

BUILDING THE LINK BETWEEN FLOOD RISK MANAGEMENT PLANNING AND CLIMATE CHANGE ASSESSMENT IN THE SAVA RIVER BASIN

**Developing and implementing transboundary climate change
adaptation strategies**

Second meeting of the global network of basins working on climate change adaptation

13-14 February 2014, Geneva

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Building the link between flood risk management planning and climate change assessment in the Sava River Basin

Project completed
December 2013

Pilot projects on adaptation to climate change in transboundary basins



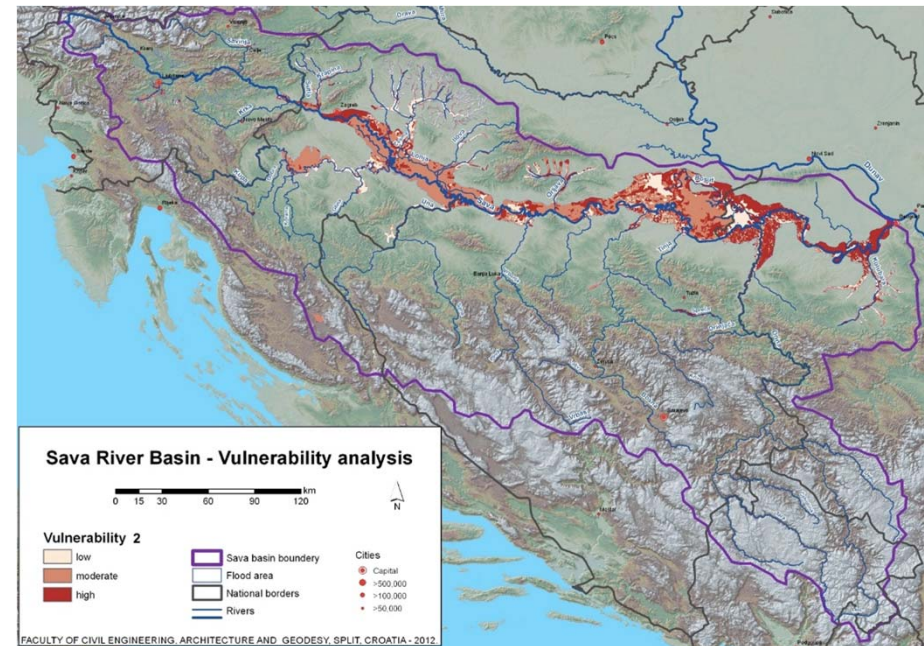
- A1 Report on already completed or ongoing FRM planning projects in the Sava River Basin
- A2 Report on legislation related to FRM planning and climate change adaptation (transboundary and national)
- A3 Report on meteorological part of development of climate projections for the Sava River Basin
 - Report on climate change impact on flood discharge of the Sava River
 - HBV hydrologic model of the Sava River Basin
- A4 Report on initial flood vulnerability assessment in the Sava River Basin
 - ArcGIS project and accompanying spatial data
- A5 Report on climate change adaptation measures for flood protection in the Sava River Basin
- A6 Program for development of the Sava Flood Risk Management Plan
- A7 Report on assessment of data and information needs for preparation of a joint FRMP for the Sava River Basin
 - ArcGIS model of the flood management related data in the form of ArcGIS file databases

Climate change and vulnerability assessment

Consultant's findings:

TEMPERATURE CHANGE (°C)				
Period/ Season	spring	summer	autumn	winter
2011 - 2040	+ 2-4	+ 3-5	+ 2.5-3.5	+ 3-4
2041 - 2070				
2071 - 2100				

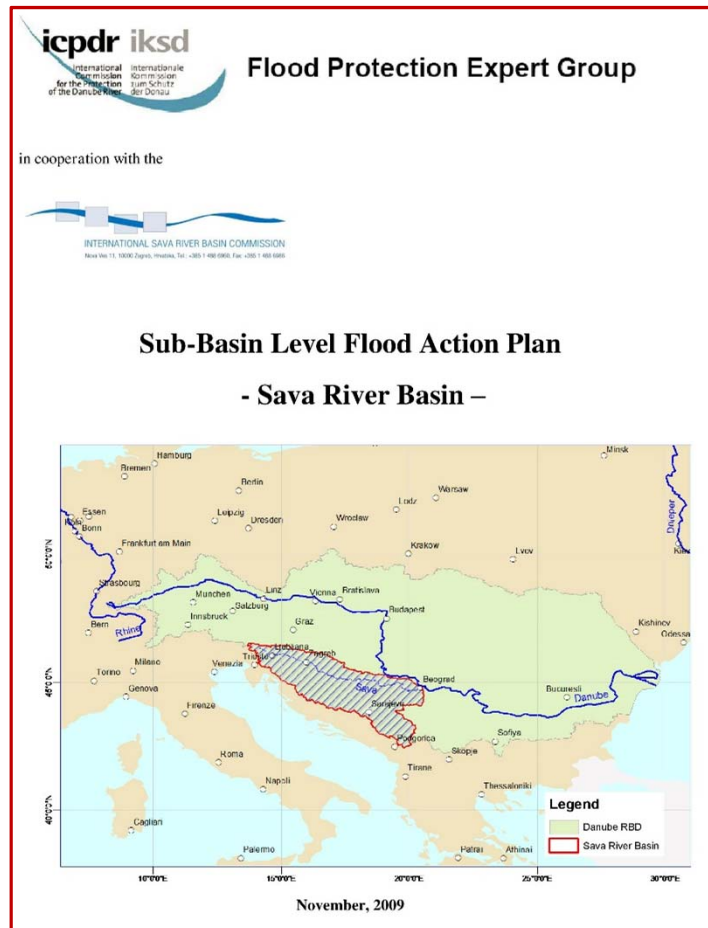
PRECIPITATION CHANGE (%)				
Period/ Season	spring	summer	autumn	winter
2011 - 2040		- 10 SE		+ 10 NW
2041 - 2070	- 10-15 SW	- 10 NW - 20 SE	+ 10 NW + 10 SE	+ 20 NW
2071 - 2100	- 10-15 SW	- 20 NW - 40 SE	- SW + N	+ 30 NW



SAVA DISCHARGE							
Station/ Period	Q1% (m ³ /s)				Q1% increase (%)		
	E-OBS	2011-2040	2041-2070	2071-2100	2011-2040	2041-2070	2071-2100
Čatež	2780	3297	3770	4134	19	36	49
Crnac	2510	2670	2817	2929	6	12	17
Jasenovac	2718	2863	2993	3086	5	10	14
Slavonski Brod	3573	3895	4062	4142	9	14	16
Županja	4227	4699	4957	5270	11	17	25
Sremska Mitrovica	6603	7143	7580	7409	8	15	12
Belgrade (mouth)	6715	7253	7695	7509	8	15	12

Climate change adaptation measures for flood protection

Starting point



COMMON TARGETS:

- Regulation of land use and spatial planning
 - Reactivation of former or creation of new retention and detention capacities
 - Structural flood defences
 - Non-structural measures (preventive actions, capacity building of professionals, raising awareness and preparedness of general public)
- ➔ National measures

Proposed packages of measures for the SRB

Short-term implementation of measures (3 years, EUR 50 million):

- Development of **flood warning system** based on:
 - Institutional strengthening of organizations responsible for hydrological data collection and exchange, WL gauges renewal, use of satellite images for hydrological monitoring, development of RR models, installation of additional gauging stations
 - Hydrologic and hydraulic modelling for flood forecasting and definition of flood protection measures
- Maintenance and reconstruction of existing **flood protection structures**

Proposed packages of measures for the SRB

Medium-term implementation of measures (15 years, EUR 1 billion):

- Institutional strengthening of organizations responsible for hydrological data collection and exchange, purchase on new state-of-the art equipment (meteorological radars, equipment for measurement of snow cover water content and soil moisture)
- Increase of the level of protection of major cities along the Sava River (Belgrade, Zagreb and Ljubljana), and of critical infrastructure (highways, railroads, industrial and health care buildings)
- Protection of other cities and populated areas along the Sava River depending on long-term spatial planning and future development; flood hazard zoning integrated with spatial planning

Long-term implementation of measures (50 years, EUR 2 billion):

- Continued protection of populated areas in the Sava River Basin depending on long-term spatial planning and future development; flood hazard zoning integrated with spatial planning
- Giving more room to the rivers

Program for development of the Sava Flood Risk Management Plan

Preparation of the Program in accordance to the *Protocol on Flood Protection to the Framework Agreement on the Sava River Basin* shall comprise all elements relevant for development of the Sava FRM Plan:

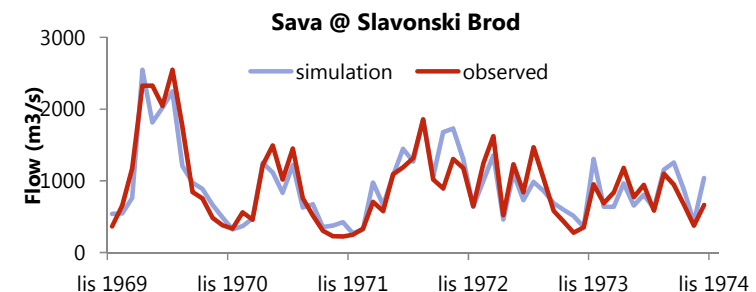
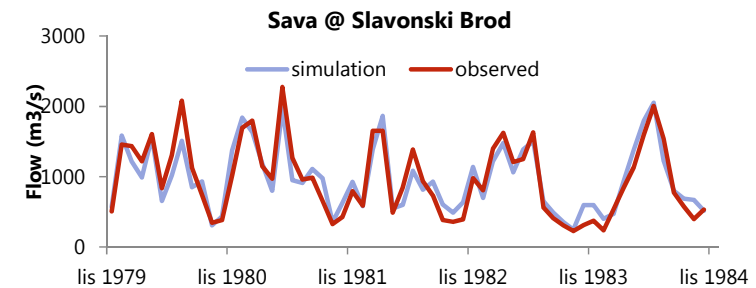
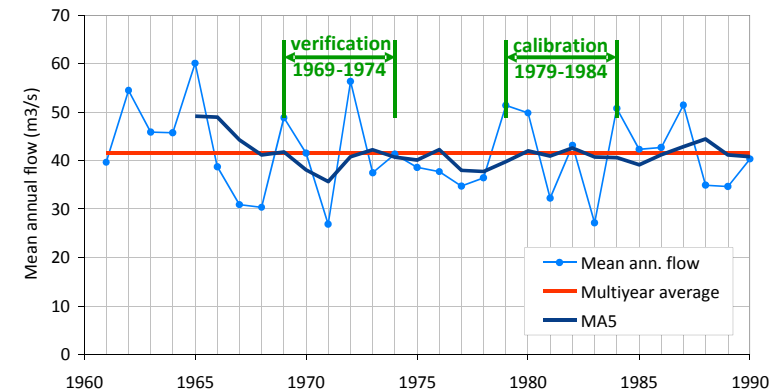
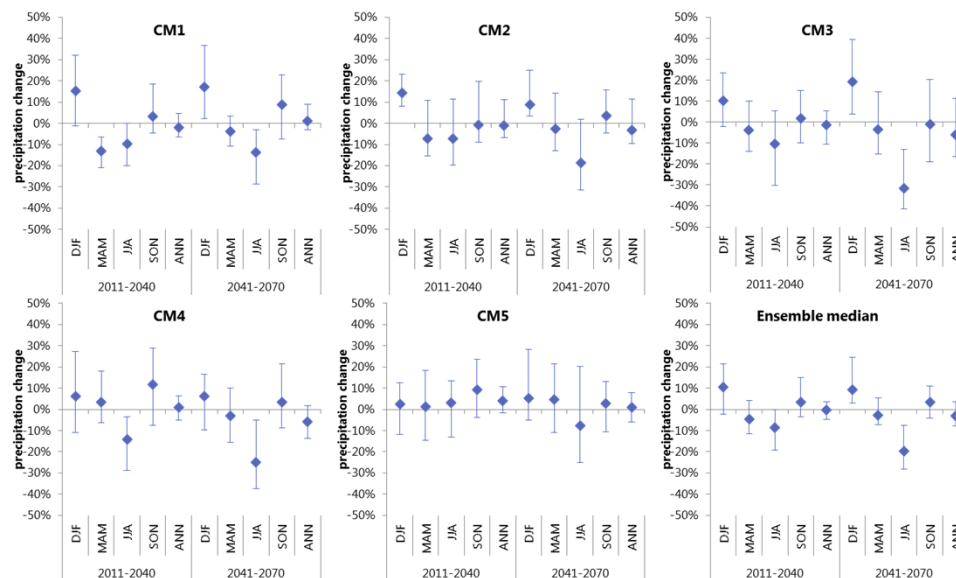
- **Preliminary Flood Risk Assessment** and **Areas of Potential Significant Flood Risk**
 - National (summary)
 - Sava River Basin (contents of the report, information exchange, harmonisation)
- **Flood maps** (proposed joint methodology, Protocol – Article 7(4)):
 - Flood hazard and flood hazard classes maps
 - Flood vulnerability and flood risk maps

Program for development of the Sava Flood Risk Management Plan

- **Sava Flood Risk Management Plan** (contents):
 - Conclusions of the Preliminary Flood Risk Assessment
 - Flood hazard maps and flood risk maps
 - Description of the objectives of flood risk management
 - Summary of measures and their prioritisation
 - Description of the methodology of cost-benefit analysis used to assess measures with transnational effects
 - Description of the implementation of the plan:
 - Description of the prioritisation and the way in which progress in implementing the plan will be monitored
 - Summary of the public information and consultation measures/actions taken, mainly for transboundary areas
 - List of competent authorities and, as appropriate, a description of the coordination process within transboundary areas and of the coordination process with Water Framework Directive

Water and Climate Adaptation Plan (WATCAP) for Sava River Basin

- Project tasks:
 1. Historic climate data analysis
 2. Future climate data analysis
 3. Hydrologic model including the provision of hydrologic data and scenario modelling



- Filling data gaps, flooding events, structures inclusion, new calibration
- Additional GHG emission scenarios
- Link with hydraulic model

Water and Climate Adaptation Plan (WATCAP) for Sava River Basin



Water & Climate Adaptation Plan for the Sava River Basin

- Project tasks:

4. Guidance Notes

- Irrigation
- Flood protection
- Hydropower
- Navigation
- Economic evaluation of CC impacts

5. Water and Climate Adaptation Plan (WATCAP Main Report)

- Final presentation in March 2014



Guidance Note on Adaptation to Climate Change for the Sava River Basin – Navigation

December 2013

1	Background
2	Present navigation conditions
3	Climate change impact on navigation conditions
3.1	Low flows
3.2	High flows
3.3	Ice
4	Adaptation measures
4.1	Waterway infrastructure
4.2	Waterway transport operations and vessels
4.3	Overview of measures
5	REFERENCES

THANK YOU