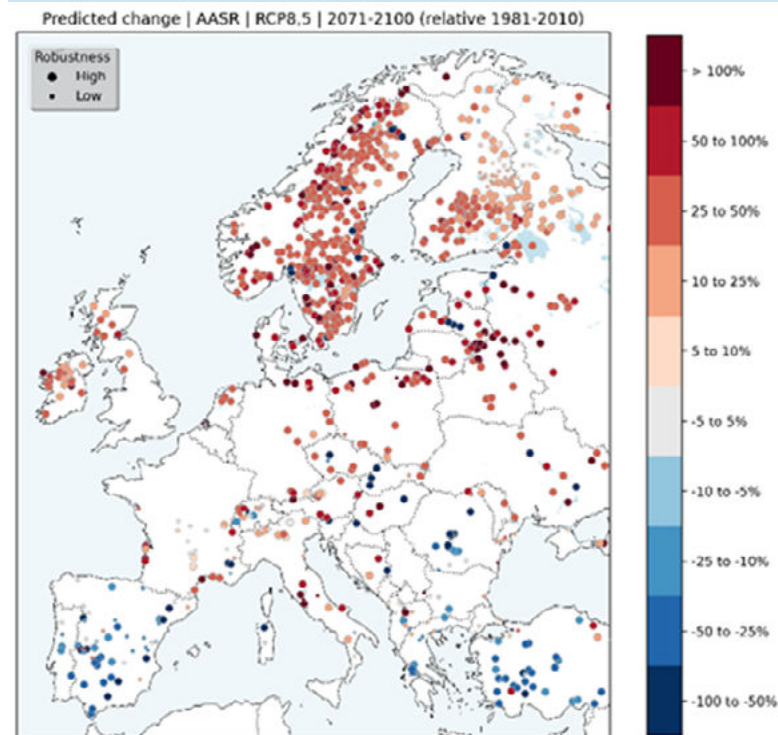


DIRT-X: Evaluating sediment Delivery Impacts on Reservoirs in changing climate and society across scales and sectors.

The project DIRT-X investigated how the changing climate and socioeconomic conditions influence water reservoirs and the services they provide to different economic sectors. We analysed hydrological processes across spatial scales and temporal scales under the current and future climate and socioeconomics. The integration of hydrological process models with economic models assessing energy systems then translated water resource impacts into economic consequences and energy production, focusing on renewable energy sources.

Key Findings

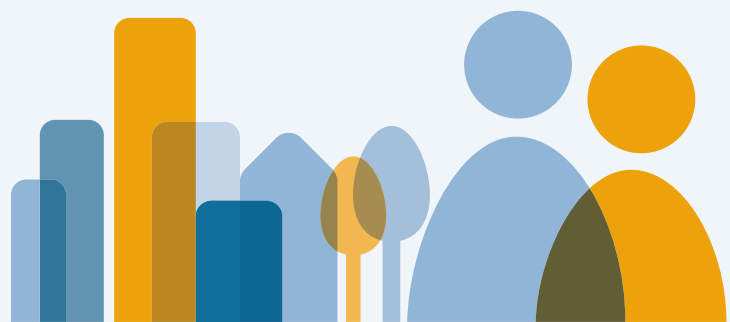
- Future climate and socioeconomic conditions were determined for all major reservoirs in Europe, specifically considering the impact of accumulated sediments on water storage capacity. Higher sedimentation rate is projected to reduce storage capacity faster than under current conditions for the majority of European reservoirs.
- Energy modelling showed that a minor reduction in the production of intermittent renewables (e.g., wind and solar) is projected for most of Europe by 2050. The average potential hydropower generation at the European level increases from 6.2% under RCP 2.6 to 7.5% under RCP 8.5. However, the interannual variability is much more pronounced than the climate signals.
- Three case studies underwent detailed evaluation of future impacts (2 hydropower reservoirs and one coastal area used for mussel farming). Snow and glacier dynamics had an important impact on sediments in water bodies for both reservoirs.



Percent change in average annual sedimentation rate (AASR) in European reservoirs projected for the high emission scenario (RCP8.5) at the end of the century period (2071-2100), calculated as relative difference from the reference period (1981-2010). Robustness is high when results for all three climate models agree on a direction of the change.

Strategic Sediment Management: A Key Factor in Adapting Water Reservoirs to Changing Conditions

Understanding the impact of sediments on available water storage in reservoirs is essential to plan proper management and operational strategies under changing climate and socio-economic conditions. Our study highlights the need for the majority of reservoirs to have a solid Sediment management plan that considers changing climate and other conditions. Reservoir operators and water resource planners would benefit from increased understanding of future sediment dynamics and



its impact. Analyses of changes projected for the production potential of hydropower and other renewable energy sources can support planning of future European power systems.

Enhancing Integration of Hydrological and Energy/Power System Models for Comprehensive Evaluation

Further investigation of connecting hydrological and energy/power system models would be desirable to improve overcoming differences in spatial and temporal resolution to better evaluate the system as a whole.

A larger sample of case studies would be needed to better define cross-scale impacts from various modelling chains. We were not able to separate the impact of selected modelling tools on climate impact indicators from the impact of the scale.

About AXIS

The ERA-NET Consortium AXIS (Assessment of Cross(X) - sectoral climate Impacts and pathways for Sustainable transformation) aims to promote cross-boundary, cross-community research with the overall goal to improve coherence, integration and robustness of climate impact research and connect it to societal needs. To this effect, AXIS aims to overcome boundaries between science communities through inter- or transdisciplinary research projects. <https://jpi-climate.eu/programme/axis>

Partners

- University of Stuttgart
- Institute of Hydrology and Water Resources Management at the Leibniz University Hannover
- Norwegian University of Science and Technology
- University of Utrecht
- University of Innsbruck

Project Duration

September 2019– June 2023

Contact

Dr. Alena Bartosova
Swedish Meteorological and Hydrological Institute
Sweden
alena.bartosova@smhi.se
<https://www.smhi.se/en/q/Stockholm/2673730>

Dirt-X is part of AXIS, an ERA-NET initiated by JPI Climate, and funded by FFG and BMBWF Austria, BMBF Germany, FORMAS Sweden, NWO NL, RCN Norway with co-funding by the European Union (Grant No. 776608).

<https://dirtx-reservoirs4future.eu/>

