INTERNATIONAL SAVA RIVER BASIN COMMISSION

Climate change predictions for the Sava River basin and relevant projects

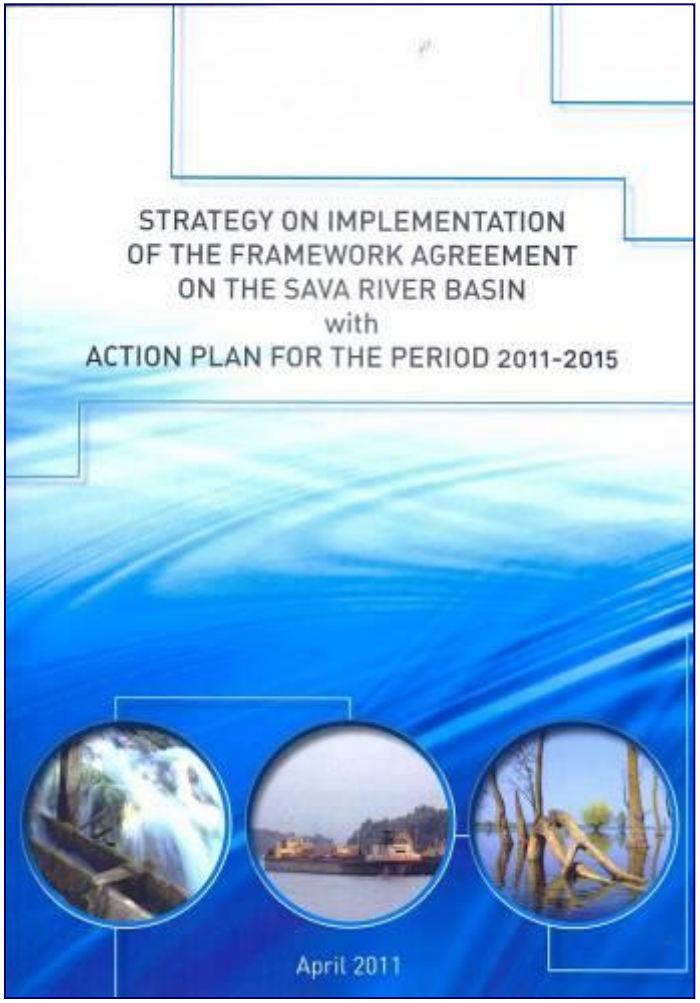
Workshop on assessing the water-food-energy-ecosystems nexus and benefits of transboundary cooperation in the Drina River basin

Podgorica, 21-22 April 2016

Dr. Dejan Komatina,
Secretary, ISRBC

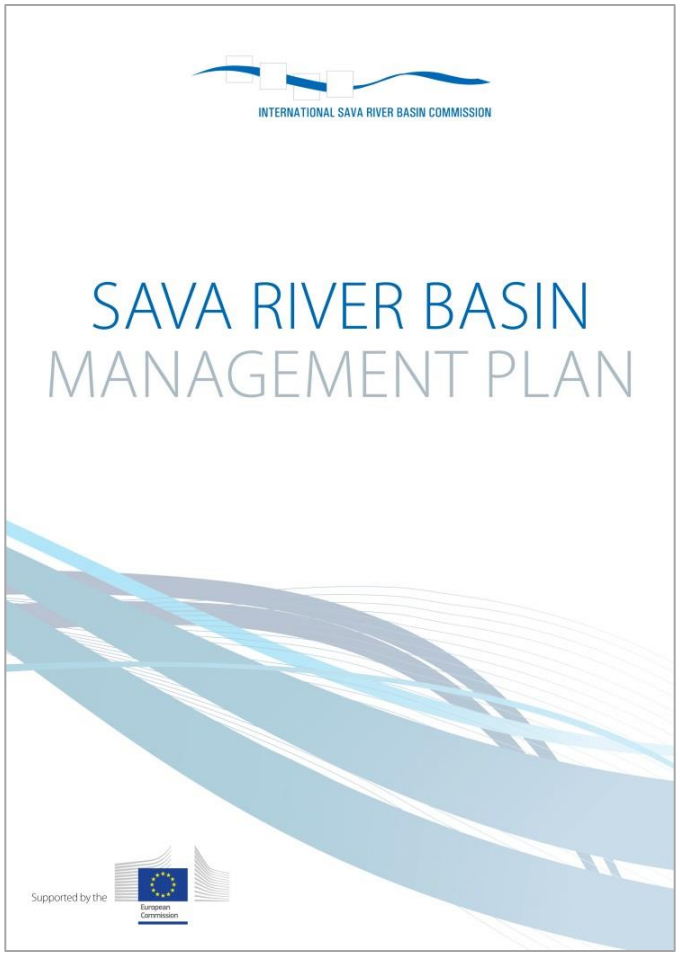
Political commitment

- **Strategy on Implementation of the FASRB** (2011)
- **Declarations from the Meetings of the Parties** (2007, 2009, 2011, 2013, 2014)



River basin management

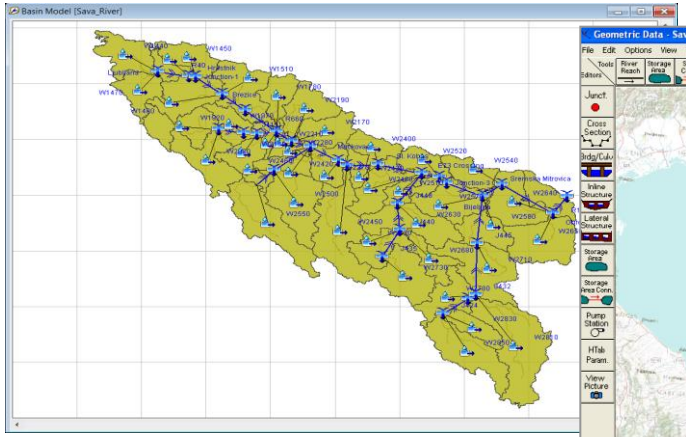
- **River Basin Management Plan** (2014)
- **Water & Climate Adaptation Plan** (2015)
- **Water – Food – Energy – Ecosystems Nexus Assessment**
  - UNECE project (2015)
  - EC JRC project (2016)



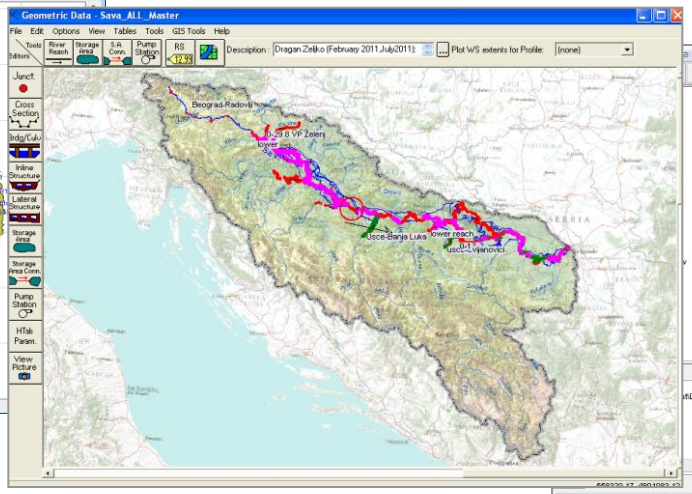
Flood management

- **Linking FRM planning and Climate Change assessment** (2013)
- **Simulation models**
  - **Hydrologic model** and **hydraulic model** (2011, 2013)
  - **Upgrade of the models** (2015-2016)

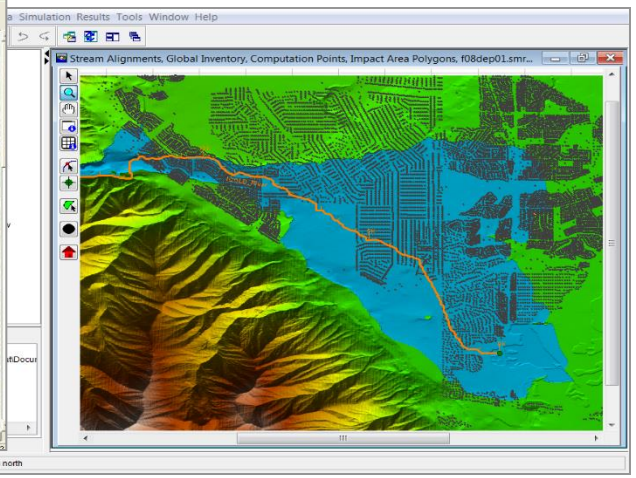
Hydrologic model



Hydraulic model

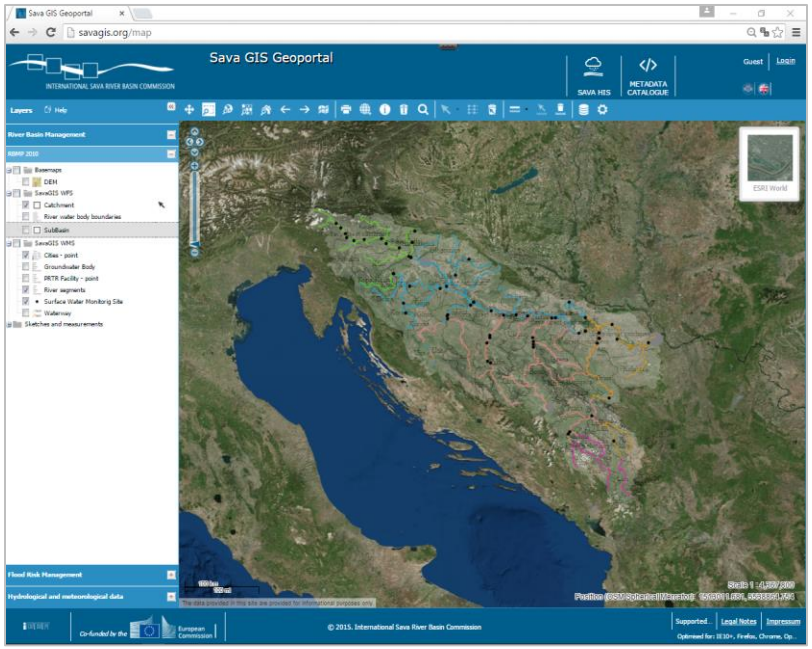


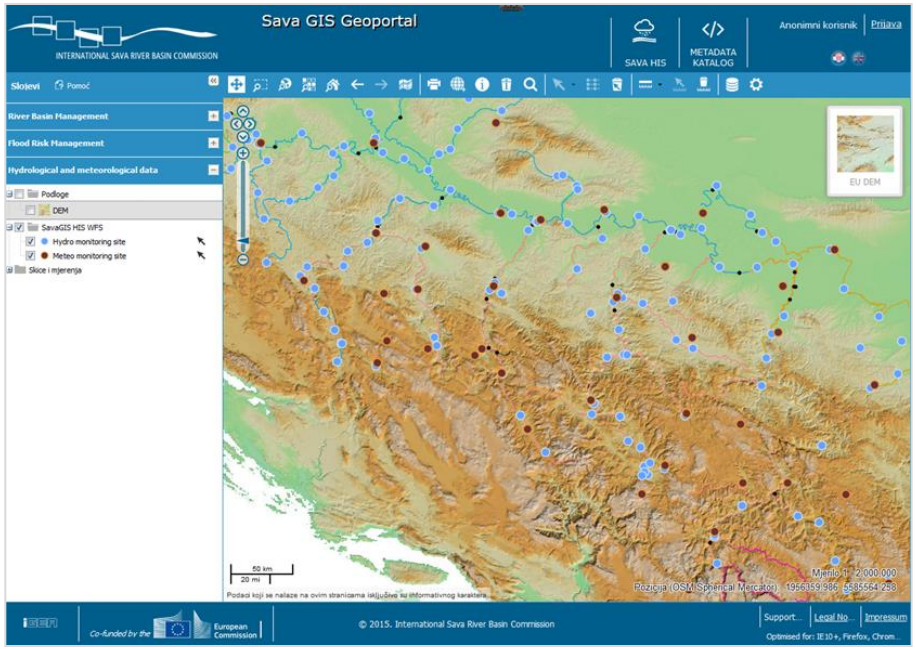
Consequence assess. tool



Data & information exchange

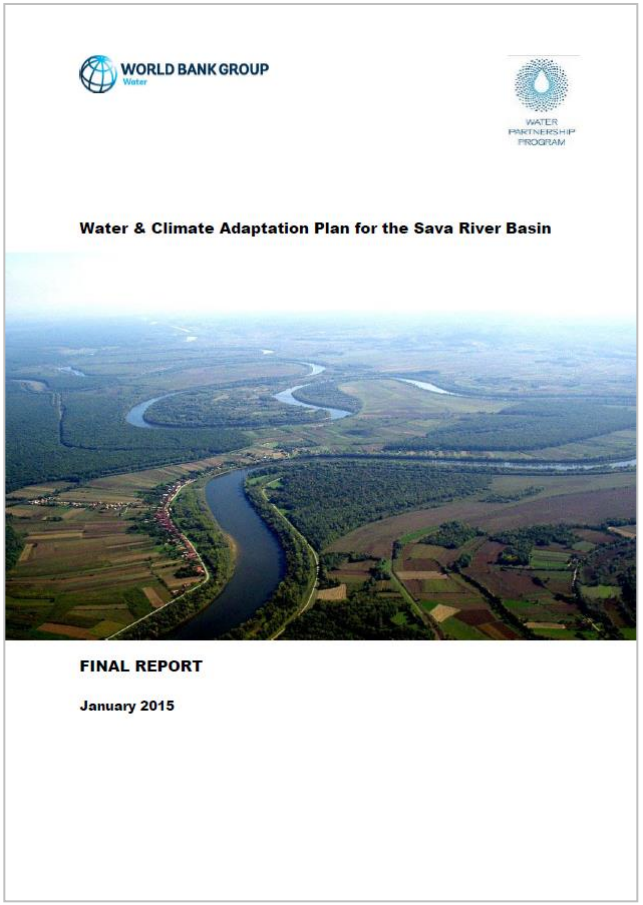
- **Sava GIS** (2015) - RBM, FRM, historic H&M data
- **Sava HIS** (2015) - 'Real-time' H&M data





Climate adaptation plan

- **Analysis of historic climate trends**
- **Climate** and **hydrological modelling**
- **Main report + Guidance notes**
  - Navigation
  - Hydropower
  - Agriculture
  - Flood protection
  - Economic evaluation of CC impacts
- **All outcomes available at:**
  http://www.savacommission.org/project_detail/18/1



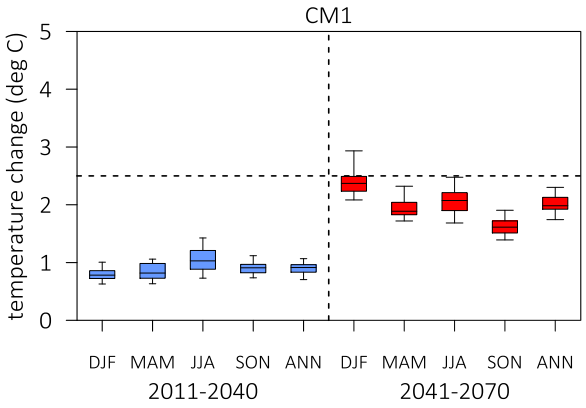
Climate modelling

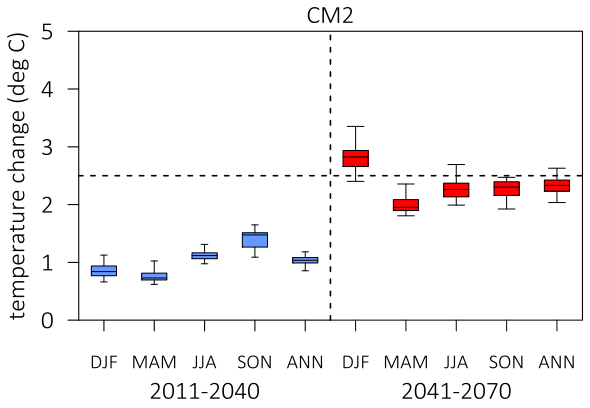
- **5 GCM/RCM outputs** for A1B IPCC/SRES scenario (ENSEMBLES FP6 project, http://ensemblesrt3.dmi.dk/)
  - 1961-1990 (Baseline)
  - 2011-2040 (Near future)
  - 2041-2070 (Distant future)

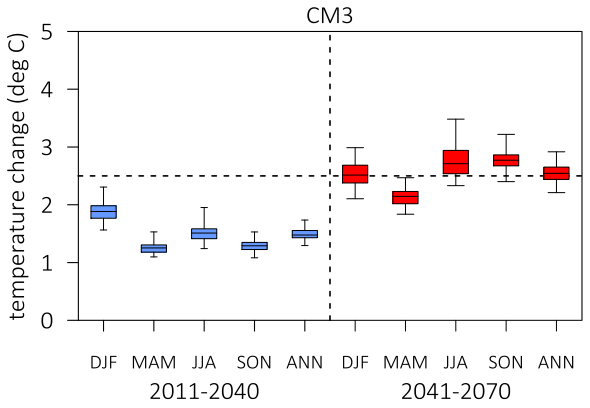
Climate model	GCM	RCM
CM1	ECHAM5r3	RACMO
CM2	ECHAM5r3	REMO
CM3	HadCM3Q0	CLM
CM4	HadCM3Q0	HadRM3Q0
CM5	ECHAM5r3	RegCM3

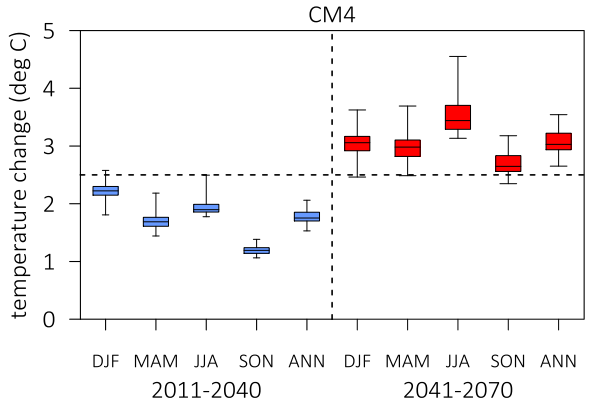
Climate modelling

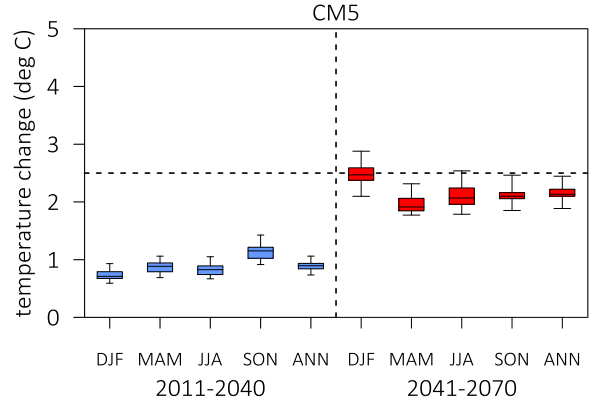
- **Temperature scenarios**

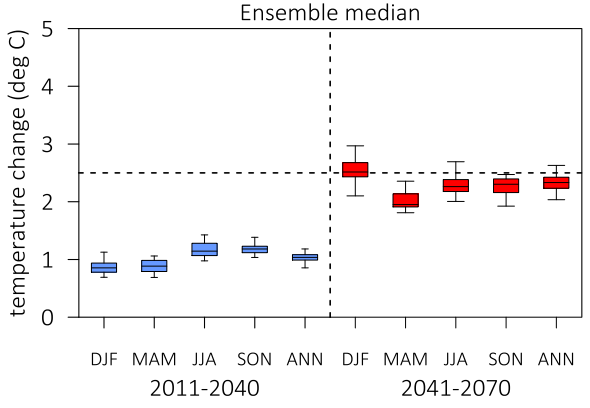






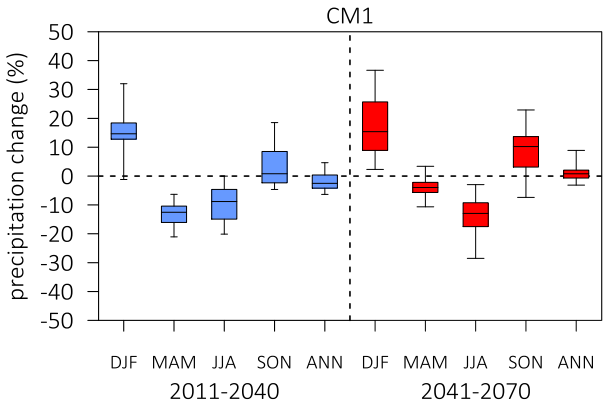


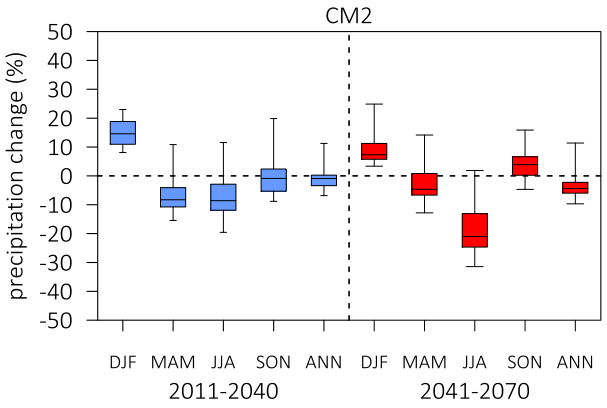


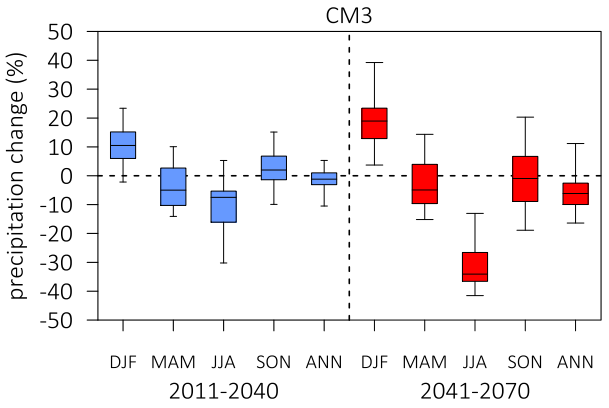


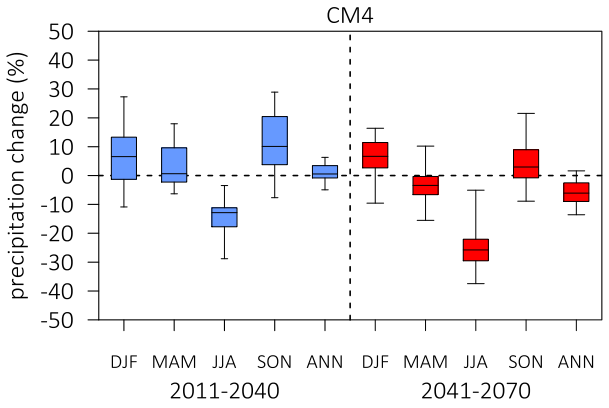
Climate modelling

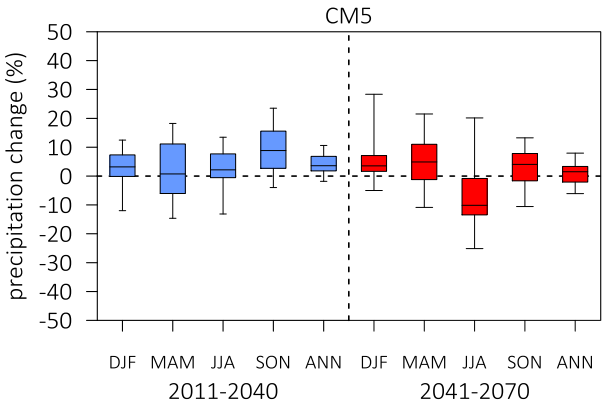
- **Precipitation scenarios**

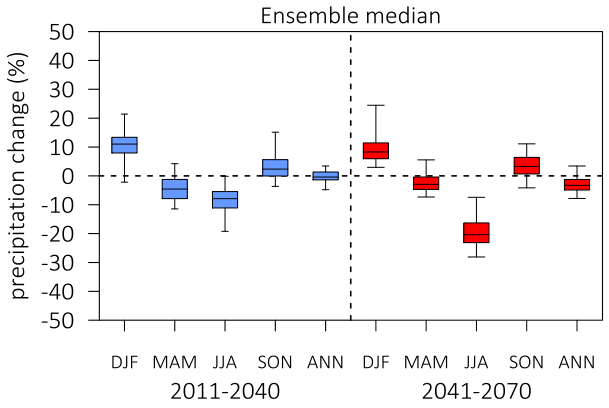








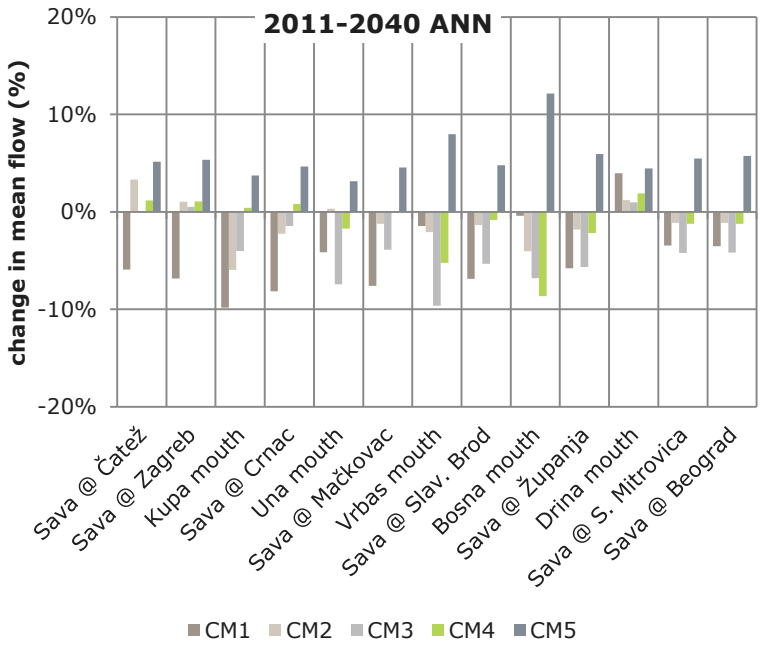


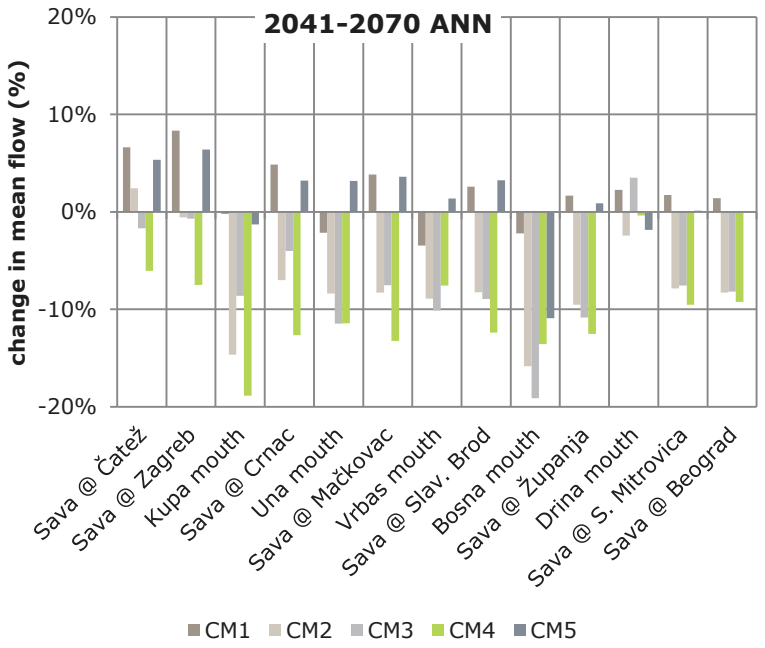


Hydrologic modelling

Hydrologic modelling

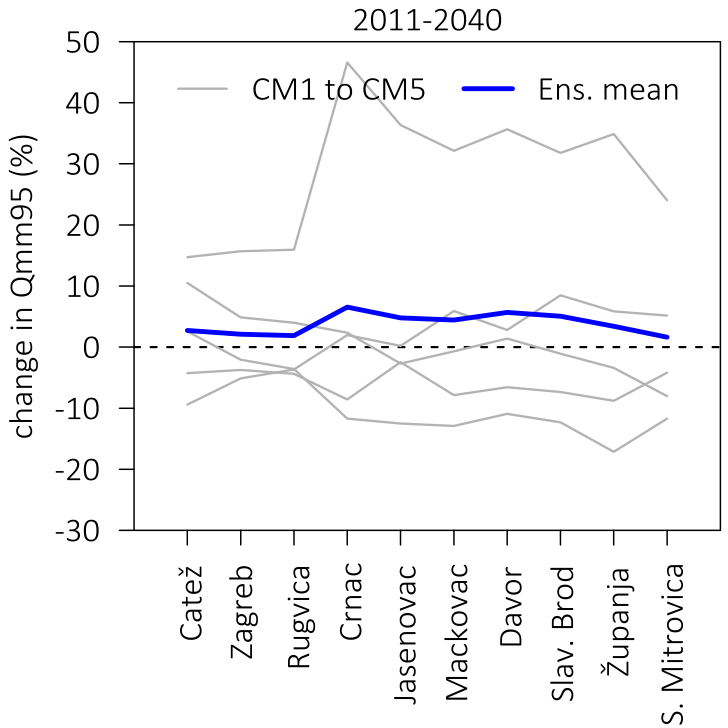
- **Change in mean annual runoff**
  at selected locations for five climate scenarios

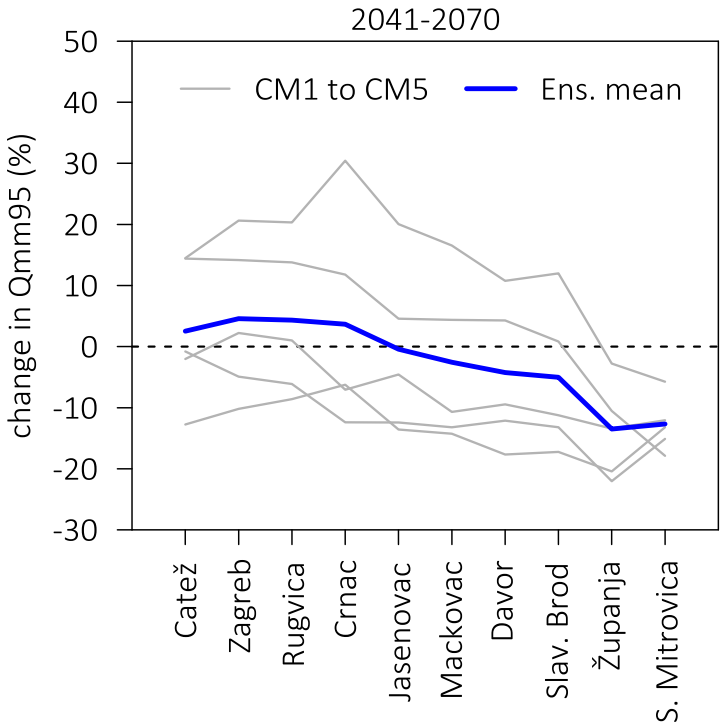




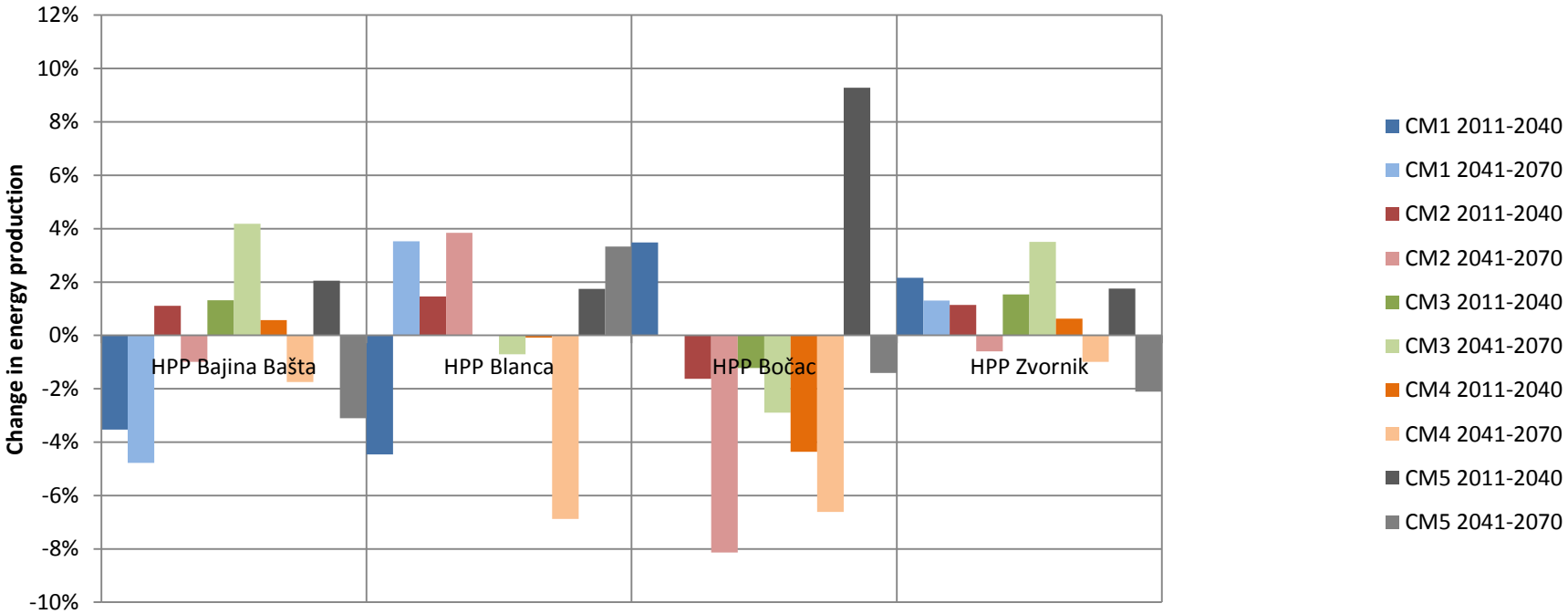
Hydrologic modelling

- **Change in ensemble median values of low flows** (95% mean monthly Q)



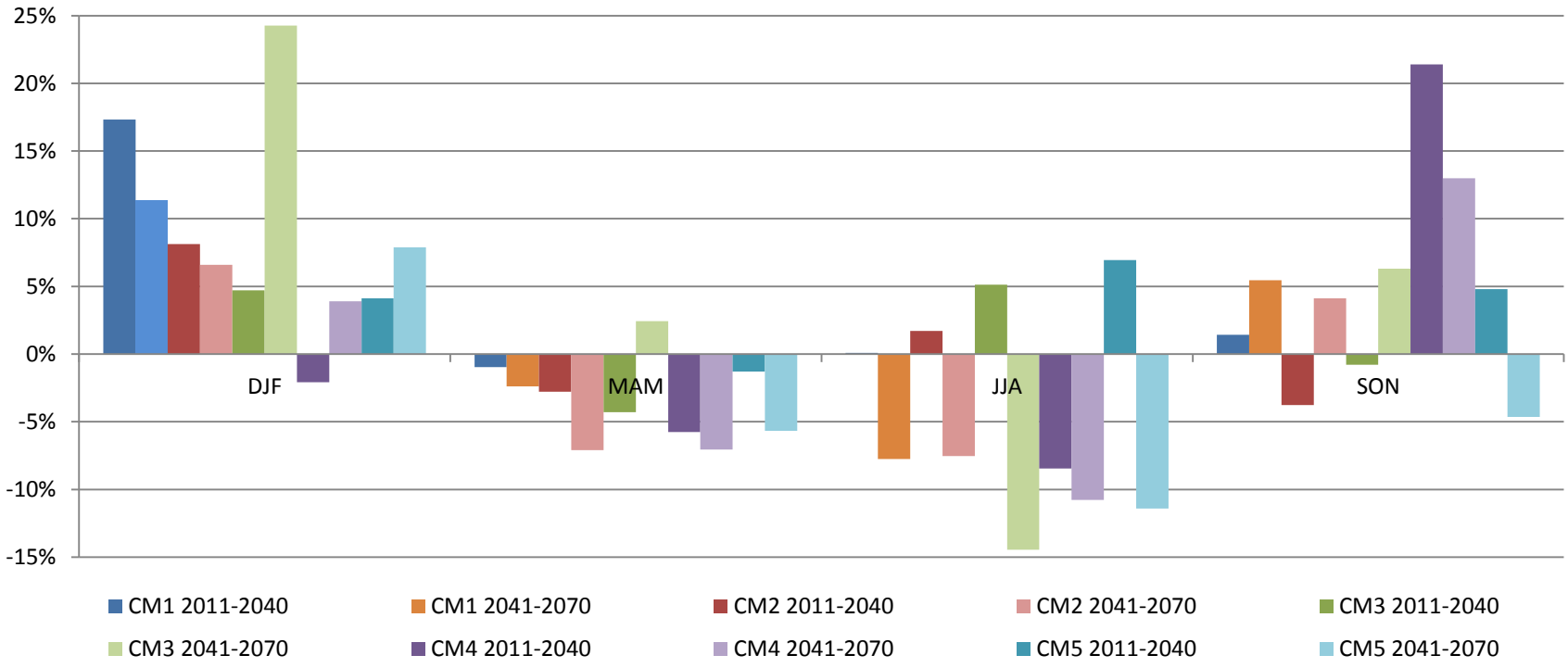


Changes in energy production



Seasonal energy production variability

- **HPP Bajina Bašta**



Possible adaptation approaches

Area of Intervention	Response (measure)	Additional Information
Waterway design and maintenance	• Creation of water storage • Deepening of channels instead of widening	• (Upstream) reservoirs needed for flood mitigation can also be used to improve navigation
Waterway operation	• Managing water flow • Improving forecast of water level • Improved queuing procedures • Implement River Info System (RIS) • Provide up to date electronic charts	• Store water in times of high water flow and release in times of low flow • Better information and decision support systems and automation of queuing will help overcome capacity restriction • RIS in general support safe and efficient navigation • Better information to optimise use of vessels
Transport management	• Chartering additional vessels • Increasing daily operation times • Cooperation with other transport modes • Increasing storage of goods	• Contractual arrangements with road and rail transport companies can be made for time of reduce navigability
Vessel operation	• Using state of the art electronic chart display and info system (ECDIS)	• Provide always up to date information
Vessel design	• Reduction of weight • Increasing width	• Using alternative design/material or install lighter equipment • Wider vessels need less draught

Priority adaptation measures

- **Preparing for adaptation**
  - Better monitoring of water levels
  - Improved hydrological forecasting
- **General measures**
  - Promoting river transport on Sava will enhance the competitiveness of river transport relative to other modes of transportation
  - Providing sufficient water depth in times of low water flow
- **Ecosystem based measures**
  - Definition of navigation fairway conditions according to ecological needs
  - Combining any increased water storage to support navigation infrastructure with habitat creation initiatives

Priority adaptation measures

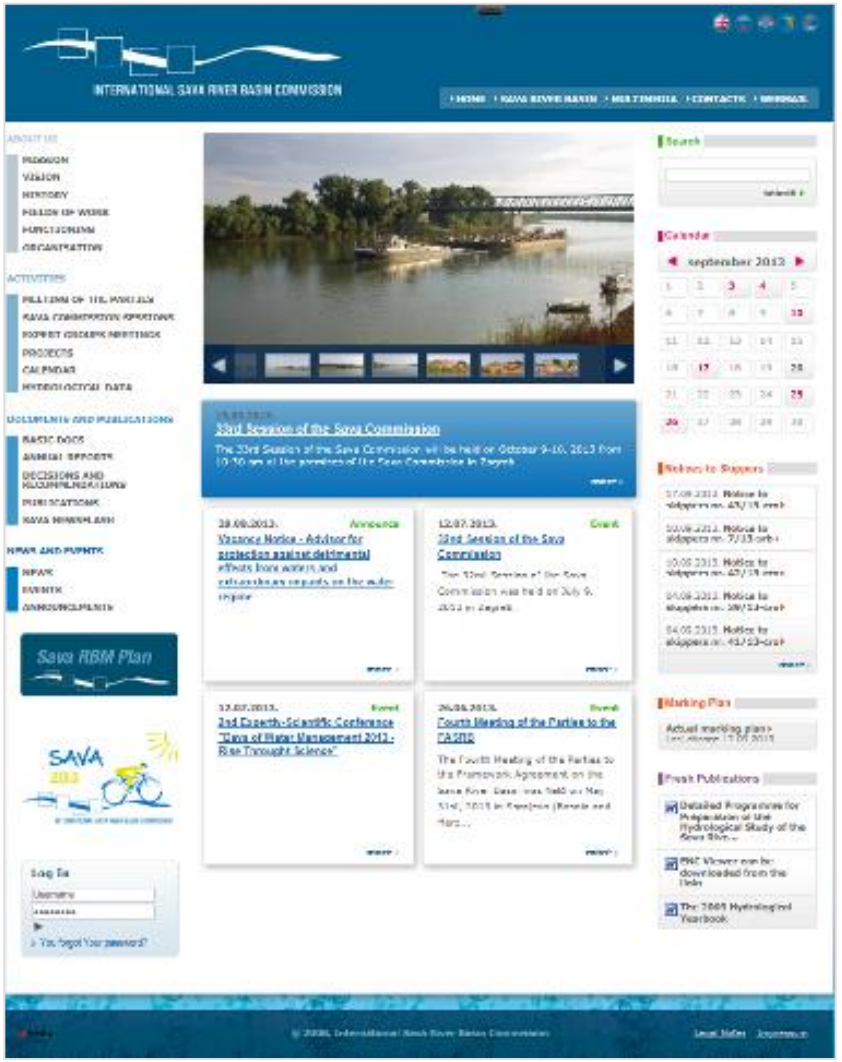
- **Management measures**
  - Low flows augmentation by better reservoir management
  - Increasing the share of river transport in total transport of goods
  - Look to changes in industrial production leading to lower transport requirements, or shifting transport towards the season with higher river levels
- **Technological measures**
  - Adaptation / creation / modernisation of waterways and ports
  - Support container shipping with shallow draft vessels
  - Fleet modernisation

Future projects

- **Flood Risk Management Plan** (2016-2018)
- **Flood** (Drought) **Forecasting & Warning System** (2016-2018)
- Support to development of **Climate Adaptation Strategy and Action Plan** (2017-2018)
- Updated **Sava River Basin Management Plan** (2017-2018)

Additional information

- **ISRBC web-site**



www.savacommission.org