Geophysical Research Abstracts
Vol. 12, EGU2010-13731, 2010
EGU General Assembly 2010

Q-BIC^3 - A Québec-Bavarian international collaboration for adapting regional watershed management to climate change

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Adapting to the impacts of climate change is certainly one of the major challenges in water resources management over the next decades. Adaptation to climate change risks is most crucial in this domain, since projected increase in mean air temperature in combination with an expected increase in the temporal variability of precipitation patterns will contribute to pressure on current water availability, allocation and management practices. The latter often involve the utilization of valuable infrastructure, such as dams, reservoirs and water intakes, for which adaptation options must by developed over long-term and often dynamic planning horizons. Research to establish novel methodologies for improved adaptation to climate change is thus very important and only beginning to emerge in regional watershed management.

The presented project Q-BIC^3, funded by the Bavarian Minstry for the Environment and the Québec Ministère du Développement économique, de l'Innovation et de l'Exportation, aims to develop and apply a newly designed spectrum of tools to support the improved assessment of adaptation options to climate change in regional watershed management. It addresses in particular selected study sites in Québec and Bavaria. The following key issues have been prioritized within Q-BIC^3:

i) The definition of potential adaptation options in the context of climate change for pre-targeted water management key issues using a subsequent and logical chain of modelling tools (climate, hydrological and water management modeling tools)
ii) The definition of an approach that accounts for hydrological projection uncertainties in the search for potential adaptation options in the context of climate change
iii) The investigation of the required complexity in hydrological models to estimate climate change impacts and to develop specific adaptation options for Québec and Bavaria watersheds.
iv) The development and prototyping of a regionally transferable and modular modelling system for integrated watershed management under climate change conditions.

The study sites under investigation, namely the Haut-Saint Francois and Gatineau watersheds in Québec and the Isar and Regnitz catchments in Bavaria, are under heavy anthropogenic use. Intense dam and reservoir operations and even water transfer systems are in place to satisfy multi-purpose demands on available water resources. These are imposing extreme modifications to the natural flow regimes.

In the first phase of the project, climatic forcing, stemming from an ensemble of selected GCM and RCM runs, is applied to a variety of hydrological models with different complexity. The derived projections of future hydrological conditions serve to investigate, whether current operation rules and/or existing infrastructure needs to be adapted to a changing environment. First findings demonstrate the large uncertainties associated to the model chain outputs, but also indicate that related adaptation is indispensable to meet the challenges of the rapidly changing man-environment systems.