

SPS-Blue Nile—Development and Transfer of a Seamless Prediction System for Decision Support in Transboundary Water Management of the Blue Nile

Water as a Global Resource (GRoW)

The Nile and its tributaries are the most important source of water for 400 million people in eleven riparian countries. The largest tributary, accounting for about 60 percent of the total runoff and 75 percent of the sediment, is the Blue Nile in Ethiopia and Sudan. How much water will the Blue Nile bring to these regions in the future? What can be done to better manage irrigated agriculture and water reservoirs, in particular the new Grand Ethiopian Renaissance Dam? German, Sudanese and Ethiopian participants in the joint project SPS-Blue Nile aim to develop a meteorological-hydrological forecasting system for the transboundary water management of the Blue Nile. The goal is to create a “seamless” approach with interconnected forecast horizons ranging from days to several months. This will enable a comprehensive, transboundary assessment and derivation of recommended actions within the water-food-energy nexus.

Loking into the Near and More Distant Future

Extreme events such as heat waves and droughts, but also heavy rainfall, have been increasing worldwide. Despite their uncertainties, forecasts with horizons of several months are therefore becoming ever more important. They can be used, for example, to develop strategies on how to adapt to climate change and mitigate its effects. A forecast horizon of up to seven months in advance is particularly valuable with regard to upcoming droughts or heat episodes. Heavy rainfall events, however, need to be predicted on shorter time scales and with higher spatial and temporal precision.

To initiate measures against a variety of extreme events at an early stage, it is required to combine seasonal forecasts covering several months with those of shorter horizons from two to six weeks in advance. Within the joint project SPS-Blue Nile, participants from science, politics and water management are therefore developing methods to

integrate information from different forecasting horizons into a consistent, seamless prediction system (SPS).

Predictive Dam Management

The forecasting system provides precipitation and temperature information that allows estimating future water availability for predictive dam management. However, a key problem in dam operation is the progressive sedimentation of the reservoirs: heavy precipitation or large-scale flooding release large amounts of sediments that eventually settle in the reservoirs and severely limit their operation and lifetime. Thus, the project partners do not only integrate inflow into the reservoir, they also include information on sediment transport and deposition into the seamless climate-hydrological prediction system. In addition, expected crop yields are taken into account for further recommended actions.

In order to guarantee the long-term benefits of such a system, it is essential that the modules developed can be easily transferred to different computer infrastructures. Consequently, the project consortium devises cloud-ready methods in all model phases and uses interfaces that allow remote access. This enables simple data and system transfer to local and business partners at a later stage.



Water management in Sudan: the Upper Atbara Dam

Transboundary Collaboration

Given the importance of the Blue Nile, it is vital that the Grand Ethiopian Renaissance Dam, Africa's largest hydropower plant, is operated jointly with the downstream countries of Sudan and Egypt. Particularly during extreme events such as prolonged droughts, concerted, transboundary and sustainable water management is required to ensure sufficient water resources for power generation, water supply and downstream irrigation. Tensions related to the dam are exacerbated partly by problems with shared data. Hence, the results of the SPS prediction system need to be communicated in a transparent manner, and transboundary cooperation should also be promoted.

The project closely involves local partners from Ethiopia and Sudan. Regular workshops and training courses online and in the target region as well as the exchange of PhD students ensure co-development of the SPS Blue Nile prediction system. Researchers share their methods and information and carry out joint research activities. A close involvement of participants in politics and water management in both countries allows for a transfer of results into practice and thus a sustainable implementation of the developed methods beyond project completion.



Close exchange of all project participants on site

Funding Measure

Water as a Global Resource (GRoW)

Project Title

Development and Transfer of a Seamless Prediction System for Decision Support in Transboundary Water Management of the Blue Nile (SPS-Blue Nile)

Grant Number

02WGR1643A-C

Duration

September 1, 2022 - August 31, 2025

Funding Volume

EUR 998,898

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Ministry of Irrigation and Water Resources, Khartoum, Sudan
Sudan Meteorological Authority, Khartoum, Sudan

Website

bmbf-grow.de/de/sps-blue-nile

Published by

Federal Ministry of Education and Research (BMBF)
Division Resources, Circular Economy; Geosciences
53170 Bonn

March 2023

Edited by

Project Management Agency Karlsruhe (PTKA)

Layout

Project Management Agency Karlsruhe (PTKA)

Printed by

Karlsruhe Institute of Technology (KIT)

Photo Credits

Front and Back: Harald Kunstmann, KIT