Geophysical Research Abstracts
Vol. 20, EGU2018-15551, 2018
EGU General Assembly 2018

Systems modelling and nexus assessment to support global change adaptation in the Himalayas

Andrea Momblanch (1), Ian Holman (1), Sanjay K. Jain (2), Daniel Banister (3), Andrew Orr (3), Anil Kulkarni (4), Vijay Shankar (5), Sikhululekile Ncube (6), Lindsay Beevers (6), Boris Snapir (1), Toby Waine (1), Chandra S.P. Ojha (7), and Adebayo J. Adeloye (6)

(1) Cranfield University, Cranfield Water Science Institute, Cranfield, United Kingdom, (2) National Institute of Hydrology, Roorkee, India, (3) British Antarctic Survey, Cambridge, United Kingdom, (4) Indian Institute of Science, Bangalore, India, (5) National Institute of Technology, Hamirpur, India, (6) Heriot-Watt University, Edinburgh, United Kingdom, (7) Indian Institute of Technology, Rooorkee, India

In a context of rapid human development, in which water demands grow and diversify, making water available in space and time for often competing water uses requires holistic approaches that account for all human needs and the protection of the environment as inextricably dependent variables [1]. The water-food-energy-environment nexus accounts for these multiple relationships and considers water as a cross-cutting issue rather than a sector [2]. Water resource systems modelling approaches are capable of representing the connections between natural and human systems [3]. Thus, they are particularly useful for exploring these nexus interrelationships and their sensitivity to future climate and socio-economic changes. However, in order to produce relevant and robust information for adaptation decision making, stakeholders should be involved in all aspects of the modelling process, from system conceptualisation and implementation, scenario development to the selection of meaningful output indicators [4].

The UK-Indian collaborative project ‘Sustaining Himalayan Water Resources in a Changing Climate’ (SusHi-Wat) uses a systems modelling approach to support solutions to global change impacts in the Satluj-Beas water resource system, located in the state of Himachal Pradesh in northern India, through working with stakeholders to develop adaptation policies for water resources management. Hydrology in the study area is strongly climate-sensitive due to the combination of monsoon rainfall and melt water from snow and glaciers. The system is managed to supply large irrigation, hydropower and sparse drinking water demands along with protection against floods, which coexist with instream religious uses and a unique environmental setting.

This presentation shows the joint use of the Water Evaluation and Planning (WEAP) systems model and the nexus approach as a participatory scenario development tool for global change adaptation in the Satluj-Beas system. The model results are summarised in a set of user-relevant indicators that help to untangle the existing synergies and trade-offs among the different nexus components, including flood risk and religious values. Plausible coherent future socio-economic scenarios for the region and diverse sectors, designed in focus groups, will be tested along with climate projections using WEAP to provide an estimation of no-adaptation impacts. The outcomes will be used to develop stakeholder-defined water management adaptation policies that account for economic growth, equity and sustainability, and their effectiveness will be tested with WEAP.

1. Bakker, K. Water Security: Research Challenges and Opportunities. Science (80-.). 337, 914–915 (2012).
2. Gupta, J., Pahl-Wostl, C. & Zondervan, R. ‘Glocal’ water governance: a multi-level challenge in the anthropocene. Curr. Opin. Environ. Sustain. 5, 573–580 (2013).
3. Mohtar, R. H. & Daher, B. Water-Energy-Food Nexus Framework for facilitating multi-stakeholder dialogue. Water Int. 8060, 1–7 (2016).
4. Moors, E. J. et al. Adaptation to changing water resources in the Ganges basin, northern India. Environ. Sci. Policy 14, 758–769 (2011).