



PROGRAM FOR DEVELOPMENT OF SEDIMENT MANAGEMENT PLAN IN THE SAVA RIVER BASIN¹

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International Sava River Basin Commission

Kneza Branimira 29

10000 Zagreb, Croatia

T: + 385 1 488 6960

F: + 385 1 488 6986

isrbc@savacommission.org

www.savacommission.org

TABLE OF CONTENTS

1	Introduction.....	1
2	Legal background.....	2
2.1	<i>Framework Agreement on the Sava River Basin.....</i>	<i>2</i>
2.2	<i>Protocol on Sediment Management to the Framework Agreement on the Sava River Basin</i>	<i>3</i>
2.2.1	General provisions	3
2.2.2	Sediment management	4
2.2.3	Institutional arrangements and cooperation	8
2.2.4	Final provisions.....	9
3	Work plan for preparation of the Sava Sediment management plan	11
	References	13
	ANNEX 1: Rivers of basin-wide importance	14
	ANNEX 2: Review of monitoring network, standards, techniques and practices in SRB countries	15

ABBREVIATIONS

AL	Republic of Albania
BA	Bosnia and Herzegovina
EC	European Commission
EU WFD	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (Water Framework Directive)
FASRB	Framework Agreement on the Sava River Basin
HR	Republic of Croatia
IHP	International Hydrological Programme
ALISI	International Sediment Initiative
ISRBC	International Sava River Basin Commission
ME	Montenegro
PEG RBM	Permanent Expert Group for River Basin Management
RS	Republic of Serbia
SavaHIS	Sava Hydrological Information System
SavaGIS	Sava Geographical Information System
SedNet	European Sediment Network
SI	Republic of Slovenia
SSM	Sustainable Sediment Management
SWMI	Significant Management Issue
UNESCO	United Nations Educational, Scientific and Cultural Organization

1 Introduction

Parties² to the *Framework Agreement on the Sava River Basin (FASRB)*³, having noted the need to deepen the cooperation and to implement jointly agreed activities aimed at ensuring preconditions for sustainable sediment management in the basin, have signed a *Protocol on Sediment Management to the FASRB*⁴ (*Protocol*). The *Protocol* emphasizes the importance of the sustainable sediment management for maintain the water regime, promote active international cooperation to enhance appropriate policies and to reinforce and coordinate action at all appropriate levels for promoting sustainable sediment management related to quality and quantity and to promote sustainable sediment management solutions, which carefully balance the socio-economic and environmental values to be set within the whole Sava River Basin. The *Protocol* represents affirm legal foundation for the implementation of all activities agreed by the Sava countries, via their joint platform – the International Sava River Basin Commission (ISRBC).

With the aim of fulfilling the goals of the *Protocol*, the Parties have agreed to regulate the procedures of mutual cooperation related to sustainable sediment management to protect the integrity of the water and sediment regime in the Sava River Basin undertaken the obligation to cooperate in the implementation of the following activities:

- Developing a joint Sava River Basin Sediment Management Plan (hereinafter: the Sediment Management Plan);
- Adoption of a Program for Development of the Sediment Management Plan;
- Harmonization of Sediment Management Plan;
- Establishment of coordinated system of sediment monitoring;
- Developing of Information of Planned Dredging

The *Protocol* was ratified by all the Parties in 2015 and entered into force on October 8, 2017.

It is important to emphasize that significant steps have already been made in terms of implementation of this *Protocol*, even before its formally entering into force. At the level of the Sava River Basin and within the framework of a cooperative effort associating the UNESCO Venice Office (UVO), the International Sava river Basin Commission (ISRBC), the European Sediment Network (SedNet) and the UNESCO-IHP, International Sediment Initiative (ISI), ISRBC has initiated a project *Towards Practical Guidance for Sustainable Sediment Management using Sava River as a Showcase* resulting in:

- organizing the training course (October 2012, http://www.savacommission.org/event_detail/8/22/273/4),
- drafting the *Guidance on Sustainable Sediment Management– Part I* (draft finished in 2013),
- implementing the projects:
 - o *Estimation of the Sediment Balance of the Sava River* (2013, http://www.savacommission.org/project_detail/16/1) and
 - o *Proposal of the Establishment of the Sediment Monitoring System for the Sava River Basin* (November 2015- (http://www.savacommission.org/project_detail/20/1)).

² Slovenia, Croatia, Bosnia and Herzegovina, and Serbia

³ http://www.savacommission.org/dms/docs/dokumenti/documents_publications/basic_documents/fasrb.pdf

⁴ http://www.savacommission.org/dms/docs/dokumenti/documents_publications/basic_documents/protocols/protokol_nanos.pdf

Draft *Program for Development of Sediment Management Plan in the Sava River Basin (Program)* is one of the main outcomes of the project “Establishment of the Sediment Monitoring System for the Sava River Basin” supported by UVO.

In the following chapters, this *Program* provides for activities and actions required for the development of the *Sava Sediment Management Plan* in line with the *Protocol*, taking into account the activities already finished or ongoing in the Parties and at the basin-wide level.

This *Program* applies for the first cycle of preparation of the *Sava Sediment Management Plan* and may be amended for the subsequent reviews.

The threshold value for planning at the level of the Sava River Basin regarding size of the river catchments is 1000 km², as agreed upon during the development of the first *Sava River Basin Management Plan*, with exemption of the rivers with smaller catchment areas but designated as of basin-wide importance. The full list of rivers of basin-wide importance is provided in **Annex 1**.

2 Legal background

2.1 Framework Agreement on the Sava River Basin

Sava River Basin countries have a long history of different activities in managing water resources, developing and building hydraulic structures, and protecting the Sava River from land base sources of pollution. The legal framework for such activities has been set by the *FASRB*. The overall objective of the agreement is to support transboundary cooperation for sustainable development of the region and one of the particular goals is regulating the issues of sustainable sediment management in the Sava River Basin

FASRB, Article 2: Objective of the Agreement

1. The Parties shall cooperate in order to achieve the following goals:
 - a) Establishment of an international regime of navigation on the Sava River and its navigable tributaries;
 - b) Establishment of sustainable water management; and
 - c) Undertaking of measures to prevent or limit hazards, and reduce and eliminate adverse consequences, including those from floods, ice hazards, droughts and incidents involving substances hazardous to water.
2. For the purpose of carrying out the goals stated in Paragraph 1 of this Article, the Parties shall cooperate in the process of the creation and realization of joint plans and development programs of the Sava River Basin and harmonization of their legislation with EU legislation.

The Parties to the *FASRB* closely cooperate in all aspects of water management since the establishment of the ISRBC and its expert bodies.

Montenegro, which shares the basin but is not the Party to the *FASRB*, cooperates in the fields covered by the *FASRB* on the basis of the *Memorandum of Understanding on cooperation between the International Sava River Basin Commission and Montenegro*⁵, signed on December 9, 2013 in Belgrade.

⁵ http://www.savacommission.org/dms/docs/dokumenti/documents_publications/memo_of_understanding/final_mou.pdf

2.2 Protocol on Sediment Management to the Framework Agreement on the Sava River Basin

The *Protocol*, prepared as stipulated by the *FASRB*, Article 30 (1), defines framework for cooperation and implementation of the activities aimed at creating the conditions for sustainable sediment management in the Sava River Basin.

2.2.1 General provisions

Protocol, Article 1: Definitions

1. For the purpose of this Protocol:
 - a. "The Sava River Basin" means the geographical area extended over the territories of the Parties, determined by the watershed limits of the Sava River and its tributaries, which comprises surface and ground waters, flowing into a common terminus;
 - b. "FASRB" means the Framework Agreement on the Sava River Basin, done at Kranjska Gora, Slovenia, on 3 December 2002, including amendments stipulated within the Agreement on Amendments to the Framework Agreement on the Sava River Basin and Protocol on Navigation Regime to the Framework Agreement on the Sava River Basin, done at Ljubljana on 2 April 2004;
 - c. "Sava Commission" means the International Sava River Basin Commission established by Article 15 of the FASRB;
 - d. "Impact" means any adverse or detrimental effect on the river environment resulting from a change in water or sediment regime, caused by human activity, and which change may affect life and property, safety of facilities, and the aquatic ecosystem concerned;
 - e. "Main tributaries of the Sava River" are defined in Annex I to this Protocol;
 - f. "Water regime" means quantity and quality conditions of the waters of the Sava River Basin in space and time influenced by human activities and/or natural changes;
 - g. "Waterway" means navigable part of Sava River and its main tributaries;
 - h. "Sediment regime" means quantity and quality conditions of the sediment of the Sava River Basin in space and time influenced by human activities and/or natural changes;
 - i. "Sediment" means solid material that is or can be transported by or deposited from water;
 - j. "Sediment management" means organized and coordinated sediment related activities provided in accordance with certain policies, plans and programmes to achieve main social, economic and environmental objectives;
 - k. "Dredging" is excavation of sediment and means an activity or operation usually carried out at least partly underwater with the purpose of gathering up bottom sediments and disposing of them at a different location;
 - l. "Capital dredging" means dredging in scope of creating new engineering works such as new waterways, new harbours, land reclamation and dredging allowed in accordance with national law;
 - m. "Maintenance dredging" means dredging for maintenance and improvement of the waterway to ensure safe navigation, or dredging for maintenance and improvement of water regime performed in accordance with national law;
 - n. "Environmental remedial dredging" means dredging of polluted sediments to solve environmental problems;
 - o. "Pollution" means the direct or indirect introduction, as a result of human activity, of substances into the environment which may be harmful to human health or the quality of aquatic ecosystems and terrestrial ecosystem direct depending on aquatic ecosystem;
 - p. "Sava River Basin Management Plan" means the plan developed in accordance with Article 12 of the FASRB.
2. Other terms from this Protocol that are not separately defined shall be interpreted in accordance with the FASRB.

 For a purpose of better understanding and clarification of the specific expressions used in the protocol the definitions are provided in Article 1. The definitions should be used

as it is explained and they have no any other meaning. Some other relevant definitions are given in the Framework Agreement on the Sava River Basin.

Protocol, Article 2: Scope

1. The Parties agree to regulate the procedures of mutual cooperation related to sustainable sediment management to protect the integrity of the water and sediment regime in the Sava River Basin.
2. This Protocol shall apply to sustainable sediment management and comprise:
 - (a) quality issues such as sediment pollution, including risk-assessment, control of source and deposition of polluted sediment; and
 - (b) quantity issues such as dredging, erosion and torrent control, reservoir sedimentation and morphological changes.

✚ *Sediment is an essential, integral and dynamic part of the river and it can affect various environmental, social and legal objectives. In the transboundary basin, in particular, like the Sava River Basin it is important that the riparian countries agree on coordinated joint actions to minimize the negative impacts on the water regime. It is also important that all aspects of environmental protection are taking into account, i.e. quality and quantity issues.*

2.2.2 Sediment management

Protocol, Article 3: Principles of sustainable sediment management

The Parties shall cooperate in order to achieve sustainable sediment management in the Sava River Basin by:

- (a) Respecting the natural processes;
- (b) Respecting the water regime;
- (c) Recognizing the sediment, considering its quality and quantity, as resource;
- (d) Providing the balance between socio-economic and environmental values of sediment;
- (e) Planning and executing measures to reduce up- or downstream impacts;
- (f) Providing the integrated river-sediment-soil-groundwater solutions;
- (g) Supporting and increasing the cooperation with stakeholders..

✚ *The sediment is a resource not a waste. Sustainable sediment management is a comprehensive approach addressing the long-term management of sediments. SSM requires integrated, cross-sectoral coordination of activities taking into account basic principles included in article 3 of the protocol. The focus of the SSM should be the river basin. ,.*

Protocol, Article 4: Sava River Basin Sediment Management Plan

1. The Parties shall develop a joint Sava River Basin Sediment Management Plan (hereinafter: the Sediment Management Plan).
2. The Sediment Management Plan shall be adopted by the Sava Commission.
3. The Sediment Management Plan shall cover the following issues, *inter alia*:
 - (a) sediment balance throughout the river system;
 - (b) sediment monitoring;
 - (c) evaluation of sediment quality and quantity;
 - (d) measures to prevent impacts and pollution of water or sediment resulting from dredging;

- (e) measures to control erosion, torrents and other sediment processes;
 - (f) measures to ensure and maintain integrity of water regime;
 - (g) measures to provide, ensure and maintain conditions for safe navigation;
 - (h) measures to protect wetlands areas and retention spaces;
 - (i) measures to control reservoir sedimentation;
 - (j) designated areas for capital dredging;
 - (k) guidance for the sediment disposal, treatment and use;
 - (l) institutional arrangements for implementation of the Sediment Management Plan.
4. The Sediment Management Plan shall define the detailed contents of the Information of Planned Dredging.
 5. The Parties shall adopt the first Sediment Management Plan no later than six years after this Protocol enters into force. The Sediment Management Plan shall be revised at least every six years.

✚ *To balance human activities and environmental objectives the Sediment Management Plans should be developed. The Plan has to consider high natural variability of sediment dynamics and should not compromise the ability of the system to respond. A programme of measures should be part of the Plan taking into account specific uses of sediment and protection of water and aquatic eco-system. The Plan will be developed on the Sava River basin level and will be coordinated by the ISRBC Secretariat, which will ensure the participation of the representatives of the Parties through permanent and ad-hoc expert groups. The Plan will be adopted by the ISRBC and send to the Parties with recommendation for its application.*

Protocol, Article 5: Program for Development of Sediment Management Plan

1. The Sava Commission shall adopt a Program for Development of the Sediment Management Plan (hereinafter: the Program), within six months as of the entry into force of this Protocol.
2. The Program shall comprise all elements relevant for development of the Sediment Management Plan, including responsibilities of the Parties, mechanisms of the plan development, holders of the particular activities and their realisation deadlines.

✚ *The Programme for Development of Sediment Management Plan should include a list of activities and responsibilities of the participants in the process of preparation of the Sediment Management Plan for the Sava River Basin. The overall objective of the Program is to clearly establish common principles and methodologies for the preparation of the Sediment Management Plan for the Sava River Basin.*

✚ *The development of the Programme will be coordinated by the ISRBC Secretariat in close cooperation with the experts from the Sava countries. The decision support system of the ISRBC will be used with participation of the permanent and ad hoc expert groups.*

Protocol, Article 6: Coordination/harmonization of plans

The Parties shall take appropriate steps to coordinate and/or harmonize the Sediment Management Plan, the Sava River Basin Management Plan and other plans and programmes dealing with water management and sediment management for achieving common synergies and benefits having regard to the objectives of the FASRB accordingly.

✚ *The Parties to the FASRB and Montenegro has already accepted the 1st Sava River Basin Management Plan where the sediment has been recognized as one of the potential*

significant management issue (SWMI). The plan has been developed in line with the provisions of the EU WFD. EU WFD does not specifically deal with sediment although there is a link between the sediment quality and quantity and EU WFD objectives. Good ecological status or high ecological potential could not be achieved without sustainable sediment management. The EU WFD also foresees economic instruments which may be needed in sediment management.

- ✚ The Parties to the FASRB and Montenegro has already accepted the 1st Flood Risk Management Plan for the Sava River Basin which have taken into account sediment management issues.

Protocol, Article 7: Coordinated system of sediment monitoring

The Parties shall establish a coordinated system of sediment monitoring in order to provide all data necessary for development and implementation of the Sediment Management Plan.

- ✚ Data on the quantity and quality of sediments are needed to better evaluate and manage surface waters. Therefore one major goal of every sediment monitoring program is to measure, map, and document the distribution of concentration, mobility, and toxicity of pollutants and of possible cause and effects in sediments, to identify spatial and temporal trends..
- ✚ In July 2014 a Policy on the Exchange of Hydrological and Meteorological Data and Information in the Sava River Basin was signed by relevant organizations of Sava River Basin countries (SI, HR, RS, BA), i.e. the national/entities hidrometeorological institutions and water agencies. This Policy is intended to provide a framework within which Signatories will exchange meteorological and hydrological data and information. It outlines a minimum level of data and information exchange and covers the hydrological and meteorological stations in the whole Sava River basin,. The full implementation of the Policy including planning and implementation of the technical solutions for the data exchange need to be realized. Implementation of the Policy will ensure availability of all the observed data for all the Sava River basin countries. One of the first result of the implementation of the Policy in practice is establishment of the Sava Hydrological Information System (SavaHIS). In the SavaHIS some historical data on suspended sediment are available form Slovenia and Croatia but it is expected that the system of sediment monitoring will be expanded to all countries of SRB.
- ✚ Establishment of the common sediment monitoring system in the Sava River Basin.

Protocol, Article 8: Dredging

1. The Parties shall perform only maintenance and environmental remedial dredging.
2. Capital dredging shall be allowed only in the designated areas that are in accordance with Sediment Management Plan and national law.
3. The dredging shall be performed only by natural or legal person, which is, in accordance with national law of the Party, entitled to perform dredging.

- ✚ . Dredging of sediment is a valuable tool for the benefit of mankind, for social and economic development, and for environmental restoration. On the other hand lacking of awareness or underestimating the effects of dredging to entire ecological system could lead to deterioration of river water bodies. The "river basin approach" should be applied in sediment management, i.e. taking into account all activities that may impact

the sediment regime. To minimize the negative impact of dredging, the Protocol allows only maintenance and environmental remedial dredging while the capital dredging could be allowed in designated areas only.

- ✚ The control the quantity and quality of dredged material is possible only if dredging is performed only by natural or legal persons with permission issued by the authorities in accordance with national law of the Parties.*

Protocol, Article 9: Information on Planned Dredging

1. Each Party shall develop the Information on Planned Dredging on yearly basis.
2. Until the Sediment Management Plan is adopted, the Information on Planned Dredging shall contain at least the following:
 - (a) planned locations and types of dredging including assessment of quantity and quality of sediment to be dredged for Sava River and its main tributaries;
 - (b) methods for sediment disposal;
 - (c) methods for sediment treatment in case the sediment is polluted;
 - (d) summarized quantities of dredged sediment for the sub-basins of other tributaries.
3. The Sava Commission shall establish the Template for the Information on Planned Dredging until the Sediment Management Plan is adopted.
4. Each Party shall develop Report on realization of the activities under the Information on Planned Dredging for previous year.
5. Information on Planned Dredging for the next year shall be sent to the Sava Commission until the end of the current year.
6. Report on Realization of the activities under the Information on Planned Dredging for previous year shall be sent to the Sava Commission by the end of March of the current year.
7. Parties shall be informed about the Information on planned dredging and Report of Realization through the Sava Commission. On request of any Party, the Sava Commission shall organize consultations with other Parties related to any issue of importance for development and implementation of the activities under the Information on Planned Dredging.

- ✚ The main purpose of Information on Planned Dredging is the exchange of information on quantity and quality of sediment dredged in the previous year and on the planned quantities for next year. Gathered information may be used for comparison with the other components of sediment balance in the river, indicating possible negative impacts. This information will be taken into account by relevant authorities of the Parties when issuing the permits for exploitation of sediment for next year to legal or private persons.*

- ✚ It is also important that the Parties have information how the dredged material would be used.*

- ✚ In article 9 also the due dates of reporting are defined (e.g. until of the end current year for planned dredging and report of the realization of activities for previous year until March of current year. Reporting will be done through the ISRBC mechanisms of exchange of information.*

2.2.3 Institutional arrangements and cooperation

Protocol, Article 10: Competent authorities and Focal point

1. Each Party shall designate the competent authority/authorities which shall be responsible for implementation of this Protocol and nominate its Focal Point for official communication in implementation of this Protocol, on its behalf.
2. Each Party shall, no later than on the date of entry into force of this Protocol notify the Sava Commission of the competent authority/authorities and name and address of its Focal point. Each Party shall forthwith notify the Sava Commission of any changes in competent authority/authorities and name and address of its Focal point.
3. The Sava Commission shall forthwith inform the Parties of the notifications received under Paragraph 2 above.

✚ *The ISRBC is tasked for coordination of the activities related to the water management including the sustainable sediment management. The ISRBC also follows up the related activities at the national and bilateral level that might have an influence on the common actions at the basin-wide level.*

✚ *The Parties shall designate competent authorities, which shall be responsible for implementation of the activities elaborated in the Program. The Parties shall nominate one authority and corresponding contact person for official communication.*

Protocol, Article 11: Exchange of information

1. The Parties shall, either directly or through the mechanisms of the Sava Commission, exchange reasonably obtainable information on subjects related to the implementation of this Protocol.
2. The Parties which have agreed to exchange information directly among them shall nevertheless communicate such information to the Sava Commission. The latter shall communicate this information to the other Parties.

✚ *The Parties could exchange information directly among themselves or through the mechanisms of ISRBC. In case of exchange information among themselves the Parties should inform the ISRBC as well. In that case the ISRBC will inform other Parties of the FASRB. This process ensures that all the Parties will be informed on the issues on sediment management.*

Protocol, Article 12: Common research and development

The Parties shall, as appropriate, initiate research and cooperate in the development of methods and technologies for the sustainable sediment management. For these purposes, the Parties shall encourage and actively promote scientific and technological cooperation, including research aimed at limiting impact to water and eco-system caused by dredging and preventing and limiting the consequences of dredging.

✚ *The Parties are aware that there is not enough data and information on sediment. The Parties should cooperate in research and development of methods and technologies for the sustainable sediment management.*

Protocol, Article 13: Meeting of the Parties

Meeting of the Parties as stipulated under Article 14 of the FASRB shall also serve as the Meeting of the Parties to this Protocol.

Protocol, Article 14: International Sava River Basin Commission

The Sava Commission shall exercise its functions defined in the FASRB, mutatis mutandis, for the implementation of this Protocol.

Protocol, Article 15: Secretariat

The Secretariat defined in Article 18 of the FASRB shall exercise its functions defined in the FASRB, mutatis mutandis, for the implementation of this Protocol.

Protocol, Article 16: Monitoring of implementation of the Protocol

The methodology of permanent monitoring established pursuant to Article 21 of the FASRB shall also apply to the monitoring of implementation of this Protocol.

✚ *Article 13, 14, 15 and 16 of the Protocol should be considered in accordance with the relevant articles in the FASRB.*

2.2.4 Final provisions

Protocol, Article 17: Dispute settlement

Any dispute arising between two or more Parties regarding the interpretation or implementation of this Protocol shall be settled in accordance with the procedure set forth in the FASRB.

Protocol, Article 18: Relationship of the Protocol with the FASRB

Except when otherwise provided in this Protocol, the provisions of the FASRB relating to its Protocols shall apply to this Protocol.

✚ *In Article 17 and 18 clear link to the FASRB as a basic legal background for cooperation between the Parties on the water resources management is indicated.*

Protocol, Article 19: Other agreements

1. Nothing in this Protocol shall affect the rights and obligations of a Party arising from any agreement being in force on the date on which this Protocol enters into force.
2. For the implementation of this Protocol, the Parties may enter into bilateral or multilateral agreements or arrangements, which shall not contradict this Protocol.

Protocol, Article 20: Reservations

No reservations may be made to this Protocol.

Protocol, Article 21: Duration and entry into force

1. This Protocol shall be concluded for an indefinite period of time.
2. This Protocol shall be subject to ratification acceptance or approval.
3. Instruments of ratification, acceptance or approval shall be deposited as soon as possible with the Depositary. The Depositary shall notify the Parties of the date of the deposit of each instrument of ratification, acceptance or approval.
4. This Protocol shall enter into force on the thirtieth day after the date of deposit of the fourth instrument of ratification, acceptance or approval. The Depositary shall notify the Parties of the date of the entry into force of this Protocol.

Protocol, Article 22: Amendments, withdrawal and termination

1. The provisions of the FASRB related to amendments and withdrawal shall apply to this Protocol.
2. This Protocol may be terminated by mutual agreement of all Parties.

3. This Protocol shall terminate in case of the termination of the FASRB.

✚ *Articles 19-22 are similar to relevant articles in the FASRB and other protocols already adopted by the Parties to the FASRB.*

Protocol, Article 23: International Borders

Establishing and marking of interstate borders among the Parties shall not be affected by any provision of this Protocol or its implementation.

✚ *Any provisions of the Protocol do not affect the international borders of the Parties.*

Protocol, Article 24: Depositary

1. The Government of the Republic of Slovenia shall be the Depositary of this Protocol.
2. The Depositary shall, upon entry into force of this Protocol, ensure its registration in accordance with Article 102 of the Charter of United Nations.”

✚ *The Government of SI is a Depositary of the FASRB and all protocols already adopted by the Parties to the FASRB.*

3 Work plan for preparation of the Sava Sediment management plan

Protocol article	Activity	Outcome	Mechanism	Leading Body	Supporting Body	Deadline
4	Sava River Basin Sediment Management Plan	Report	Through technical assistance for development of the common Sava Sediment Management Plan.	ISRBC	PEG RBM, Task expert group for sediment management	
5	Program for Development of Sediment Management Plan	Programme	The draft programme will be developed within the project Establishment of sediment monitoring system for the Sava River	ISRBC Secretariat	PEG RBM Task expert group for sediment management	6 month after the Protocol entry into force
7	Coordinated system for sediment monitoring	Report	Existing monitoring system will be upgraded	ISRBC	National authorities	Upon availability of funds
9	Information on Planned Dredging	Template, Report	Template will be developed by the ISRBC secretariat. National authorities will fill template on the yearly basis and send it to the ISRBC.	ISRBC Secretariat	Task expert group for sediment management, National authorities	Yearly

Protocol article	Activity	Outcome	Mechanism	Leading Body	Supporting Body	Deadline
10	Designation of Competent authorities and Focal point	Names of designated bodies	The Parties should designate the competent authorities responsible for implementation of the protocol and focal points for official communication	ISRBC	National authorities	Before the Protocol enters into force
11	Development of the system for exchange of information	System	Sava GIS/HIS should be upgraded with information on sediment (e.g. on line data on suspended sediment in Sava HIS, data on quantity and quality on yearly basis in hydrological yearbooks in SavaHIS, information on planned dredging on the ISRBC web site or SavaGIS).	ISRBC	National authorities, Task expert group for sediment management	Upon availability of funds

References

- Framework Agreement on the Sava River Basin, Bosnia and Herzegovina, Republic of Croatia, Republic of Slovenia and Federal Republic of Yugoslavia, signed in Kranjska Gora (SI) on 03 December 2002;
- Protocol on Sediment Management to the Framework Agreement on the Sava River Basin, International Sava River Basin Commission, signed in 2010 and entered into force on 27 November 2015;
- Strategy on Implementation of the Framework Agreement on the Sava River Basin, International Sava River Basin Commission, Zagreb, 2011;
- Action plan for the period 2011-2015 concerning the Strategy on Implementation of the Framework Agreement on the Sava River Basin, International Sava River Basin Commission, Zagreb, 2011;
- Project proposal "Towards Practical Guidance for Sustainable Sediment Management using the Sava River Basin as a Showcase";
- Estimation of Sediment Balance for the Sava River- BALSES, ISRBC, December 2013;
- Project "Establishment of the Sediment Monitoring System for the Sava River Basin", ISRBC, November 2015.

ANNEX 1: RIVERS OF BASIN-WIDE IMPORTANCE

River	Tributary order	Basin area [km ²]	Countries
Sava		97,713	SI, HR, BA, RS, ME, AL
Ljubljanica	1	1,860	SI
Savinja	1	1,849	SI
Krka	1	2,247	SI
Sotla/Sutla	1	584	SI, HR
Krapina	1	1,237	HR
Kupa/Kolpa	1	10,226	HR, SI, BA
Dobra	2	1,428	HR
Korana	2	2,302	HR, BA
Glina	2	1,427	HR, BA
Lonja	1	4,259	HR
Česma	2	3,253	HR
Glogovnica	3	1,302	HR
Ilova (Trebež)	1	1,796	HR
Una	1	9,829	BA, HR
Sana	2	4,253	BA
Vrbaš	1	6,274	BA
Pliva	2	1,326	BA
Orljava	1	1,618	HR
Ukrina	1	1,504	BA
Bosna	1	10,810	BA
Lašva	2	958	BA
Krivaja	2	1,494	BA
Spreča	2	1,948	BA
Tinja	1	904	BA
Drina	1	20,320	ME, AL, BA, RS
Piva	2	1,784	ME
Tara	2	2,006	ME, BA
Ćehotina	2	1,237	ME, BA
Prača	2	1,018	BA
Lim	2	5,968	AL, ME, RS, BA
Uvac	3	1,596	RS, BA
Drinjača	1	1,091	BA
Bosut	1	2,943	HR, RS
Kolubara	1	3,638	RS

ANNEX 2: REVIEW OF MONITORING NETWORK, STANDARDS, TECHNIQUES AND PRACTICES IN SRB COUNTRIES

Slovenia

(a) Suspended sediment transport

Monitoring network: Suspended load monitoring has been re-established through the execution of the program BOBER at 9 monitoring stations in the Republic of Slovenia - is presently done on only 3 rivers in the SRB: the Sava River (gauging station Hrastnik), the Sora River (g.s. Suha) and the Savinja River (g.s. Veliko Širje I). Suspended sediment is not monitored.

Sampling method: Measurements are done continuously using turbidity meters (HACH LANGE Solitax).

Sampling/measurement schedule: Measurements are continuous; the data transfer from the measuring sites to the database will be done continuously.

Laboratory analysis: Sediment concentration is obtained through conventional filtration method.

Processing: The usual method for discharge measurements in gauging stations is applied by Acoustic Doppler Current Profilers (h-ADCPs). Knowing the profile of sediment concentration and discharge (measured at the same time) sediment transport rate (kg/s) through profile is calculated and finally summed up to an annual profile sediment load (kg/year).

Analyses: Suspended load data is gathered on daily, monthly and annual basis. Annual overview of daily suspended load concentrations (kg/m³) and daily transportation rates (kg/s) is freely available on the web in the ARSO hydrologic archive (http://vode.arso.gov.si/hidarhiv/pov_arhiv_tab.php).

(b) Bedload measurements do not exist.

(c) Sediment quality monitoring

Monitoring network: at 6 water bodies – river reaches (2 reaches at the Sava Dolinka River, 2 sites at tributaries of the Lower Sava River (Krka, Sotla/Sutla Rivers), and 2 sites at the Lower Sava River (Vrhovo-Boštanj, border cross section at Jesenice na Dolenjskem)

Standard: For sampling of river sediments standards SIST ISO 5667 - 12 & ISO 5667 - 15 are used. For the chemical analysis of sediments the wet sieved fraction < 63 µm is used.

Sampling schedule: Primary substances in sediments are sampled 4 to 12 times a year.

(d) Reservoir sedimentation measurements

Sedimentation is monitored in reservoirs of HPP Moste on the Sava Dolinka River, HPP Mavčiče and HPP Vrhovo on the Sava River.

(e) Dredging data

Data on dredging are collected on a few locations: Hrušica in the Sava Dolinka River upstream of the HPP Moste, cross section Hotič upstream of Litija on the Sava River, reservoir upstream of the weir for cooling water intake for the Nuclear Power Plant Krško on the Sava River.

(f) River cross sections: In water gauging stations on a regular basis (on average four times a year), occasionally using ADCP on a boat (in existing HPP reservoirs). A new Krško gauging station downstream of the new HPP Krško will be built (will be part of ARSO state hydrologic monitoring). A new gauging station Čatež II will be built (with h-ADCP) after HPP Mokrice will be finished.

Croatia

(a) Suspended sediment transport

Monitoring network: Suspended sediment is monitored on 10 gauging stations in SRB (4 stations on the Sava River and 6 stations on the tributaries).

Sampling method: Grab samples (dipping a bucket/container in the river), point or depth integrating samplers are used. These types of measurement are used according to ISO 4365:2005 standards. ISO 4363:2002 standards are followed for profile mean suspended sediment concentration and mean particle size distribution measurements.

Sampling/measurement schedule: Point samples at all gauging stations are taken once a day. Profile measurements of sediment concentration and sediment load, at 3 stations on the Sava River, are done periodically.

Laboratory analysis: Sediment concentration is obtained through standard vaporization and filtration methods.

Processing: The usual methods for discharge measurements are Acoustic Doppler Current Profiler (ADCP) or hydrometric current meter. ADCP is also used in suspended sediment concentration measurement. Knowing the profile sediment concentration and discharge (measured at the same time) sediment transport (kg/s) through profile is calculated.

Analyses: Suspended load data is gathered on daily, monthly and annual basis and its correlation with water levels, discharges, and grain size distribution of the material is derived. Annual overview of daily suspended load concentration and transportation rates is published in the Hydrological yearbooks. Periodic profile measurements of concentrations and transportation rates and grain size distribution of material are published in annual reports and studies.

(b) Bedload measurements do not exist.

(c) Sediment quality monitoring

Monitoring network: Monitoring is done by Croatian Waters on seven locations as part of the general plan for water quality monitoring (according to WFD requirements)

Standard: The chemical analysis of sediments includes total nitrogen, total phosphorus, cadmium, nickel, lead, mercury, mineral oil, polychlorinated biphenyls, organochlorine pesticides, alachlor, triazine pesticides, pentachlorobenzene. As there are no standards for the assessment of the sediment quality, the content of substances are compared between different streams. Besides the regular monitoring, periodic chemical analyses are performed by different institutions on a project-to-project basis.

Sampling schedule: Besides the regular monitoring, periodic chemical analyses are performed by different institutions on a project-to-project basis.

(d) Reservoir sedimentation measurements

Only in the reservoir upstream of the Novska lake in order to control intake of sediment load into the lake.

(e) Dredging data.

Available in Croatian waters.

(f) River cross sections

Available in Croatian Waters, Agency for inland waterways and Meteorological and Hydrological Service (DHMZ) (only cross sections of gauge stations).

Bosnia and Herzegovina

(a) Suspended sediment transport

As stated before, regular suspended sediment monitoring is not performed by hydrometeorological services (FHMZFBiH and RHMZRS). Occasional monitoring of sediment is conducted for individual projects, like “The Sava River waterway design - monitoring on the Sava River” and “HPP Vranduk project – monitoring on the River Bosna”.

- (b) Bedload measurements** do not exist.
- (c) Sediment quality monitoring – only occasionally, through specific projects (Miljacka, Bosna)**
Monitoring network: Regular monitoring doesn't exist. Sediment quality measurements were only conducted within "Sava River Basin project: Sustainable usage, management and protection of resources" (08/2005, 11/2005, 05/2006, 10/2006).
- (d) Reservoir sedimentation measurements** – performed only for reservoir Modrac, as mentioned before
- (e) Dredging data** – do not exist
- (f) River cross sections** – in course, for the implementation of Flood Directive

Serbia

(a) Suspended sediment transport

In the past, RHMZ did regular suspended sediment monitoring on a number of gauging stations in SRB. Monitoring was done on the Sava River, at Sremska Mitrovica (1958-1980), Sabac (1958-2002), and Beograd (1958-1998), as well as on large tributaries: the Drina (Badovinci, 1990-2001) and the Kolubara River (Drazevac, 1958-2002). Instruments and methodology should be updated.

Institute Jaroslav Cerni conducted yearly programs of the Iron Gate 1 reservoir monitoring, between 1974 and 2014. These encompassed daily monitoring of suspended sediment transport at Beograd and Sremska Mitrovica on the Sava River.

- (b) Bedload measurements** do not exist.
- (c) Sediment quality monitoring**
Monitoring network: River sediments are analysed at 4 locations on the Sava River (Jamena, Sremska Mitrovica, Šabac, Ostružnica) and many locations on the Drina, Lim, Kolubara and Topčiderka Rivers.
Standard is set in by-law.
Sampling schedule is not set.
- (d) Reservoir sedimentation measurements:** occasionally, in Bajina Bašta and Zvornik reservoirs on the Drina river. Include sampling of bed material in reservoirs and survey of the riverbed within reservoir space
- (e) Dredging data:** Only data on water permissions for individual dredging fields are stored in a database. Actually dredged quantities are not available.
- (f) River cross sections:** Sava riverbed was surveyed in 2004 and 2009.