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"Climate change impact on water resources - a challenge for IWRM". BRAHMATWINN - Twinning European and South Asian River Basins to enhance capacity and implement adaptive management approaches

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BRAHMATWINN addresses climate change impact of the hydrology of two macro-scale river basins having headwaters in alpine mountain massifs. The project will elaborate on the consequential vulnerability of present IWRM and river basin management that have been persistent in these basins during the past decades and will develop tested approaches and technologies for adaptive IWRM and resilience.
The overall objective of BRAHMATWINN is to enhance and improve capacity to carry out a harmonized integrated water resources management (IWRM) approach as addressed by the European Water Initiative (EWI) in headwater river systems of alpine mountain massifs in respect to impacts from likely climate change, and to transfer professional IWRM expertise, approaches and tools based on case studies carried out in twinning European and Asian river basins, the Upper Danube River Basin (UDRB) and the Upper Brahmaputra River Basin (UBRB).
Sustainable IWRM in river basins of such kind face common problems: (i) floods e.g. during spring melt or heavy storms and droughts during summer; (ii) competing water demands for agriculture, hydropower, rural, urban and industrial development, and the environment; (iii) pollution from point as well as diffuse sources; and (iv) socio-economic and legal issues related to water allocation. Besides those common topics both basins also differ in other issues requiring the adaptation of the IWRM tools; these are for example climate conditions, the density of monitoring network, political framework and trans-boundary conflicts. An IWRM has to consider all water-related issues like the securing of water supply for the population in sufficient quantity and quality, the protection of the ecological function of water bodies and it has to consider the probability of natural hazards like floods and droughts. Furthermore the resource water should be threatened in a way that the needs of future generations can be satisfied. Sustainable development is one of the main characteristics of an IWRM. An analysis of present IWRM practices and strategies in the basins and test sites, as well as an analysis of water administration, related organizations and water laws was conducted in the frame of the project to evaluate the status of water management in the regions and develop approaches to enhance the situation and to transfer professional IWRM expertise.
For investigating the actual status of the system and its development in the past a thorough system analysis was conducted as the fundament for further activities. With the knowledge of the historical development of climate conditions, runoff regime, glacier development and similar basin-related information it is possible to extrapolate the system response for future developments. One approach of the system analysis is the delineation of hydrological response units (HRUs). “Hydrological response units are distributed, heterogeneously structured entities having a common climate, land use and underlying pedo-topo-geological associations controlling their hydrological dynamics” (FLÜGEL 1995, Hydrological Processes, Vol.9, 423-436). HRUs can be used as model entities to simulate the hydrology of the basin using a distributive hydrological modeling system. The hydrologic modeling is the next logical step after the HRU delineation. The novel hydrological model JAMS/J2000g, developed at the Friedrich-Schiller-University of Jena, was used for this purpose.
For managing data (time series, GIS-data and documents) within the BRAHMATWINN project, a River Basin Information System (RBIS) was developed. In addition, RBIS provides the technical basis of a decision support system. For this challenge, the frontend offers different analysis functions. The structure of the web application RBIS consists of several components. One element is responsible for application administration tasks, e.g. the

access management. Another component was constructed as a variable number of application modules plus a shared management for metadata, following the ISO 19115 standard, including specific extensions for each application module. Available modules are RBISts for the management of time series data, RBISdoc for the management of documents and RBISmap for the management and visualization of GIS data.

BRAHMATWINN will considerably enhance the state-of-the-art in alpine mountain IWRM, mitigation of likely climate change scenarios and aspects of trans-boundary conflict management. By providing an innovative IWRMS toolset comprising the hydrological model, the presented web based information system, and a decision support component the outcomes of the project will be applicable for other river basins of this kind world wide.