NP,U

COUNTRY	CODE	PA NAME	AREA_HA	TYPE
SI	SI3000255	Trnovski gozd - Nanos	52636.48	H
SI	SI3000256	Krimsko hribovje - Menišija	20107.19	H
SI	SI3000259	Bohinjska Bistrica	650.14	H
SI	SI3000260	Blegoš	1571.94	H
SI	SI3000262	Sava - Medvode - Kresnice	382.99	H
SI	SI3000263, SI5000013	Kočevsko, Kočevsko - Kolpa	106,342.00	H, B
SI	SI3000266	Kamenški potok	127.40	H
SI	SI3000267	Gorjanci - Radoha	11,607.00	H
SI	SI3000268	Dobrava - Jovsi	2,902.00	H
SI	SI3000270, SI5000006	Pohorje Pohorje	388.92	H,B
SI	SI3000271, SI5000014	Ljubljansko barje	12,666.00	H,B
SI	SI3000273	Orlica Orlica	3772.78	H
SI	SI3000274	Bohor	6,793.00	H
SI	SI3000275	Rašica	2212.32	H
SI	SI3000278	Pokljuška barja	872.00	H
SI	SI3000285	Karavanke	23066.29	H
SI	SI5000002	Snežnik - Pivka	54,906.00	B
SI	SI5000015	Cerkniško jezero	3,357.00	H,B, R
SI	SLO25300	Sava Bohinjka in Sava Dolinka	936.54	O
SI	SLO25400	Sava od Radovljice do Kranja s sotocjem Tržiške Bistrice	877.91	O
SI	SLO26400	Sava Bohinjka z Mostnico in Ribnico	455.74	O
SI	SLO26800	Sava Dolinka od Zelencev do Hrušice	337.40	O
SI	SLO27700	Zelenci in Ledine pod Ratečami	112.20	O
SI	SLO33500	Sava od Mavcic do Save	3,229.39	O
SI	SLO63700	Sava od Radec do državne meje	2,837.65	O
HR	HR	Park prirode Zumberek (The Zumberak Park of Nature)	33,300.00	PN
HR	HR	Nacionalni park "Risnjak" (The Risnjak National Park)	6,400.00	NP
HR	HR1000001	Pokupski bazen	44,951.00	B
HR	HR1000002	Sava kod Hrušcice (s okolnim šljuncarama)	1,758.00	B
HR	HR1000003	Turopolje	22,735.00	B
HR	HR1000004	Donja Posavina	125,615.00	B
HR	HR1000005	Jelaš polje s ribnjacima i poplavnim pašnjacima uz Savu	41,755.00	B
HR	HR1000006	Spačvanski bazen	42,902.00	H, B
HR	HR1000009	Ribnjaci uz Česmu - Siščani, Blatnica, Narta i Vukšinac (Fish ponds along the Česma River)	23,224.00	B
HR	HR1000010	Poilovlje s ribnjacima Končanica, Garešnica i Poljana	27,352.00	B
HR	HR1000040	Papuk	36,258.00	B
HR	HR2000414	Izvorišno područje Odre (The Odra River source region)	905.00	H
HR	HR2000415	Odransko polje	8,493.00	H
HR	HR2000416	Lonjsko polje	50,157.00	H, R
HR	HR2000420	Sunjsko polje	20,352.00	H
HR	HR2000421	Ribnjaci Lipovljani (Lipovljani fish ponds)	1,940.47	H
HR	HR2000422	Ribnjaci Sloboština - Vrbovljani (Fish ponds Slaboština - Vrbovljani)	1,352.95	H
HR	HR2000424	Vlakanac - Radinje	3,194.00	H
HR	HR2000425	Jelaš polje	10,430.94	H
HR	HR2000426	Dvorina	2,055.00	H
HR	HR2000427	Gajna	565.00	H
HR	HR2000431	Sava - Štitar	1718.00	H
HR	HR2000439	Dolona Bjele (The Bijela River Valley)	516.00	H
HR	HR2000452	Zrinska gora	35,645.00	H

COUNTRY	CODE	PA NAME	AREA_HA	TYPE
HR	HR2000463	Dolina Une (The Una River Valley)	3,698.00	H
HR	HR2000465	Žutica	4,695.00	H
HR	HR2000580	Park prirode "Papuk" (The Papuk Park of Nature)	35,020.00	H, PN
HR	HR2000583	Park prirode "Medvednica" (Medvednica Park of Nature)	22,601.00	H, PN
HR	HR2000592	Ogulinsko-plaščansko područje	43,461.00	H
HR	HR2000593	Mrežnica - Tounjčica	1,520.00	H
HR	HR2000595	Rijeka Korana (The Korana River)	2,515.00	H
HR	HR2000609	Dolina Dretulje (The Dretulja River Valley)	581.00	H
HR	HR2000620	Mala i Velika Utinja	2,149.00	H
HR	HR2000631	Rijeka Odra (The Odra River)	502.00	H
HR	HR2000642	Rijeka Kupa (The Kupa River)	6,282.00	H
HR	HR2000879	Lapačko polje	2,222.00	H
HR	HR2001116	Sava	11,953.00	H
HR	HR2001121	Sava - Podsused	377.92	H, B
HR	HR2000449	Crna Mlaka	625.00	R
HR	HR5000020	Nacionalni park Plitvička jezera s Vrhovinskim poljem (The National Park Plitvice Lakes)	26,639.00	H, NP, U
HR	HR2000632	Krbavsko polje	11,430.00	H
BA	BA	Vrelo Bosne (The Bosna River Source)	603.00	O
BA	BA	Skakavac (waterfall area)	1,430.70	O
BA	BA	Bijambare	367.36	O
BA	BA	Nacionalni park "Kozara" (The Kozara National Park)	3,494.51	NP
BA	BA	Nacionalni park "Una" (The Una National Park)	19,800.00	NP
BA	BA	Tajan	35,10.00	O
BA	BA	Prokoško jezero (The Prokoško Lake)*	2,119.00	O
BA	BA	Semešnica	360.00	O
BA	BA00001	Ribnjak Saničani (The Saničani fish pond) *	4,316.35	O
BA	BA00002	Plivska jezera (The Pliva Lakes)	395.88	O
BA	BA00003	Bosanska gradiška*	3,238.57	O
BA	BA00004	Ribnjak Bardača (The Bardača fish pond) *	8,961.79	O
BA	BABardaca	Zaštićeno područje "Bardača" (Protected Area Bardača)	3,500.00	O, R
BA	BA00005	Srbac*	270.31	O
BA	BA00006	Ribnjak Prnjavor (The Prnjavor fish pond) *	1,221.86	O
BA	BA00007	Ukrina*	1,181.96	O
BA	BA00008	Liješće polje*	3,743.98	O
BA	BA00009	Dolina Spreče (The Spreča River valley) *	266.00	O
BA	BA00010	Donji Svilaj*	1,750.69	O
BA	BA00011	Vojskova*	321.78	O
BA	BA00012	Jezero Modrac (The Modrac Lake) *	10,989.76	O
BA	BA00013	Velika i Mala Tišina	1,521.16	O
BA	BA00014	Žabar*	616.17	O
BA	BA00015	Orašje*	110.42	O
BA	BA00016	Lončari*	699.35	O
BA	BA00017	Rača*	10,989.76	O
BA		Gromiželj	831	O
BA	BA00018	Patkovaca i rijeka Usora – Derventa (Patkovica and the Usora River) *	2,275.59	O
BA	BASutjeska	Nacionalni park "Sutjeska" (The Sutjeska National Park)	17,250.00	NP

COUNTRY	CODE	PA NAME	AREA_HA	TYPE
RS	RS	Rajac	1,200.00	O
RS	RS	Slapovi Sopotnice (The Sopotnica River cascade)	209.00	O
RS	RS0000018	Šargan-Mokra gora	10,813.00	H, B
RS	RS0000037	Pešter (Peštersko polje)	3,543.00	H, B, R
RS	RS0000054	Reka Gradac (The Gradac River)	1,268.00	H
RS	RS023IBA	Donja Drina	4,706.00	B
RS	SR0000009	Tara National Park	19,175.00	H, B, NP
RS	SR0000025	Uvac Natural Reserve	7,543.00	H, B
RS	SR0000026	Mileševka River	296.64	H, B
RS	SR0000036 RS025IBA	Valjevske planine	11,000.00	H, B
RS	SR0000039	Trešnjica River	595.00	H
RS	SRB_001	Ušće Save u Dunav-Veliko Ratno Ostrvo	212.06	B
RS	SRB_002	Crni Lug - Ribnjak Živaca	1,221.14	O
RS	SRB_003	Bojčinska šuma	709.50	O
RS	SRB_004	Ključ-Orlaca	1,284.89	O
RS	SRB_005	Usće Drine	2,599.43	O
RS	SRB_006	Obedska Bara	9,820.00	H, B, R
RS	SRB_007	Zasavica	671.00	H, B, R
RS	SRB_008	Trskovača	381.60	O
RS	SRB_009; RS021IBA	Morovićko Bosutske šume	21,899.77	B
RS	RS0000057	Zaovine	4,300.00	H
ME	ME	Nacionalni park "Durmitor" sa kanjonom Tare (Durmitor National Park with the Tara River Gorge)	39,000.00	NP
ME	ME	Sliv rijeke Tare (The Tara River catchment)	182,889.00	O, U
ME	ME	Kanjon Komarnice (The Komarnica River Canyon)	1,437.86	O
ME	ME	Kanjon Pive (The Piva River Canyon)	1,664.07	O
ME	ME	Dolina Lima (The Lim River Valley)	17,148.52	O
ME	ME	Ćehotina Valley	13,356.96	O
ME	ME	Komovi	21,000.00	O
ME	ME	Nacionalni park "Biogradska gora" (Biogradska Gora National Park)	5,650.00	NP

* Total area out of which 49,362.39 ha is in the Sava River Basin.

*The sites are not currently protected by national legislation

Legend: **NP –** National Park; **PN –** Park of Nature; **B –** Natura 2000 sites important for the protection of avifauna (proposed to preserve the birds species enumerated in the Birds Directive - 79/409/EEC)**; H –** Natura 2000 sites proclaimed as of the Community importance for protection of the habitat types and the species enumerated in Habitats Directive 92/43/EEC; **R –** "Ramsar sites", sites selected as Wetlands of International Importance according to The Convention on Wetlands of International Importance from 1971 ("Ramsar Convention"); **U –** UNESCO World Heritage Site, the site that is listed by the UNESCO (The United Nations Educational, Scientific and Cultural Organization) as of special cultural or physical significance (the list is maintained by the international World Heritage Programme administered by the UNESCO World Heritage Committee); **O –** other, site protected by national or sub-national legislative.

Table 2: Groundwater drinking water protected areas

No.	Country Code	GWB (DWPA) Name	GWB National Code	Transboundary GWB (Yes/No)	GWB Size [km²]
1.	SI	Savska kotlina in Ljubljansko Barje	1001	N	774.00
2.	SI	Savinjska kotlina	1002	N	109.00
3.	SI	Krška kotlina	1003	Y	97.00
4.	SI	Julijske Alpe v porečju Save	1004	Y	772.00
5.	SI	Karavanke	1005	Y	414.00
6.	SI	Kamniško-Savinjske Alpe	1006	Y	1,113.00
7.	SI	Cerkljansko, Škofjeloško in Polhograjsko	1007	N	850.00
8.	SI	Posavsko hribovje do osrednje Sotle	1008	N	1,792.00
9.	SI	Spodnji del Savinje do Sotle	1009	Y	1,397.00
10.	SI	Kraška Ljubljanica	1010	N	1,307.00
11.	SI	Dolenjski kras	1011	N	3,355.00
12.	HR	Sliv Sutle i Krapine		Y	1,408.69
13.	HR	Zagreb		Y	5,197.09
14.	HR	Lekenik - Lužani		Y	1,572.46
15.	HR	Istočna Slavonija - Sliv Save		Y	988.31
16.	HR	Gornji tok Kupe		Y	3,447.78
17.	HR	Sliv Korane		Y	3,327.65
18.	HR	Gornji tok Une		Y	443.69
19.	HR	Sliv Lonja - Ilova - Pakra		N	2,873.63
20.	HR	Sliv Orljave		N	539.69
21.	HR	Žumberak - Somoborsko Gorje		N	1,016.22
22.	HR	Donji tok Kupe		N	754.67
23.	HR	Donji tok Une		N	1,370.14
24.	HR	Sliv Dobre		N	1,248.57
25.	HR	Sliv Mrežnice		N	1,513.71
26.	BA	Plješevica	BAGW_UNA_2	Y	1,350.00
27.	BA	Posavina II	BAGW_SAV_2	N	2,050.00
28.	BA	Romanija-Devetak-Sjemeč	BAGW_BO_DRN_1	N	1,240.00
29.	BA	Treskavica-Zelengora-Lelija-Maglić	BAGW_DRN_1	N	1,800.00
30.	BA	Manjača-Čemernica-Vlašić	BAGW_VRB_1	N	3,770.00
31.	BA	Grmeč-Srnetica-Lunjevača-Vitorog	BAGW_VRB_UNA_7	N	1,720.00
32.	BA	Unac	BAGW_UNAC_UNA_1	N	120.00
33.	RS	Loznicko Polje	DR_GW_I_1	N	243.88
34.	RS	Jadar	DR_GW_I_2	N	208.54
35.	RS	Gucevo	DR_GW_K_1	N	172.97
36.	RS	Povlen	DR_GW_K_2	N	322.37
37.	RS	Tara	DR_GW_K_3	N	299.58
38.	RS	Cer	DR_GW_P_1	N	110.80
39.	RS	Osecina	DR_GW_P_2	N	320.27
40.	RS	Krupanj	DR_GW_P_3	N	384.92

No.	Country Code	GWB (DWPA) Name	GWB National Code	Transboundary GWB (Yes/No)	GWB Size [km²]
41.	RS	Boranja	DR_GW_P_4	N	68.23
42.	RS	Ljubovija	DR_GW_P_5	N	619.49
43.	RS	Zlatibor - zapad	DR_GW_P_6	N	522.30
44.	RS	Kolubara - neogen	KOL_GW_I_1	N	656.57
45.	RS	Kolubara - istok	KOL_GW_I_2	N	424.79
46.	RS	Tamnava	KOL_GW_I_3	N	276.82
47.	RS	Nepricava - karst	KOL_GW_K_1	N	609.19
48.	RS	Lelic - karst	KOL_GW_K_2	N	306.83
49.	RS	Ljig	KOL_GW_P_1	N	565.82
50.	RS	Pestan	KOL_GW_P_2	N	286.37
51.	RS	Kolubara - zapad	KOL_GW_P_3	N	502.30
52.	RS	Valjevo	KOL_GW_S_1	N	542.81
53.	RS	Zlatar	LIM_GW_K_1	N	112.38
54.	RS	Jadovnik	LIM_GW_K_2	N	107.33
55.	RS	Bucje	LIM_GW_K_3	N	147.38
56.	RS	Javorje	LIM_GW_P_1	N	217.75
57.	RS	Pobijenik	LIM_GW_P_2	N	559.27
58.	RS	Komaran	LIM_GW_P_3	N	426.28
59.	RS	Zapadni Srem - OVK	SA_GW_I_1	N	450.05
60.	RS	Istocni Srem - OVK	SA_GW_I_2	N	1,593.65
61.	RS	Macva - OVK	SA_GW_I_3	N	763.41
62.	RS	Beograd - leva obala Save	SA_GW_I_4	N	283.06
63.	RS	Beograd - desna obala Save	SA_GW_I_5	N	179.68
64.	RS	Zapadni Srem - pliocen	SA_GW_I_6	N	1,172.92
65.	RS	Istocni Srem - pliocen	SA_GW_I_7	N	2,248.99
66.	RS	Macva - pliocen	SA_GW_I_8	N	1,577.53
67.	RS	Beograd - krecnjak	SA_GW_K_1	N	60.64
68.	RS	Fruska gora	SA_GW_S_1	N	735.56
69.	RS	Beograd - jug	SA_GW_S_2	N	365.35
70.	RS	Sjenica	UV_GW_I_1	N	142.51
71.	RS	Zarudine	UV_GW_K_1	N	66.71
72.	RS	Vapa i Pester	UV_GW_K_2	N	562.38
73.	RS	Radoinja	UV_GW_K_3	N	71.41
74.	RS	Javor - zapad	UV_GW_K_4	N	259.48
75.	RS	Nova Varos	UV_GW_P_1	N	128.81
76.	RS	Stari Vlah - jug	UV_GW_P_2	N	172.22
77.	ME	Sliv rijeke Pive			1,500.00
78.	ME	Sliv rijeke Tare			2,000.00
79.	ME	Sliv rijeke Ćehotine			800.00
80.	ME	Sliv rijeke Lim			2,000.00

Annex 10

Water uses in the Sava River Basin – overview tables

Water uses in the Sava River Basin – overview tables

Information presented in the following tables based on the Sava River Basin Analysis Report 2009, however have been filled in data gaps and carried out further refinement of information re-structured according to hydrological boundaries of Sava River Basin. Meanwhile two countries – SI and HR – have finalized their national river basin plans, which required also certain modifications in data provided earlier for the SRBA Report.

In SRBA were reported hydropower plants with capacity above 10 MW. In course of discussions – especially with NGO-s - have been emphasized that hydropower plants with capacity less than 10 MW might also have significant impact on environment if reaching critically high number. However the tables 2 and 8 on hydropower plants do not cover plants of the capacity below 10MW.

Table 1: Water use in the Sava River Basin – 2005

Name of the Country	Public Water Supply	Industry	Thermal and nuclear plant	Irrigation	Other agricultural	Total water use	Per Capita Use - Public Water Supply
	million m³						l/person/d
SI	82	43	540	7	123	795	218
HR	113	57	205	3	201	580	140
BA	330	147	63	6	66	612	268
RS	233	40	1,722	14	68	2,077	328
ME*	2	1	2	0	0	5	22
Total Sava RB	**760**	**288**	**2,532**	**30**	**459**	**4,069**	**238**
Percentage	19%	7%	62%	1%	11%	100%	

* Public water supply of Montenegro stands for the quantity reported in the beginning of the year and fee paid for.

Table 2: Basic data on hydropower plants in the Sava River Basin

Name of the Sava RB Country	Name of the plant	River	Capacity installed (MW)	Installed discharge (m3/s)	Average yearly production [2005-2007] (GWh/year)	Countries' Share in average total production	Countries ' Share 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	192	4%	4%
	Lešće	Dobra	42	2x60 +2.7	94		
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		

Name of the Sava RB Country	Name of the plant	River	Capacity installed (MW)	Installed discharge (m3/s)	Average yearly production [2005-2007] (GWh/year)	Countries' Share in average total production	Countries ' Share in installed capacity
	RHE Bajina Bašta*	Drina	614	129	n/a		
ME	Piva	Piva	360	240	788	12%	15%
Total Sava RB 2005			**2,449**		**6,445**	100%	100%

* Reversible HPP

Table 3: Population and employees in the Sava River Basin per country - 2005

Name of the Sava Country	Population in whole country	Population in SRB	Share of total population	Employees in whole country	Employees in SRB	Share of employees in whole country	Employ-ment rate in SRB
	1000 persons	1000 persons	%	1000 persons	1000 persons	%	%
SI	1,978	1,030	52	910	560	62	54
HR	4,437	2,213	50	1,496	781	52	35
BA	3,815	3,374	88	811	793	98	24
RS	7,498	1,947	26	2,069	397	19	20
ME	627	195	31	171	43	25	22
Total Sava RB	**18,356**	**8,760**	**48**	**5,457**	**2,574**	**47**	**29**

Table 4: GDP and GPD per capita for the Sava River Basin by countries – 2005

Name of the Sava Country	GDP whole country 1,000 EUR	GDP Sava RB, 1,000EUR	Share of total GDP %	GDP per capita whole country	GDP per capita in Sava RB
SI	28 750 000	17 100 000	59	14 535	16 602
HR	31 262 000	17 212 000	55	7 045	7 776
BA	8 654 000	6 490 000	75	2 268	1 924
RS	23 610 000	5 906 844	25	3 186	3 033
ME	2 680 467	710 892	27	4 272	3 640
Total Sava RB	**94 956 467**	**47 419 736**	**50**	**5 173**	**5 413**

Table 5: Number of employees in the Sava River Basin by economic sectors and countries (in 1,000) – 2005

Name of the Sava Country	Employees by sector					Total number of employees in SRB	Employment rate in Sava RB %
	Agriculture total	Industry	Energy	Other activities	Public services		
SI	50	140	5	250	115	560	54
HR	97	157	13	358	156	781	35
BA	125	187	5	180	296	793	24
RS	11	139	12	118	117	397	20
ME	9	9	1	11	13	43	22
Total Sava RB	**292**	**632**	**36**	**917**	**697**	**2,574**	**29**
Share of sectors	11%	25%	1%	36%	27%	100%	

Table 6: GVA by sectors and countries in the Sava River Basin (in million EUR) – 2005

Name of the Sava RB Country	GVA by sectors					Total GVA in Sava RB
	Agriculture total	Industry	Energy	Other activities	Public services	
SI	350	4 250	600	9,000	3, 550	17,750
HR	950	3 331	372	7,347	2, 279	14,279
BA	563	601	332	3,454	550	5, 500
RS	431	663	165	1,659	398	3,316
ME	230	395	129	1,175	547	2,477
Total	**2, 524**	**9,240**	**1,598**	**22, 635**	**7,324**	**43,322**
Share of sec.	6%	21%	4%	52%	17%	100%

Table 7: Scenario for 2015 – Water demand in the Sava River Basin

Country	Public Water Supply	Industry	Thermal and nuclear plant	Irrigation	Other agricultural	Total water demand	Change as compare to 2005
	Million m^3	Million m^3	Million m^3	Million m^3	Million m^3	Million m^3	2005=100%
SI	86	42	570	0,4	135	833	105
HR	220	90	105	75	220	710	122
BA	415	135	59	56	83	747	122
RS	264	84	1 733	73	91	2 244	108
ME	9	2	5	4	2	22	454
Total Sava RB 2015	**994**	**354**	**2 472**	**208**	**530**	**4 557**	**112**
Percentage 2015	22%	8%	54%	5%	12%	100%	

Table 8: Scenario for 2015 - Basic data on installed and planned hydropower plants (planned HPPs are highlighted)

Name of the Sava RB Country	Name of the plant	River	Capacity installed & planned 2015	Discharge	Average yearly production planned	Countries' Share in average total planned production by 2015	Countries' Share in installed and planned capacity by 2015
			MW	(m3/s)	(GWh/year)		
SI	Moste/ Završnica	Sava	21	35	64	12%	10%
	Mavčiče	Sava	38	260	62		
	Medvode	Sava	26.4	130	72		
	Vrhovo	Sava	34	501	116		
	Boštanj	Sava	33	500	115		
	Blanca	Sava	43	500	160		
	Krško	Sava	40	500	149		
	Brežice	Sava	42	500	161		
	Mokrice	Sava	23.4	350	119		
HR	Gojak	Donja Dobra	55.5	57	192	4%	3%
	Lešće	Dobra	42	2x60 +2.7	94		
BA	Bočac	Vrbas	110	240	308	36%	28%
	Višegrad	Drina	315	800	1 120		
	Jajce I	Pliva	60	74	259		
	Jajce II	Vrbas	30	80	181		

Name of the Sava RB Country	Name of the plant	River	Capacity installed & planned 2015	Discharge	Average yearly production planned	Countries' Share in average total planned production by 2015	Countries' Share in installed and planned capacity by 2015
			MW	(m3/s)	(GWh/year)		
	Ustikolina	Drina	59		255		
	Vranduk	Bosna	22		103		
	Unac	Unac	71		250		
	Vrhpolje	Sana	68		157		
	Ugar-ušće	Ugar	15		60		
	Vrletna kosa	Ugar	25		63		
	Han Skela	Vrbas	11		54		
RS	Zvornik	Drina	96	620	515	38%	46%
	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	10%	13%
		Total	**2,825.3**		**7,811**	100%	100%
Change as compared to 2005:			**115%**		**121%**		

*Reversible HPP

Annex 11

Programme of measures - surface waters

Summary of urban wastewater (organic and nutrient) pollution reduction - scenarios

PoM - summary of urban wastewater (organic and nutrient) pollution reduction - scenarios

Table 1: Overview of current status, reference year 2007

Current status	Population in agglomerations > 2,000 PE	Generated load (PE) (Estimated load)	Generated load BOD_5 (t/a)	Generated load COD (t/a)	Generated load N_t (t/a)	Generated load P_t (t/a)	Discharged load BOD_5 (t/a)	Discharged load COD (t/a)	Discharged load N_t (t/a)	Discharged load P_t (t/a)	Emissions BOD_5 (t/a)	Emissions COD (t/a)	Emissions N_t (t/a)	Emissions P_t (t/a)
SI	742282	964967	21132,77	38743,41	3874,34	704,43	4303,69	9772,17	2003,46	401,15	10717,43	21530,70	3179,31	614,95
HR	1837275	2442741	53496,03	106992,06	7846,08	1935,22	15514,45	28518,72	3484,04	987,63	35514,45	73122,34	6616,75	1756,48
BA	2288389	2634237	57689,78	115379,56	8461,17	1971,07	30212,48	60365,59	4461,64	1042,40	57198,52	114326,87	8425,14	1966,27
RS	741400	698663	15300,72	29527,77	2244,11	488,55	5464,00	10596,86	1016,10	180,34	14382,25	27733,99	2157,57	480,59
ME	61638	76750	1680,83	3361,65	246,52	50,42	973,78	1939,35	147,04	30,45	1623,34	3238,46	242,31	49,93
Sava RB total	5670984	6817357	149300,13	294004,45	22672,22	5149,69	56468,41	111192,69	11112,28	2641,97	119435,99	239952,35	20621,07	4868,22

Table 2: Baseline Scenario - the first cycle of the WFD implementation (until 2015)

Scenario I - 2015	Population in agglomerations > 2,000 PE	Generated load (PE) (Estimated load)	Generated load BOD_5 (t/a)	Generated load COD (t/a)	Generated load N_t (t/a)	Generated load P_t (t/a)	Discharged load BOD_5 (t/a)	Discharged load COD (t/a)	Discharged load N_t (t/a)	Discharged load P_t (t/a)	Emissions BOD_5 (t/a)	Emissions COD (t/a)	Emissions N_t (t/a)	Emissions P_t (t/a)
SI	742282	964967	21132,77	38743,41	3874,34	704,43	2936,90	7250,78	1517,19	328,12	5398,93	11764,51	1968,56	410,19
HR	1837275	2442741	53496,03	106992,06	7846,08	1935,22	10252,09	20582,73	3106,84	845,55	24645,64	53802,37	5413,73	1408,48
BA	2288389	2634237	57689,78	115379,56	8461,17	1971,07	26141,20	51426,67	4362,89	1062,15	51857,99	99236,95	7875	1881
RS	741400	698663	15300,72	29527,77	2244,11	488,55	4271,75	8803,07	904,01	160,63	12824,48	24946,40	1989,22	436,86
ME	61638	76750	1680,83	3361,65	246,52	50,42	957,96	1926,32	148,13	30,39	1534,92	3080,24	232,75	47,70
Sava RB total	5670984	6817357	149300,13	294004,45	22672,22	5149,69	44559,90	89989,58	10039,06	2426,83	96261,95	192830,46	17479,57	4184,16

Table 3: Midterm Scenario – urban waste water collection and treatment in agglomerations >10,000 PE

Scenario II	Population in agglomerations > 2,000 PE	Generated load (PE) (Estimated load)	Generated load BOD_5 (t/a)	Generated load COD (t/a)	Generated load N_t (t/a)	Generated load P_t (t/a)	Discharged load BOD_5 (t/a)	Discharged load COD (t/a)	Discharged load N_t (t/a)	Discharged load P_t (t/a)	Emissions BOD_5 (t/a)	Emissions COD (t/a)	Emissions N_t (t/a)	Emissions P_t (t/a)
SI	742282	964967	21132,77	38743,41	3874,34	704,43	2209,00	7004,66	1380,80	218,16	3349,16	9094,95	1589,83	256,17
HR	1837275	2442741	53496,03	106992,06	7846,08	1935,22	3399,24	15900,29	2185,96	375,91	9857,18	28831,49	3139,87	602,88
BA	2288389	2634237	57689,78	115379,56	8461,17	1971,07	7153,02	20216,01	2454,24	486,54	19215,88	44330,93	4229,01	900,53
RS	741400	698663	15300,72	29527,77	2244,11	488,55	1553,33	4347,24	522,50	92,31	7798,64	16210,32	1443,28	286,89
ME	61638	76750	1680,83	3361,65	246,52	50,42	169,56	612,32	80,68	12,65	286,62	846,44	97,85	16,16
Sava RB total	5670984	6817357	149300,13	294004,45	22672,22	5149,69	14484,15	48080,52	6624,17	1185,57	40507,48	99314,12	10499,82	2062,63

Table 4: Vision scenario - urban waste water collection and treatment in agglomerations >2,000 PE

Scenario III	Population in agglomerations > 2,000 PE	Generated load (PE)(Estimated load)	Generated load BOD_5 (t/a)	Generated load COD (t/a)	Generated load N_t (t/a)	Generated load P_t (t/a)	Discharged load BOD_5 (t/a)	Discharged load COD (t/a)	Discharged load N_t (t/a)	Discharged load P_t (t/a)	Emissions BOD_5 (t/a)	Emissions COD (t/a)	Emissions N_t (t/a)	Emissions P_t (t/a)
SI	742282	964967	21132,77	38743,41	3874,34	704,43	2148,36	6543,82	1448,76	234,36	2176,94	6596,22	1454,00	235,31
HR	1837275	2442741	53496,03	106992,06	7846,08	1935,22	4264,99	17320,96	2680,34	520,29	4264,99	17320,96	2680,34	520,29
BA	2288389	2634237	57689,78	115379,56	8461,17	1971,07	6925,26	20513,62	3364,69	725,28	7010,93	20682,94	3378,29	728,55
RS	741400	698663	15300,72	29527,77	2244,11	488,55	2875,79	5555,19	1058,34	236,94	2875,79	5555,19	1058,34	236,94
ME	61638	76750	1680,83	3361,65	246,52	50,42	152,48	559,00	88,01	15,01	152,48	559,00	88,01	15,01
Sava RB total	5670984	6817357	149300,13	294004,45	22672,22	5149,69	16366,89	50492,58	8640,15	1731,88	16481,14	50714,30	8658,99	1736,10

Annex 12

Programme of measures – groundwater

Overview of measures planned to address poor groundwater chemical and quantitative status

Table 1: Measures planned to address poor groundwater chemical status

Country	Slovenia*	Croatia	Bosnia and Herzegovina							Serbia	
Groundwater body	Savinjska kotlina	Zagreb	Plješevica	Posavina II	Romanija-Devetak-Sjemeč	Treskavica-Zelengora-Lelija-Maglić	Manjača-Čemernica-Vlašić	Grmeč-Srnetica-Lunjevača-Vitorog	Unac	Mačva OVK	Ist. Srem OVK
GWB code	VTPodV_1002	DSGIKCPV_27	BAGW_UNA_2	BAGW_SAV_2	BAGW_BO_DRN_1	BAGW_DRN_1	GW_VRB_1	GW_VRB_UNA_7	BAGW_UNAC_UNA_1	RS_SA_GW_I_3	RS_SA_GW_I_2
Chemical status	Poor, Poss. at risk	Poss. at risk	Poss. at risk	Poss at risk	Poss at risk	Poss at risk	Poss at risk	Poss at risk	Poss at risk	Poss at risk	Poss at risk
Reason for being in poor status/at risk: Point sources	Leakages from industrial disposal sites Celje: Travnik and Bukovžlak	Leakages from waste disposal sites	Leakages from contaminated and waste disposal sites	Leakages from waste disposal sites	Leakages from waste disposal sites	Leakages from waste disposal sites	Leakages from waste disposal sites	Leakages from waste disposal sites	–	–	–
Reason for being in poor status/at risk: Diffuse sources	due to agricultural activities, urban land use	due to agricultural activities, non-sewered population, urban land use	due non-sewered population	due to agricultural activities, non-sewered population, urban land use	due non-sewered population	due non-sewered population	due non-sewered population	due non-sewered population	due non-sewered population	due to agricultural activities, non-sewered population	due to agricultural activities, non-sewered population, urban land use
Basic measures (Directive listed in Annex VI Part A)	DWD, UWWT, PPPD, ND, HD, IPPC Construction of WWTP and sewage systems	DWD,UWWT, ND	Water Act (Off. Gazette FB&H 70/06.), Rules on Drinking Water (Off. Gazette FB&H 40/10).	Rule on sanitary property of drinking water (Off. Journal RoS44/03)	Rule on sanitary property of drinking water (Off. Journal RoS44/03)	Rule on sanitary property of drinking water (Off. Journal RoS44/03)	Rule on sanitary property of drinking water (Off. Journal RoS44/03)	Rule on sanitary property of drinking water (Off. Journal RoS44/03)	Water Act (Off. Gazette FB&H 70/06.),Rules on Drinking Water (Off. Gazette FB&H 40/10).	–	–
Other basic measures as required by Article 11(3)(b-l)	Measures for the protection of water abstracted for drinking water (Article 7)	Prohibition of direct discharge to GW, Prior regulation of point source discharges	Regulations on limit values of dangerous and harmful substances (Off.Gazette FB&H 50/07)	Rule on sanitary protection of drink. water sources (Off. Journal RoS 44/03), Rule on treatment and sluiceway of wastewaters (Off. Journal RoS 68/01)	Rule on sanitary protection of drink. water sources (Off. Journal RoS 44/03), Rule on treatment and sluiceway of wastewaters (Off. Journal RoS 68/01)	Rule on sanitary protection of drink. water sources (Off. Journal RoS 44/03), Rule on treatment and sluiceway of wastewaters (Off. Journal RoS 68/01)	Rule on sanitary protection of drink. water sources (Off. Journal RoS 44/03), Rule on treatment and sluiceway of wastewaters (Off. Journal RoS 68/01)	Rule on sanitary protection of drink. water sources (Off. Journal RoS 44/03), Rule on treatment and sluiceway of wastewaters (Off. Journal RoS 68/01)	Regulation on determining the sanitary protection zones (Off.Gazette FB&H 51/02),Regulations on limit values of dangerous and harmful substances (Off.Gazette FB&H 50/07)	–	–

Country	Slovenia*	Croatia	Bosnia and Herzegovina								Serbia	
Need for Supplementary/Additional Measures WFD Article 11(4) and 11(5)	Stimulation of best practice measures in agriculture, particulary for pesticides. Stimulation of highly efficient agricultural measures for groundwater protection in Rural devel-opment pro-gramme.	–	–	–	–	–	–	–	–	–	Investigations on the status of groundwater body, establishment of dense GW monitoring network and programmes.	Investigations on the status of groundwater body, establishment of dense GW monitoring network and programmes.

*more information on planned measures could be found in „Pregledovalnik podatkov za vodna telesa površinskih in podzemnih voda" (http://www.mop.gov.si/si/delovna_podrocja /voda/nacrt_upravljanja_voda_za_vodni_obmocji_donave_in_jadranskega_morja_2009_2015/)

Legend:

DWD- Drinking Water Directive (80/778/EEC) as amended by Directive (98/83/EC)

UWWT- Urban Waste-water Treatment Directive (91/271/EEC)

PPPD- Plant Protection Products Directive (91/414/EEC)

ND- Nitrates Directive (91/676/EC)

HD- Habitats Directive (92/43/EEC)

IPPC- Integrated Pollution Prevention Control Directive (96/61/EC)

Table 2: Measures planned to address poor groundwater quantitative status

Country	Croatia	Serbia	
Groundwater body	Zagreb	Zapadni Srem-pliocen	Istocni Srem-pliocen
GWB code	DSGIKCPV_27	RS_SA_GW_I_6	RS_SA_GW_I_7
Quantitative status	Possible at risk	Possible at risk	Possible at risk
Reason for being in poor status/at risk	Relatively large exploitation quantities and demands for water as well as evident lowering of groundwater levels (a consequence of the trend of decreased water levels of the Sava River, a decreased precipitation and the exploitation of groundwater).	Groundwater abstracted from Pliocene aquifers is predominantly used for public water supply, industry and in less extent also for private water supply. Before commencement of organized water supply (in 1980's), artesian pressures were present on most wells, lowering of GW levels recorded in last decades.	Groundwater abstracted from Pliocene aquifers is used for public water supply , as well as for private water supply, agricultural use and industrial facilities. Lowering of GW levels recorded in last decades.
Significant quantitative GW pressures	Abstractions for public water supply,	Abstractions for public water supply	Abstractions for public water supply
	Abstractions for agriculture (lack of information)	Abstractions for industry	Abstractions for industry
		Possible illegal abstraction	
Basic measures (Directive listed in Annex VI Part A)	–	–	–
Other basic measures as required by Article 11(3)(b-l)	Abstraction control (for agriculture); research, development and demonstrations projects.	The Law on Waters (Official Gazette of RS No. 30/2010), (in line with the requirements of WFD), introduces water licences, which can be used for control of illegal GW abstractions.	The Law on Waters (Official Gazette of RS No. 30/2010), (in line with the requirements of WFD), introduces water licences, which can be used for control of GW abstractions.
Need for Supplementary/Additional Measures WFD Article 11(4) and 11(5)	Yes, Quantity (Groundwater abstraction is not the main reason of decreasing of groundwater level).	Investigations on the quantitative status of groundwater body, integration of monitoring networks of water supply companies into state monitoring programmes.	Measures could include further activities on construction of East Srem regional water supply system, based on use of groundwater source in the Sava alluvium. Regional GW source will not only solve the problem of providing an adequate supply of quality drinking water, but will also improve the quantitative status of the pliocene GWBs, since it will reduce the current rate of abstraction from deep aquifers.

Annex 13

List of background documents

List of background documents

1. Surface water bodies in the Sava River Basin
2. Groundwater bodies in the Sava River Basin
3. Significant pressures identified in the Sava River Basin
4. Hydromorphological alternations in the Sava River Basin
5. Significant Water Management Issues
6. Cost-recovery of water services – Case studies of the countries
7. Invasive alien species
8. Protected areas in the Sava River Basin
9. Integration of water protection in developments in the Sava River Basin (Floods, Navigation, Hydropower, Agriculture)
10. Climate change and RBM planning

All documents are available on ISRBC website: http://www.savacommission.org/srbmp.

Maps

Sava River Basin: Overview

MAP 1

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Shuttle Radar Topography Mission (SRTM-3) from USGS Seamless Data Distribution System was used as topographic layer.
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Processed and compiled by the Consortium of VVMZ, Environmental Institute and Water Research Institute (SK), November 2011.
Final version: Secretariat of the Sava Commision, August 2012.

Ecoregions in the Sava River Basin

MAP 2

INTERNATIONAL SAVA RIVER BASIN COMMISSION

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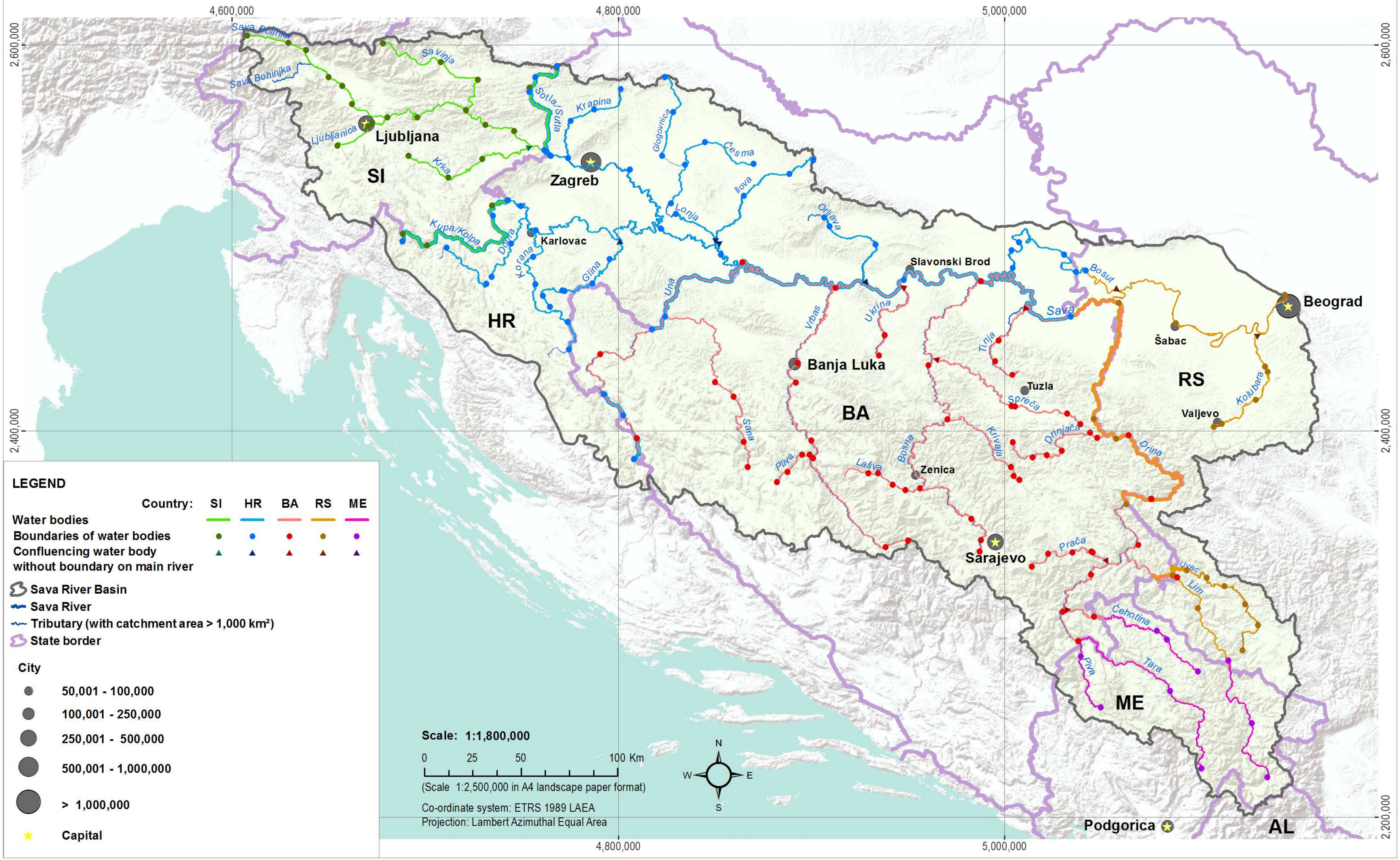
Location and boundaries of surface water bodies

MAP 3

INTERNATIONAL SAVA RIVER BASIN COMMISSION



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Groundwater bodies of basin-wide importance and density of monitoring network

MAP 4

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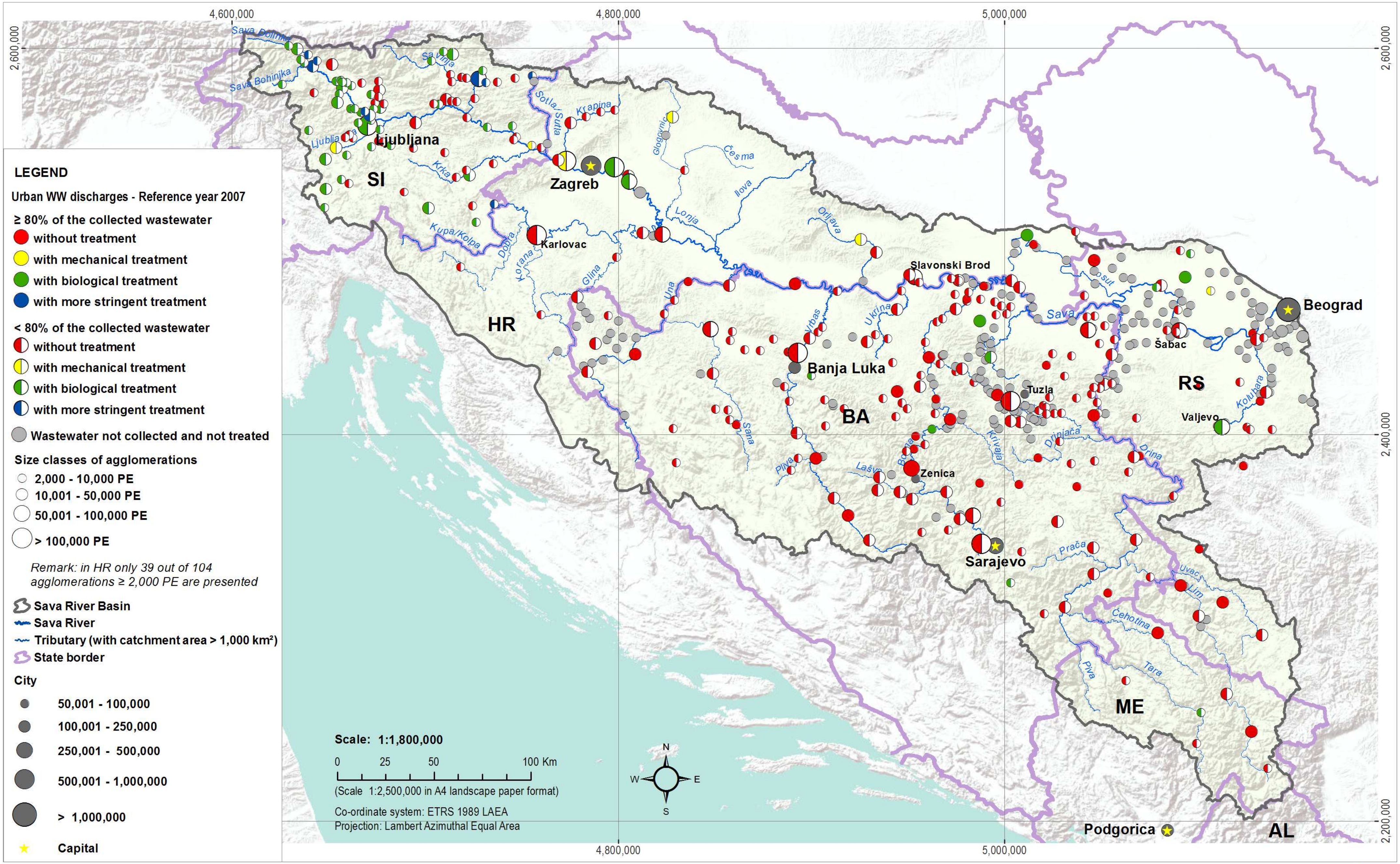
Urban wastewater discharges – Reference year 2007

MAP 5



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Significant industrial pollution sources – Reference year 2007

MAP 6

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River and habitat continuity interruptions & expected improvements (2015)

MAP 7

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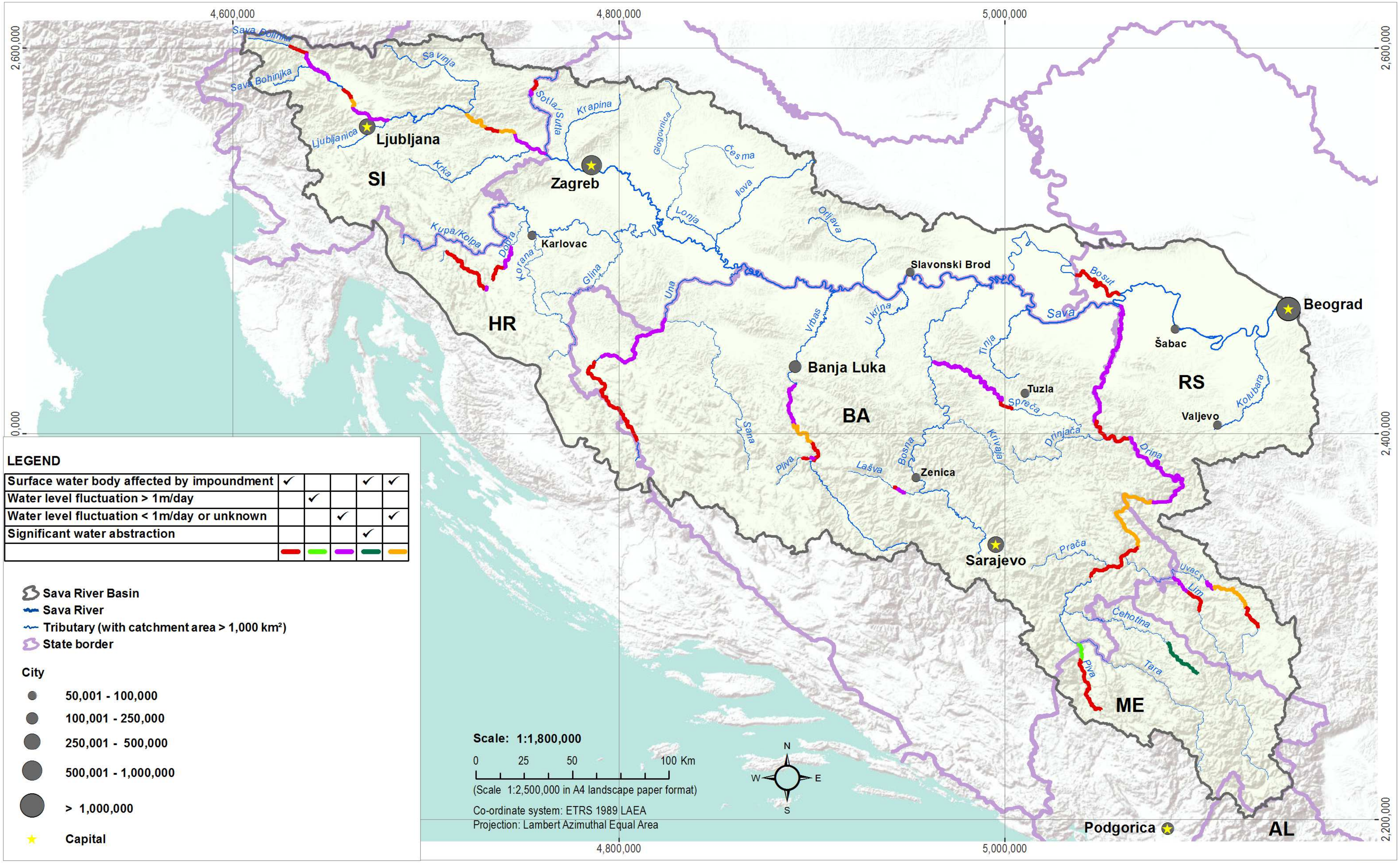
Hydrological alterations - impoundments, water abstraction and hydropeaking

MAP 8

INTERNATIONAL SAVA RIVER BASIN COMMISSION



LEGEND

Surface water body affected by impoundment	✓			✓	✓
Water level fluctuation > 1m/day		✓			
Water level fluctuation < 1m/day or unknown			✓		✓
Significant water abstraction				✓	
	red	green	purple	dark green	orange

Sava River Basin
Sava River
Tributary (with catchment area > 1,000 km²)
State border

City

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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Morphological alterations of surface water bodies

MAP 9

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Hydromorphological risk assessment of surface water bodies

MAP 10

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Existing infrastructure in the Sava River Basin

MAP 11

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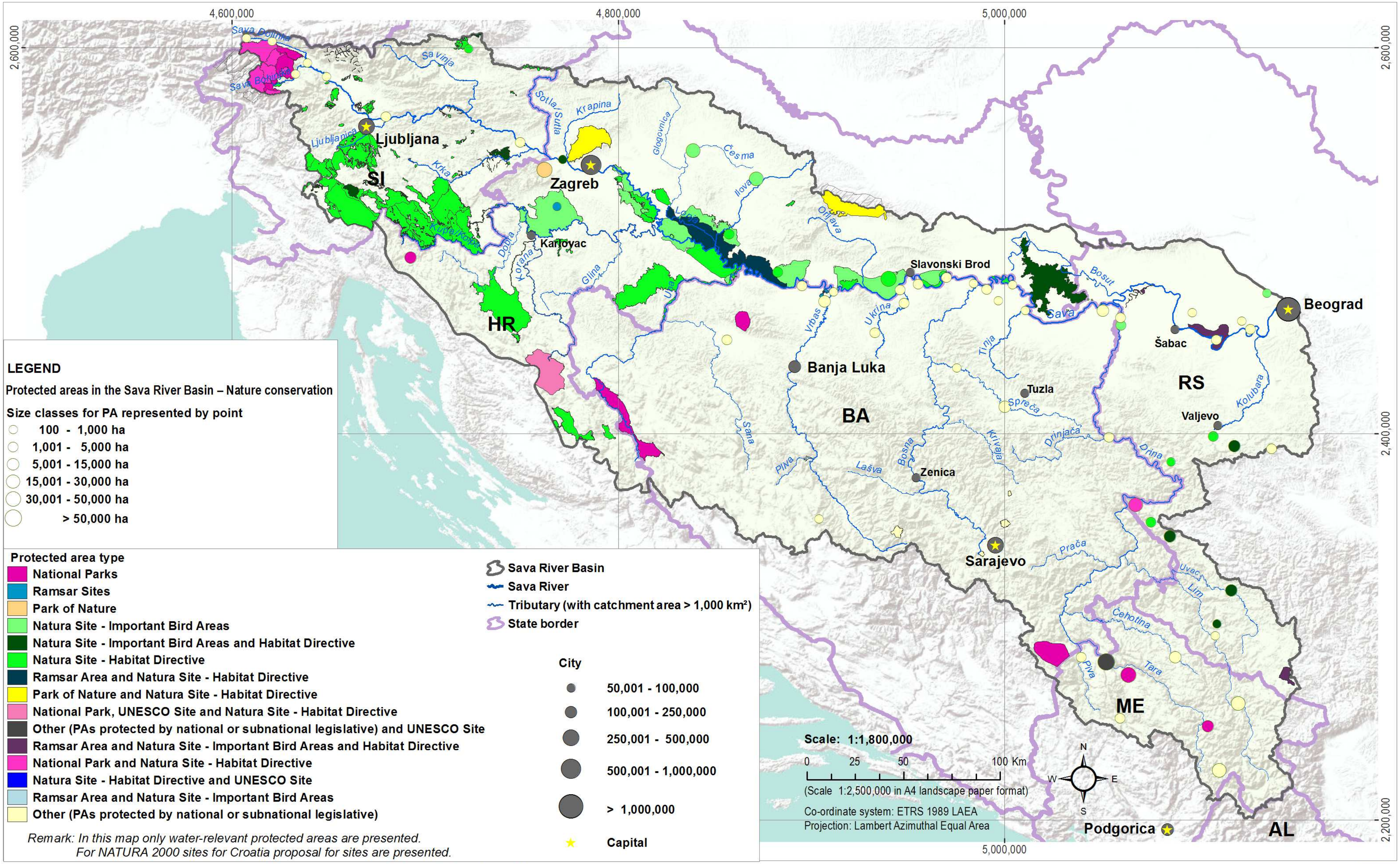
Protected areas in the Sava River Basin – Nature conservation

MAP 12

INTERNATIONAL SAVA RIVER BASIN COMMISSION



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Surface water quality monitoring network

MAP 13

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Heavily modified surface water bodies

MAP 14

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Ecological status and Ecological potential of surface water bodies

MAP 15

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Chemical status of surface water bodies

MAP 16

INTERNATIONAL SAVA RIVER BASIN COMMISSION

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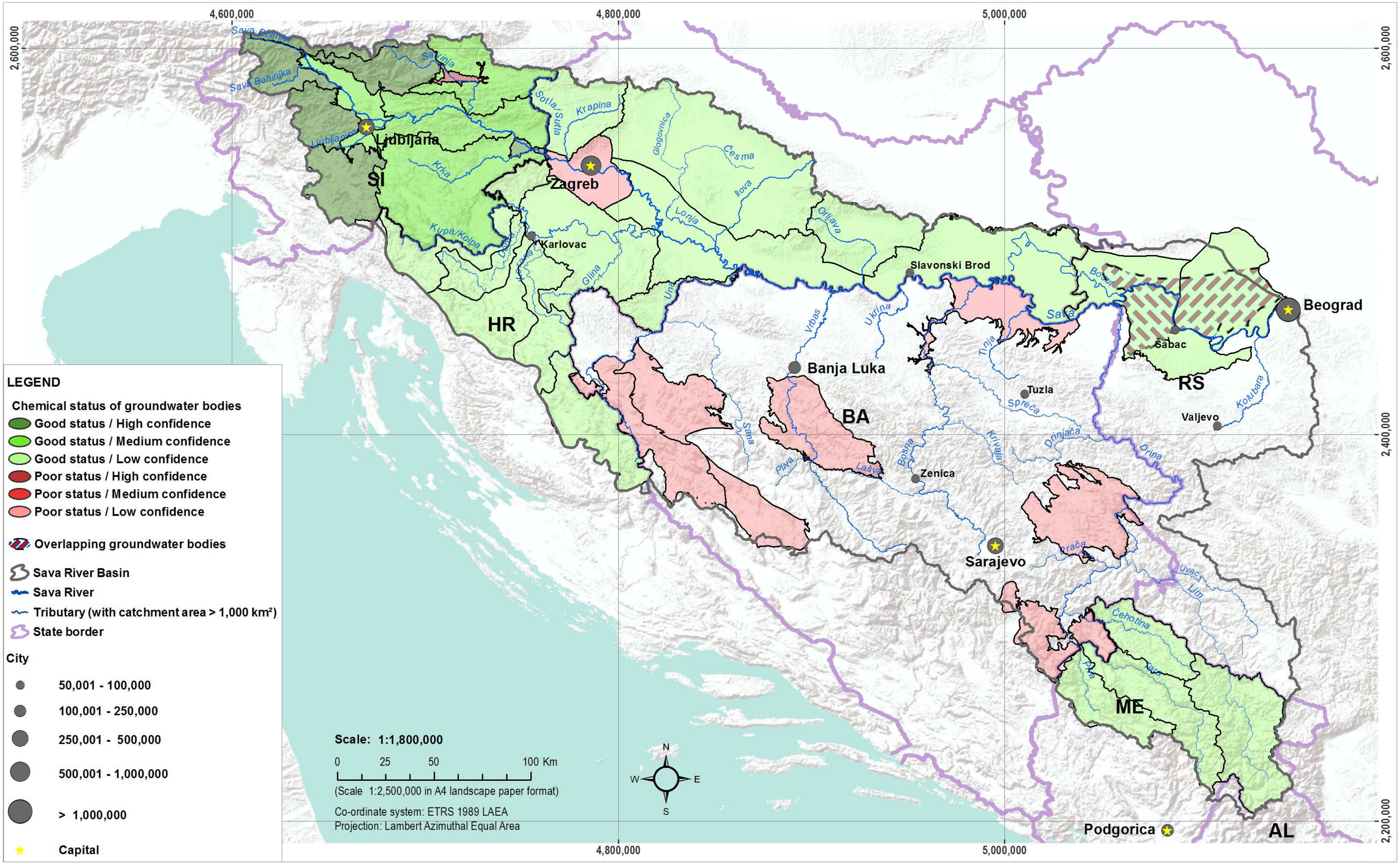
Chemical status of groundwater bodies

MAP 17

INTERNATIONAL SAVA RIVER BASIN COMMISSION



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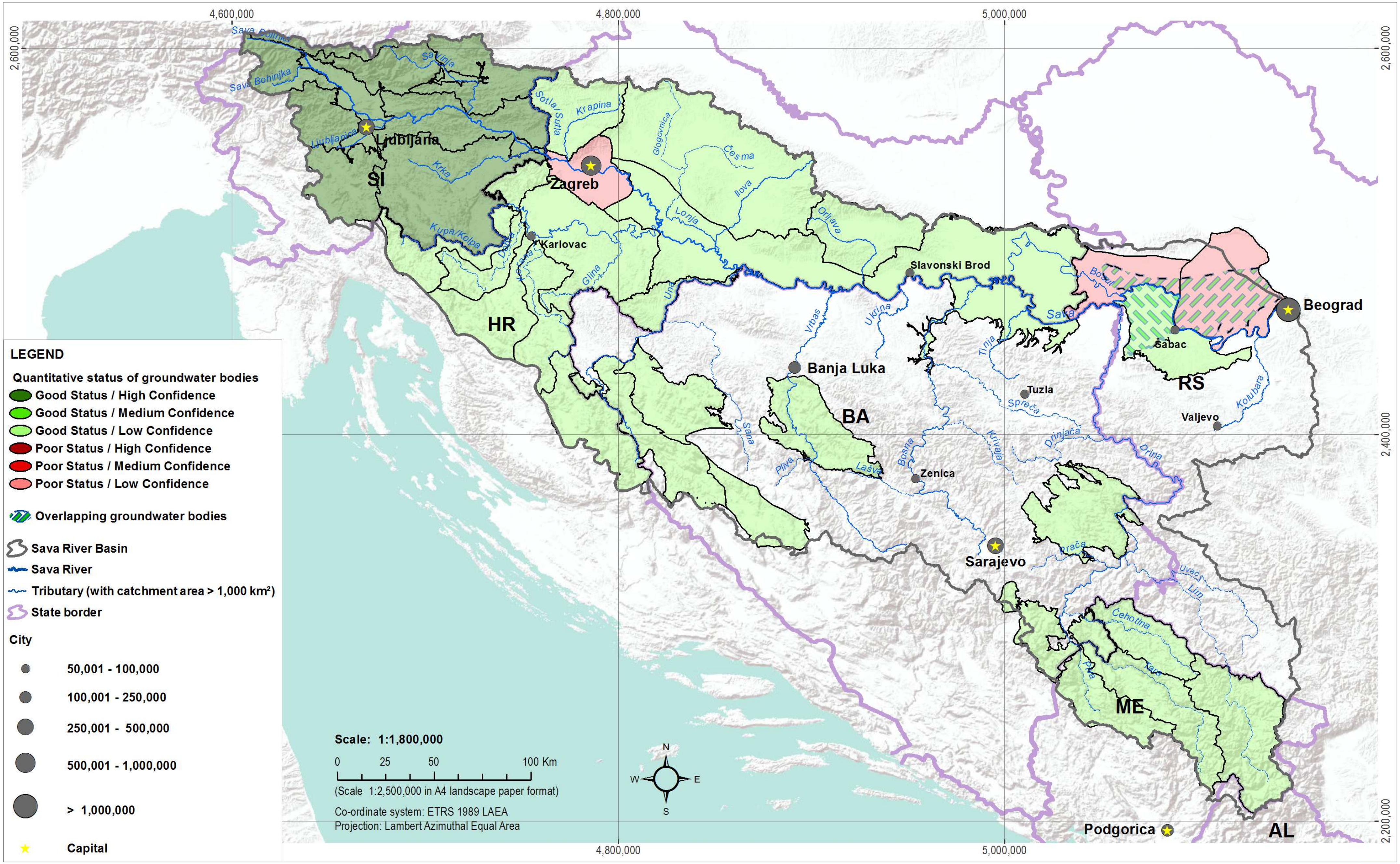
Quantitative status of groundwater bodies

MAP 18



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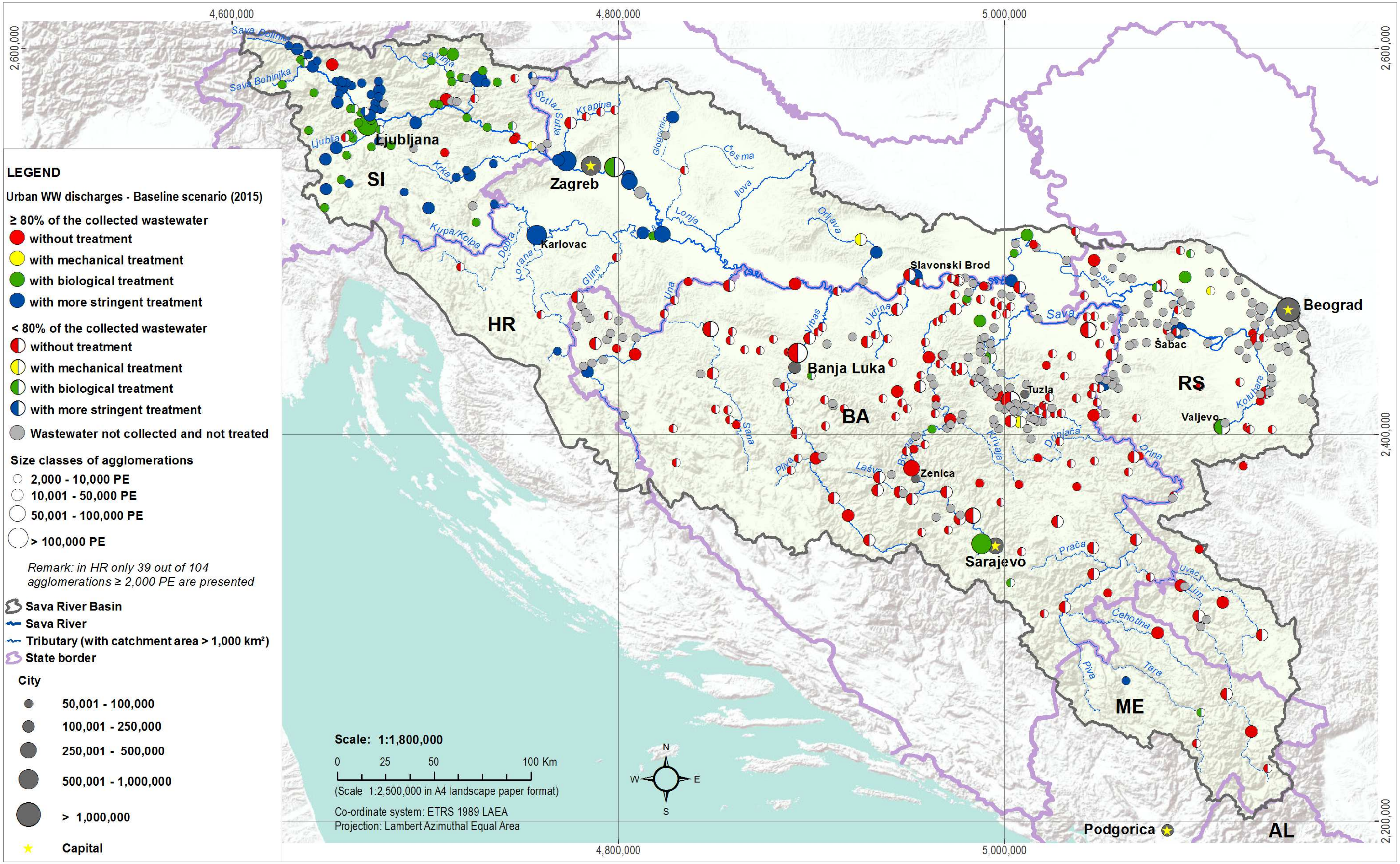
Urban wastewater discharges – Baseline scenario (2015)

MAP 19

INTERNATIONAL SAVA RIVER BASIN COMMISSION



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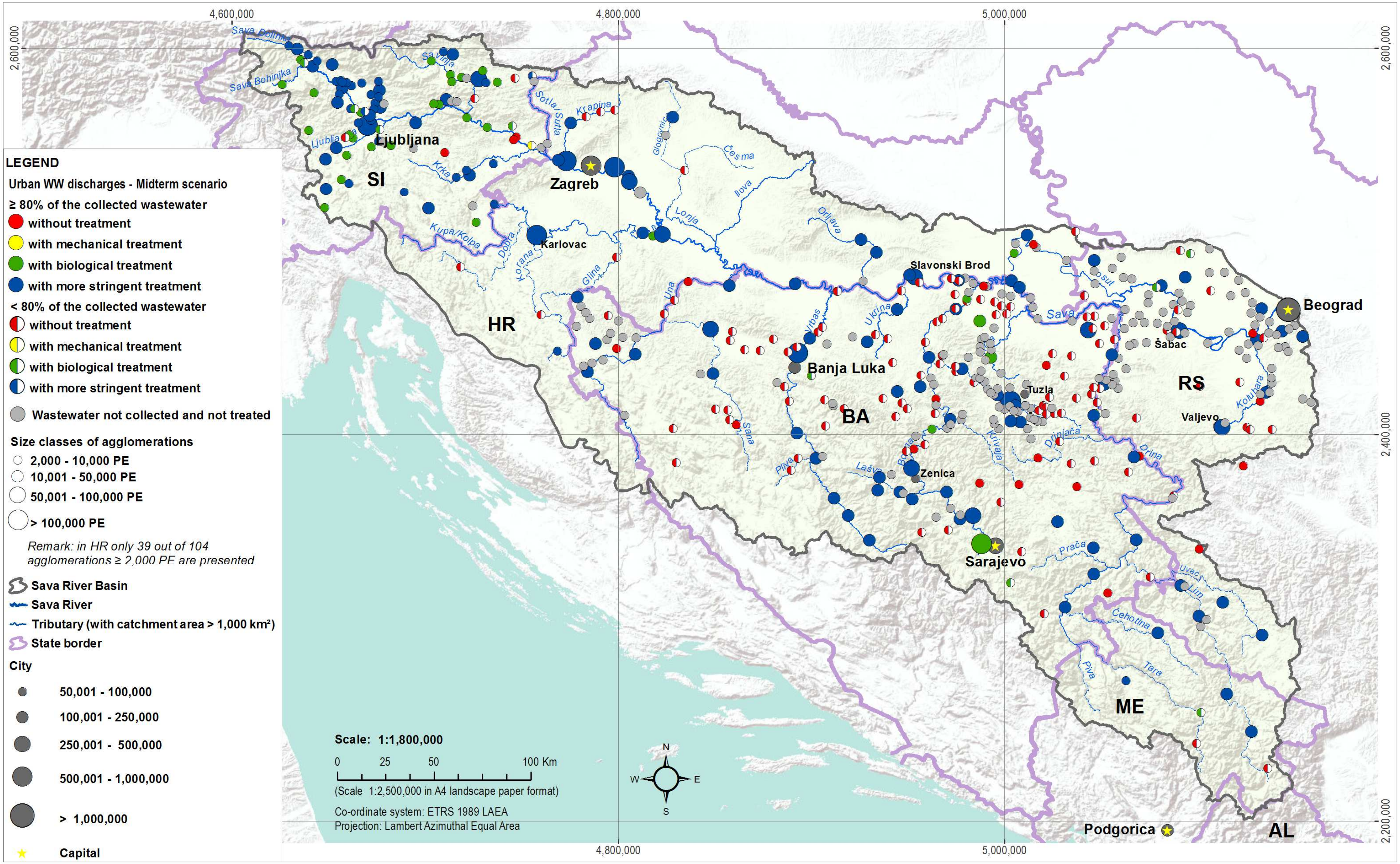
Final version: Secretariat of the Sava Commission, August 2012.

Urban wastewater discharges – Midterm scenario

MAP 20

INTERNATIONAL SAVA RIVER BASIN COMMISSION



This product is based on national information provided by the Parties to the FASRB (SI, HR, BA, RS) and ME.
Shuttle Radar Topography Mission (SRTM-3) from USGS Seamless Data Distribution System was used as topographic layer.
The boundaries and names shown and designations used on this map do not imply official endorsment or acceptance by the ISRBC.

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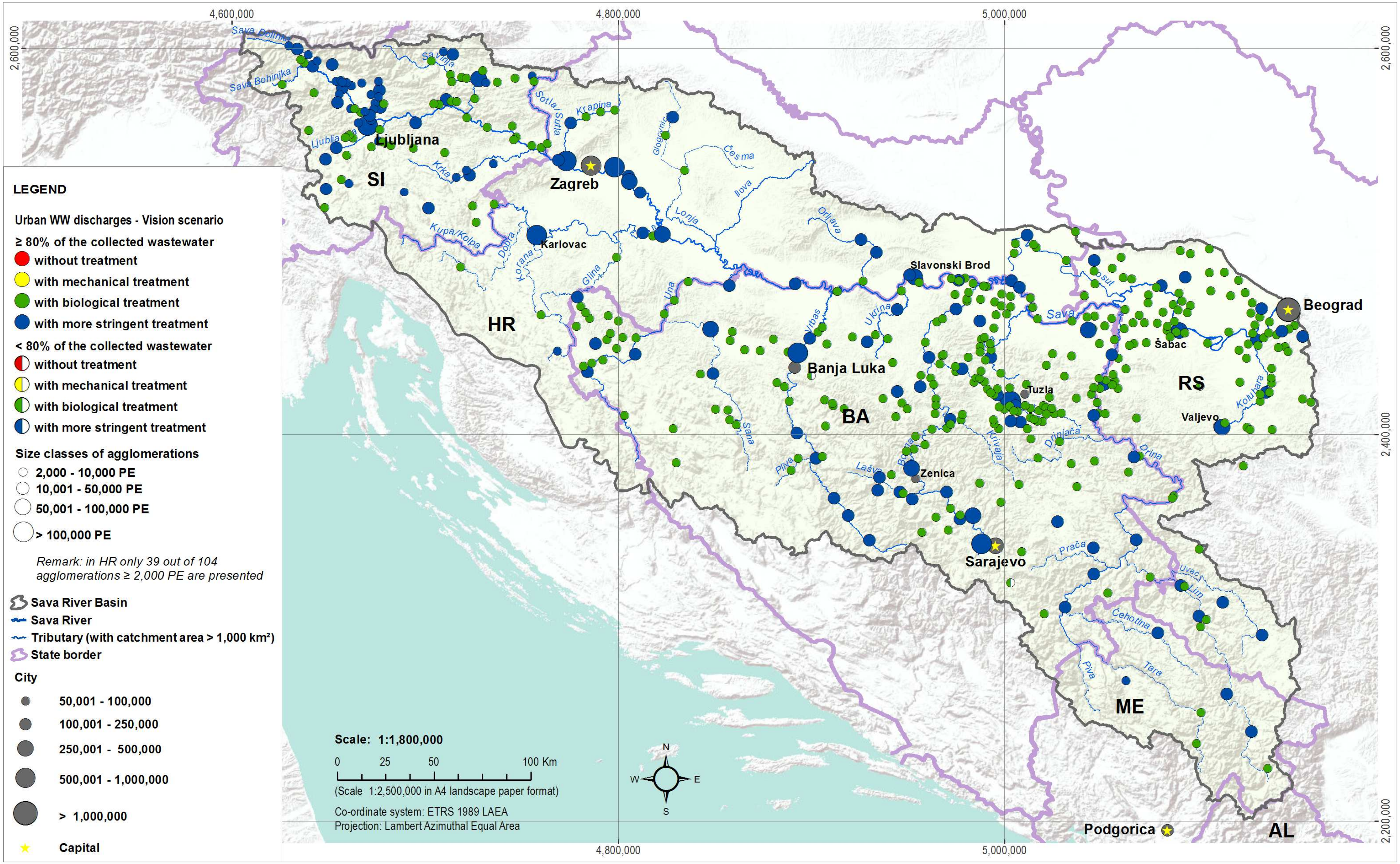
Final version: Secretariat of the Sava Commission, August 2012.

Urban wastewater discharges – Vision scenario

MAP 21

INTERNATIONAL SAVA RIVER BASIN COMMISSION



This product is based on national information provided by the Parties to the FASRB (SI, HR, BA, RS) and ME.
Shuttle Radar Topography Mission (SRTM-3) from USGS Seamless Data Distribution System was used as topographic layer.
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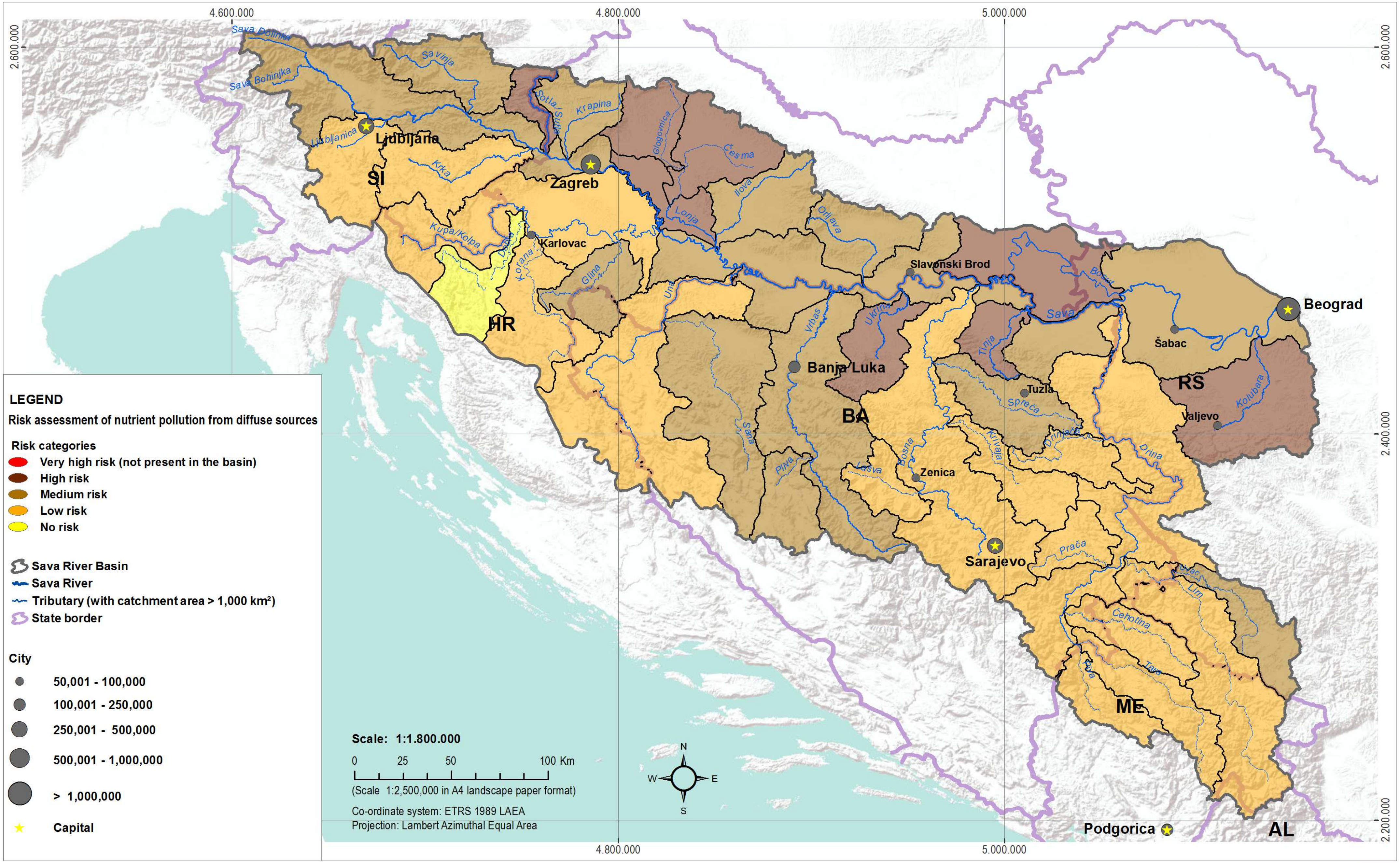
Risk assessment of nutrient pollution from diffuse sources

MAP 22

INTERNATIONAL SAVA RIVER BASIN COMMISSION



This product is based on national information provided by the Parties to the FASRB (SI, HR, BA, RS) and ME.
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INTERNATIONAL SAVA RIVER BASIN COMMISSION