SaWaM – Global Information for Regional Water Management in Arid Regions

Water as a Global Resource (GRoW)

Dry areas make up some 40 percent of the Earth's land surface. How much water will be available in these regions in the future? How can water reservoirs and agricultural irrigation in these regions be managed? Sustainable and scientifically sound water resource management can achieve a lot, especially in semi-arid areas. This makes it all the more important to know about the actual availability of water resources in these regions. In the joint research project SaWaM, the project partners are examining whether and how readily available global information and seasonal predictions can be used to improve regional water management in arid areas.

Improving the Information Basis

In semi-arid regions, for months at a time there is less precipitation than evapotranspiration, and the dry periods are long and pronounced. For the countries affected, having as precise a picture of the current and future available water resources is of the essence. In the majority of developing and newly industrialized countries, however, observational data on the water cycle is becoming increasingly scarce owing to the reduction in the number of environmental monitoring stations in the region.

In the SaWaM project, the partners are devising methods with which the information required can be derived from readily available global data obtained by means of remote sensing. To do so, various modelling techniques are applied, including seasonal weather prediction modelling, water balance modelling and sediment deposition modelling for reservoirs. The results derived from the mathematical models are combined with near realtime global satellite data.

The project partners visiting the hydrometeorological monitoring stations in the Upper Atbara Dam Complex (al-Quadarif, Sudan)

The problem, however, is that for the time being readily available global information does not meet the requirements for regional water management. The resolution of available global information is not sufficient to answer regional questions, and does not depict regional processes precisely. To be able to use the global data in regional forecasting, the researchers begin by adapting the data to a total of five semi-arid target regions. These are located in Sudan, Iran, Brazil, Ecuador and West Africa, meaning that the analysis covers a wide range of starting points with varying conditions specific to each region.

Focus on Seasonal Forecasting

In regions where water is scarce, water availability for the season ahead, i. e. for the following six to twelve months, is crucial. Adapting water resources management early enough can help mitigate the crop losses resulting from water shortages, for example. For this reason, for practical reservoir management purposes as well as for irrigation farming in semi-arid regions, reliable seasonal forecasts are vital sources of information on the long-term average water supply. In fact, weather services have been providing seasonal forecasts for some time now, factoring in this important forecasting period. How efficiently these work, however, depends greatly on the specific conditions in the target regions. The researchers in the SaWaM project are thus investigating whether seasonal weather forecasts are suitable instruments to aid decision-making in regional water management processes and if so, how well suited they are.

In the SaWaM project, with the help of various data processing methods and in cooperation with local partners, global

seasonal forecasts are adapted to the specific conditions in the different areas of interest. The researchers then take this regional hydrometeorological information – e. g. precipitation, evapotranspiration, wind and temperature – and use it as a starting point to develop new modelling systems. While hydrological models are used to draw conclusions on runoff, ground moisture and sediment delivery, ecosystem models are used by the project partners to make predictions on factors such as the water requirements for vegetation or the expected crop harvest for the following season. Just how effective these methods are is being explored by the project partners in the catchment basin areas of the Kārūn River (Iran), Rio São Francisco (Brazil), the Atbarah River and the Blue Nile (Sudan). The catchment areas of the Catamayo-Chira River (Ecuador) as well as the Volta and Niger River (West Africa) serve to demonstrate the transferability of the project results.

New Online Information System to Serve as Prototype

The seasonal information is to be made available on an online platform. A prototype for this online information system, which can be used in decision-making processes, is being developed in close cooperation with local partners and potential end users in the target regions. In this way, direct transfer of global information to practical regional water management is guaranteed.

Regular workshops are held in the target regions to foster mutual cooperation on the online information system. These workshops also promote exchange of methodology and information among participants and provide a platform for planning joint research activities. To ensure the methods devised continue to be used beyond the project duration, project participants are also offering training to local partners.

Water management in semi-arid regions 2,000 years ago: the Kārūn River in Shushtar (Khuzestan Province, Iran)