INTERNATIONAL SAVA RIVER BASIN COMMISSION

Geographical & Hydrological Information System of the Sava River Basin

Sava GIS & Sava HIS

Overview

Workshop on SEEFFG System, Zagreb 09-13 May 2016

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International Sava River Basin Commission - ISRBC Secretariat

Protocol on flood protection

to the FASRB

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- Protocol **entered into force** on Nov 27, 2015
- Protocol **regulates the issues of sustainable flood protection** in the Sava River Basin caused by:

  (a) ***natural phenomena*** such as high flows of rivers, as well as ice jamming,

  (b) ***artificial impacts*** like water discharge from reservoirs and retentions induced by dam collapsing or inadequate handling, etc.,

  with **aim to prevent or limit flood hazard, to reduce flood risk and to reduce or mitigate detrimental consequences of floods**

- **Parties agreed to cooperate in the following activities:**
  1. Preparation of the Sava Flood Risk Management Plan (**Sava FRMP**)
  2. Establishment of the Sava Flood Forecasting, Warning and Alarm System (**Sava FFWS**)
  3. Exchange of information significant for sustainable flood protection
  4. Implementation of all mutually agreed measures and activities

Protocol implementation

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- **Article 4** of the Protocol states:

With aim to achieve the objectives of this Protocol, and on the basis of documents as referred to in Article 3 paragraph 1 of this Protocol, the Parties shall cooperate on:

(a) Preparation of **the Program for development of the Sava FRMP**

- Final Draft sent for approval

(b) Undertaking of **Preliminary Flood Risk Assessment**

- Joint Sava PFRA Report **prepared in 2014**

(c) Preparation of **Flood Maps**

- Joint FHR maps planned within development of the Sava FRMP

(d) Development of the Sava FRMP

(e) Establishment of the Sava FFWS

WBIF project

(f) Exchange of information significant for sustainable flood protection

- **Sava GIS** established, including FRM module, for spatial data exchange in accordance with the EU FD, as well as for HM data exchange within **Sava HIS**

(g) Implementation of all measures and activities of mutual interest, originating from planning documents or activities from items (a) to (f) above or other mutually agreed measures and activities

- Preparation of the procedures for emergency flood defense, in a paper form, initiated within the **IPA Floods Programme**

WBIF project

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Improvement of Joint Flood Management Actions in the Sava River Basin

- **Approved in June 2014** by WBIF and WB
- **Geographical coverage:** 5 countries (BA, HR, ME, RS, SI)
- **„Direct" beneficiary countries:** BA, ME, RS (14 institutions)
- **„Indirect" beneficiary countries :** SI, HR (5 institutions)
- **Components**
  - **Flood Risk Management Plan** for the Sava River Basin (Component 1)
  - **Flood Forecasting and Warning System** for the Sava River Basin (Component 2)
- **Budget:** 2,0 mil EUR
- **Implementation period:** 2014-2017 (will be extended)

- **Progress to date:**
  - **C1:** **- Preparation of ToR ongoing** (deadline: late May 2016)
    - Expected commencement date of tendering: early Jun 2016
    - Expected commencement date of works start: Oct 2016
  - **C2:** **- Tendering finalized**
    - Expected commencement date of works start: late May 2016 (deadline: Sep 2018)

WBIF project - **Component 2**
Sava FFWS

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Expected components:

- **Operational flood forecasting and early warning system** with installations in the riparian Sava River Basin countries Bosnia and Herzegovina, Montenegro, Serbia, Slovenia and Croatia

  Flexible common platform: Core of the Sava FFWS
  - Must allow integration of a wide variety of data and model products used in each country
  - Open for the riparian countries to maintain and further develop their own flood and drought forecasting system
  - Option to integrate the own systems into the joint platform
- **Well trained staff** in each of Riparian Countries
- **Recommendations** on future improvements of the forecasting system

- **Scope of services**
  - Identification, assessment and acquisition of relevant data and information for the Sava River Basin
  - Harmonization of data and methods: FFWS on a common platform
  - Development of a distributed hydrological model
  - Assessment of predictive uncertainty and scenario generation
  - Set up, testing and operational use of predictions
  - Gap analysis
  - Investment program

Sava Geographical Information System

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- **Overall objectives**
  - common platform of **the ISRBC community** to enable sharing and disseminating of information and knowledge about protection of the water resources and water management activities in the Sava River Basin
  - support to **the ISRBC community** in sharing and disseminating of hydrologic and meteorological data, information and knowledge about the water resources in the Sava River basin
  - enable an **effective common channel** for exchanging and viewing the hydrologic and meteorological data and information in emergency situations, primarily those related to flood events

According to ***Implementing Documents for Establishment of the Sava GIS*** – 2010, establishment of the Sava GIS is focused in following benefit areas:

Modules

1. Int. River Basin Management

2. Flood Management

3. Accident Prevention and Control

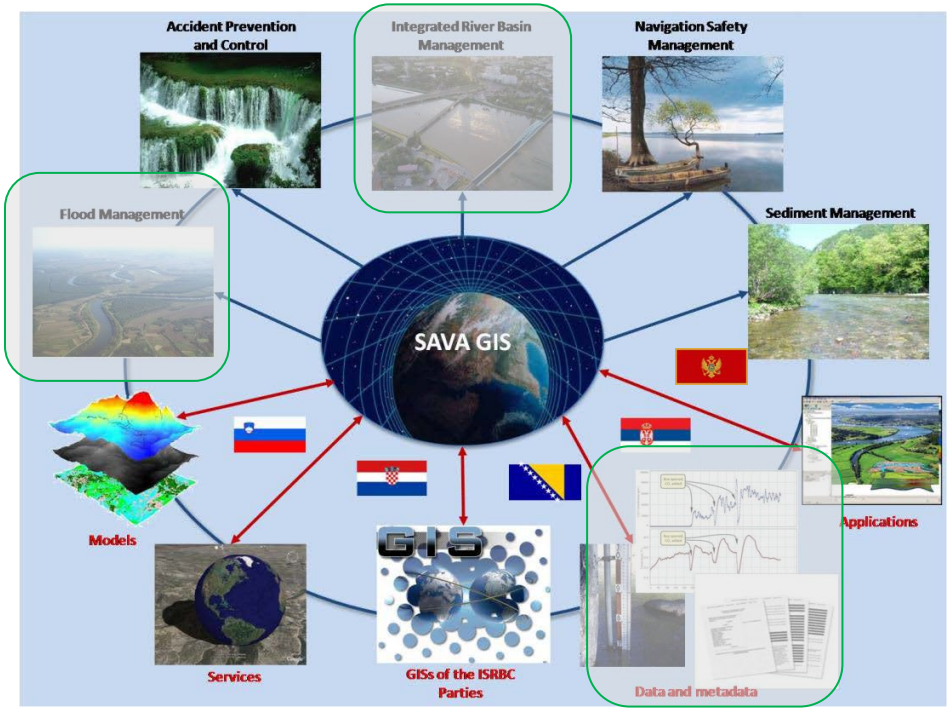
4. Navigation Safety Management

5. Sediment Management

Submodules

Time-Series Data Management

Metadata Management



Sava GIS & Sava HIS projects

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- Scope of projects

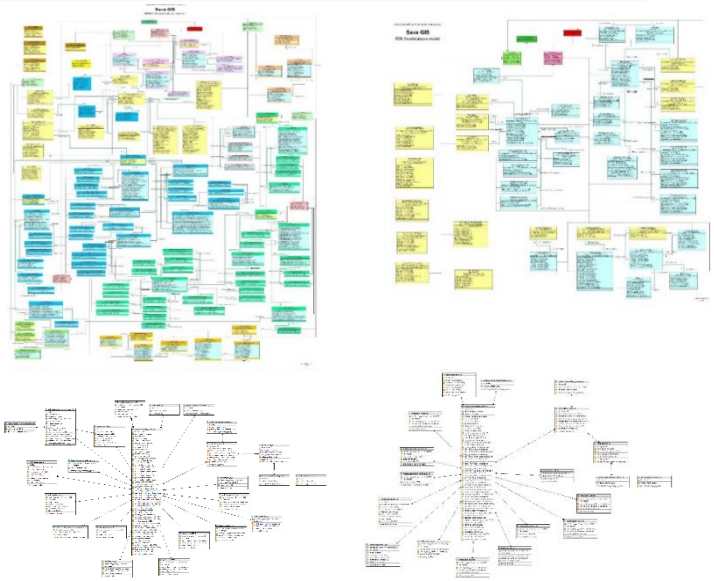
Service / deliverable
Assessment of the current hydrological and meteorological data collection
Establishment **Sava GIS database** (geodatabase)
Establishment of **Sava Geoportal** for searching, disseminating, processing and visualization information to the stakeholders and public
Establishment of **web-based application for data and metadata management**
Establishment of **web-based application for H&M real time data management**
Knowledge transfer - **Workshops & Trainings**

RBM & FRM database models are created based on

- WFD reporting Guidance 2016 v.4.9
- FD reporting Guidance 2013
- INSPIRE Directive and professional requirements
- ICPDR database models (Danube GIS)

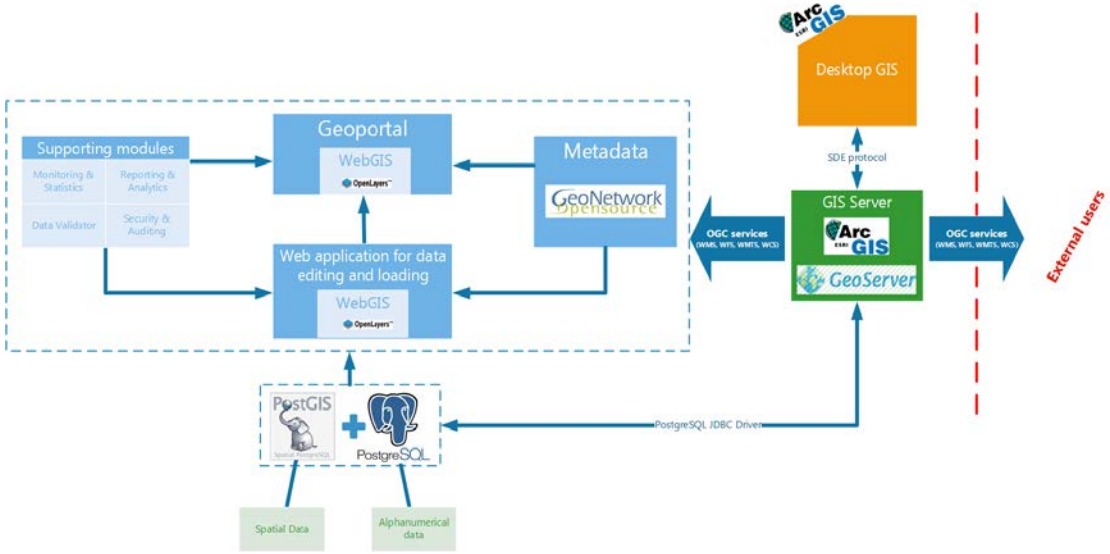
H&M database models are created based on

- WaterML 2.0 part 1: Timeseries model implementation
- INSPIRE Directive and professional requirements



SavaGIS architecture and infrastructure

- OS: Windows Server 2012 R2 Standard
- RDBMS: PostgreSQL ver. 9.3.5 with PostGIS ver. 2.1.7 extension
- GIS Server:
  - Geoserver ver. 2.7.0 (multiple instances related to cluster)
  - Esri ArcGIS for Server Enterprise Standard ver. 10.3
- Metadata catalogue: GeoNetwork ver. 2.10.5
- Java server: Apache Tomcat ver. 7.x
- Desktop GIS software: Esri ArcGIS for Desktop Standard ver. 10.3



SavaGIS project products

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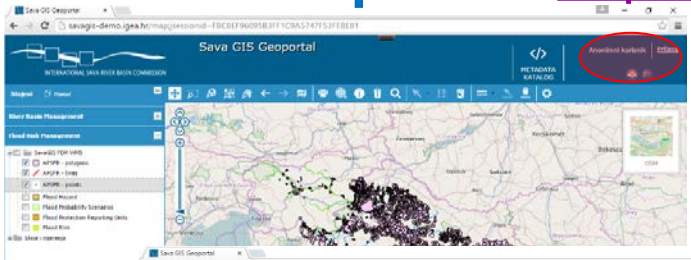
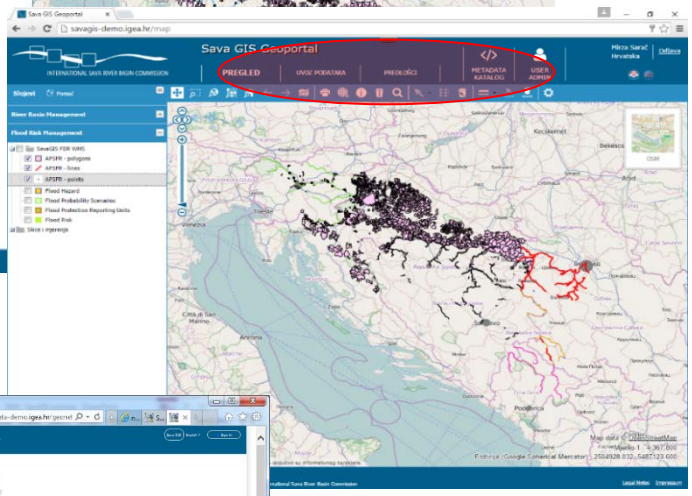
SavaGIS Geoportal http://savagis.org/





Public users

- Overview of public spatial data
- Viewing attributes and features
- Filtering by attributes or spatial data
- Exporting areas of map to PDF or PNG format
- ...

Registered users

web application for data management

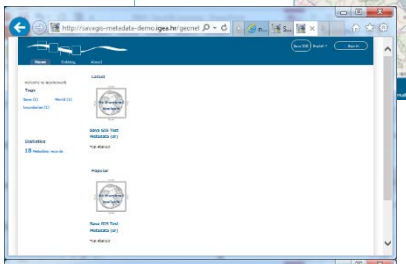
Data and metadata upload

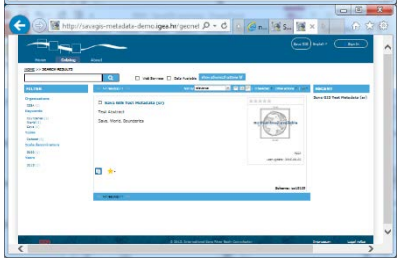
- FGDB
- XLS
- XML
- WFS of GML format
- Harvesting
- Manually

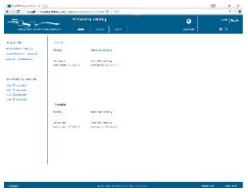
Data and metadata download

Spatial formats
- SHAPE file
- GeoJSON file
- KML file
- GML2 file
- WFS & WMS services

Attribute formats
- CSV
- XLS
- MSAccess2010
- DBF
- XML
- WATER ML 2.0 service

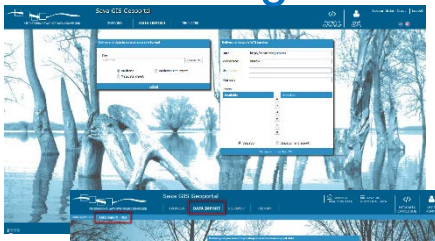


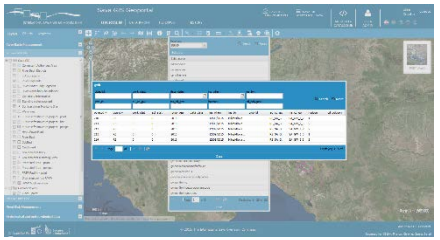


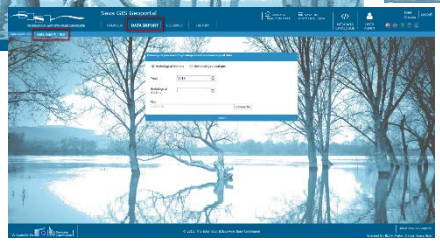


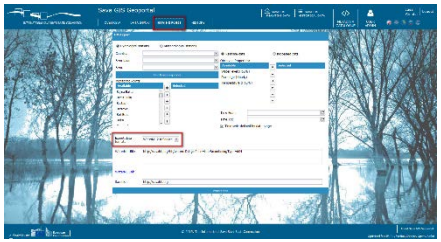
Metadata catalogue

Data management









Exchange of H&M data and information

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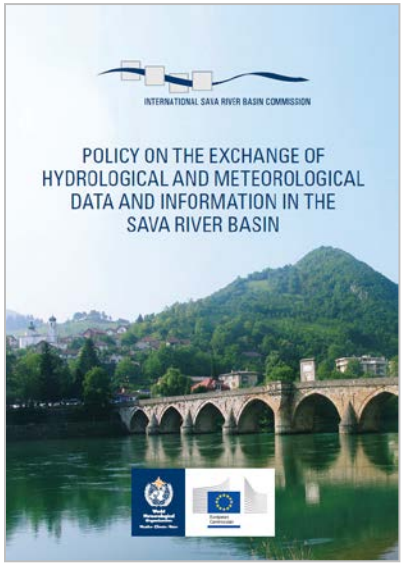
Existing data exchange

- Development of **Hydrological Yearbooks** (2000-2012)
- **System for exchange** of real time hydrological data
- **Joint in-situ discharge measurements** at border river sections

Step Forward – Data Policy

- Legal Background
  - **Framework Agreement on the Sava River Basin**
  - **Protocol on Flood Protection to the FASRB**
  - WMO Resolution 25 (Cg-XIII) and Resolution 40 (Cg-XII)
  - The Convention on Cooperation for the Protection and Sustainable use of the Danube River
  - National legislation
- In accordance with the WMO/UNESCO International Glossary of Hydrology (WMO, No. 385, 3rd Edition, 2012)
- First Data Policy document initiated by int'l basin organizations and supported by the WMO
- Principles of exchange + Minimum level of exchange
- Signed by NHMSs (6/6) and water agencies (2/4)



http://www.savacommission.org/basic_docs

Time-series HM data management
within Sava GIS Concept

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CUAHSI Consortium of Universities for the Advancement of Hydrologic Science, Inc.

A consortium representing 125 US universities

1. Standards

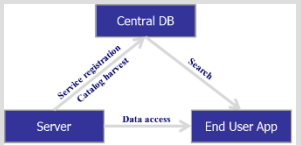
- WaterML language for describing water data

WaterML

2. Services

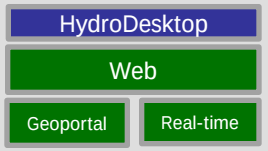
- Catalog of water data sources – web services

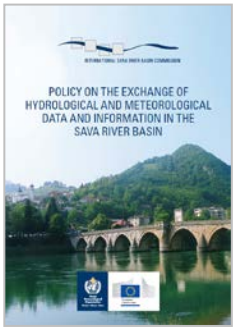
Metadata Catalog



3. End user application

- Free software for data access



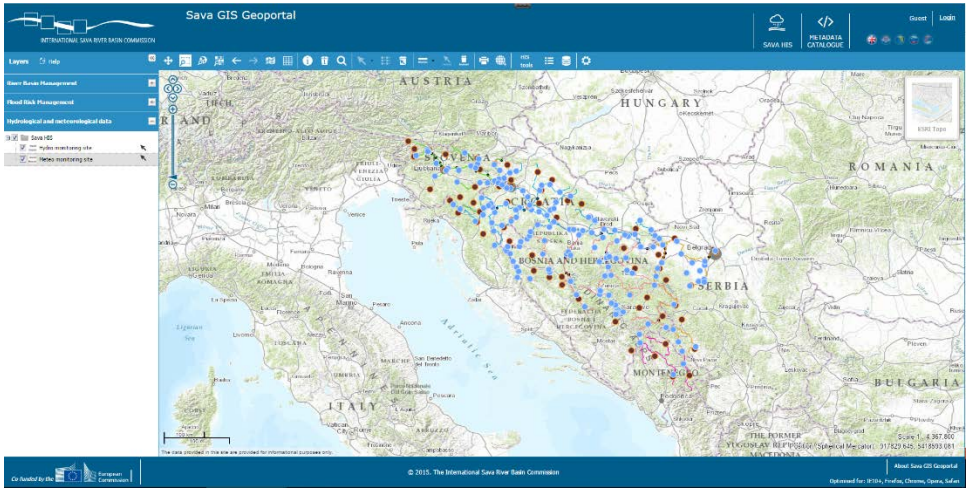


WMO OMM

WIS – WMO Information System

WHYCOS

Sava HIS products



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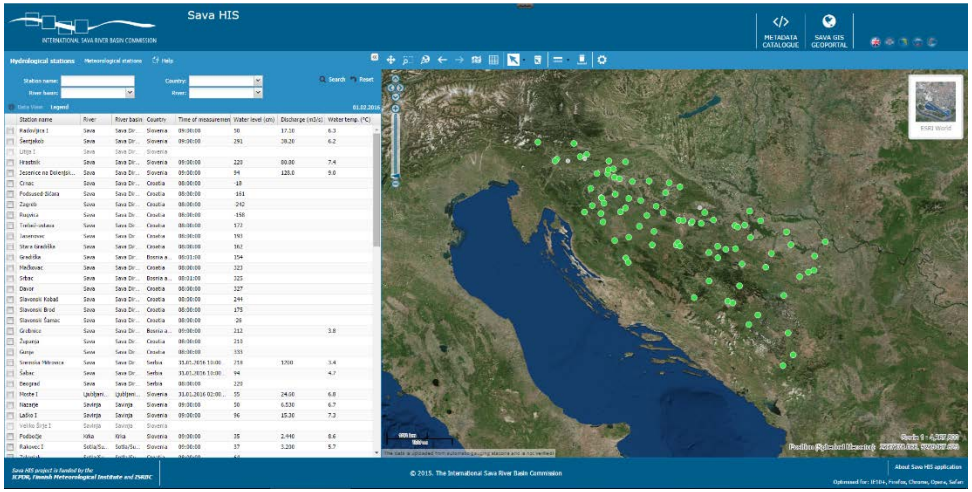

http://savahis.org/

- historical (processed) data exchange

Parameter	Temporal Resolution (Statistic)
Water Stage	Daily (Mean)
River Discharge	Daily (Mean)
Water Temperature	Daily (Mean)
Suspended Sediment Discharge	Daily (Mean)
Groundwater Level	Daily; Every 5/10th Day
Ice Condition	Daily
Relative Humidity	Daily
Wind (Speed and Direction)	Daily
Snow Depth	Daily
Evaporation	Daily (Total)
Solar Radiation	Daily
Sunshine	Daily (Total)
Atmospheric Pressure	Daily

- real-time data exchange

Parameter	Temporal Resolution
Precipitation	Daily (Total)
Air Temperature	Current
Water Stage	Current
River Discharge	Current
Water Temperature	Current

THANK YOU

Questions and discussion