Scrutinising rivers upstream

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Climate change influences water cycles. Particularly, it has an effect on the natural and socio-economic processes of river basins. Major rivers of the world have their origin in alpine-style mountains. The trouble is that their hydrological regime, which strongly depends on the freshwater flow from these regions, and has been impacted by climate change. After assessing their hydrological dynamics, scientists working under the umbrella of an EU-funded research project, called BRAHMATWINN, aimed at finding sustainable management solutions for water resources in headwater river systems in alpine mountain massifs. This initiative fell within the framework of the European Water Initiative.

Here, Wolfgang-Albert Flügel, project coordinator and chair of the department of geoinformatics, hydrology and modelling at the University of Jena, Germany, talks to youris.com about the project's holistic approach.

What were the main achievements of the project?

We developed a system designed to perform integrated land and water resource management (ILWRM). To do so, this tool integrates the spatial assessment and analysis of landscapes with socio-economic analysis methods. For example, the project partners first assessed the components of the natural environment of the river basins of the upper Danube and the upper Brahmaputra in South Asia, which have their headwaters in the alpine Alps and Himalaya, respectively. Then, they assessed the vulnerability to climate change of both their environment and their surrounding socio-economic system. We subsequently included

hydrological modelling.

In a final stage, we developed alternative ILWRM options for adapting to climate change and mitigating such impact, based on the project's results. We also offer a user-friendly framework that integrates different types of basin information. It aims at supporting stakeholders in their decisions about integrated water resource management. The main results of the project have been published online.

How can our improved understanding of river basin help better manage land use and water resources?

You need to consider the river basin landscape dynamics as a whole, rather than analysing and trying to improve single components of the system. This is a holistic and integrated approach. For example, if there are too many nutrients in the water—that is if the water is polluted—it is certainly meaningful to work on the river itself. But you have to know where these nutrients come from and how to improve the management of the catchment area in order to reduce the input to the river system measured as nutrient load.

Has the tool developed by the project made a difference?

Since the project was completed in 2009, we further developed the tool and it is now used globally. Namely, it has been adopted within projects financed by the German Federal Ministry of Education and Research (BMBF), and in South-East Asia, Europe, Brazil and Africa. For example, there is a project in Africa called SASSCAL, a project in Poland called SaLMaR and the INTECRAL project in Brazil. The research challenges are similar. We spatially map the landscape, analyse the dynamics of the water processes within the region and carry out

modelling studies in the catchment. But these projects are still ongoing and the achievements will not be published until they are completed.

What remains to be done to enhance land use and water resources management?

This is a never-ending story. For example, we would like to improve the modelling of erosion processes. We also deal with the question how to apply modelling parameters – that work for a certain river basin – to other catchment areas. We need to find out which criteria we need in order to analyse and quantify the comparability of river basins. Many additional research challenges have to be addressed.

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