Focus Issue: Water Resources in the Upper Indus Basin and Beyond

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Dear Readers,

The Indus river basin supports the world's largest irrigation system. Climate change is definitely adding risks to the prime sectors of agriculture, energy, disaster management, and sanitation, where water plays the most critical role. The main issue is uncertainty in the volume and seasonality of future water supply. The recent incidence of extreme rainfall and flooding has led to devastation. At the same time, all scenarios predict a serious shortfall in future water supply in the basin and point to the need for better (transboundary) management. Since the integrated water resources management (IWRM) approach at basin level has successfully addressed similar problems in other river basins, we feel that an integrated river basin management (IRBM) approach for the Indus will not only enhance supply by storing water during high flow but also increase use efficiency by allocating water amongst the sectors and users more judiciously. What is needed are policy and institutional reforms that ensure both equitable access and remove disincentives to conserving water. In MRD 31.3 *(August 2011), 3 initial papers focusing on the Indus Basin and water resource management were published; in this issue, 3 additional papers discuss the linkages between climate, precipitation, glaciology, and river runoff.*

The Focus Issue begins with a MountainDevelopment paper by Markus Fiebig and co-authors on the impacts of global warming on mountaineering; the results of their detailed study in the Austrian Alps will certainly be of use to other high mountain areas worldwide where mountaineering has become an important activity for leisure-seekers and a source of income for the population in the region. This paper is followed by 7 MountainResearch papers, the first 3 of which emerged as a result of the Indus Basin initiative (see MRD 31.3*).*

As already underlined by Kenneth Hewitt, Madhav Karki et al, and Asad Qureshi in MRD 31.3 *(August 2011), without knowing more about climate factors, the vertical and horizontal distribution of precipitation, the water storage capacity of glaciers, and other water-related factors and their complex interaction in the Upper Indus Basin, predictions regarding water resources downstream—and policy recommendations based on these—will remain highly prone to errors. In the present issue of* MRD, *Nathan Forsythe contributes to this much needed systems knowledge by assessing runoff sensitivity to interannual climate variability and potential change using remote sensing products. Walter Immerzeel et al explore precipitation estimation from "below": they test ways of using glaciers as a proxy to quantify the spatial distribution of precipitation. These 2 methodological approaches and assessments are complemented by the paper by Francesca Pellicciotti and co-authors, which suggests and tests calibration strategies aimed at tackling the challenges and uncertainties in hydrological modeling at such high altitudes.*

In parallel with these attempts to improve our capacity to understand the biophysical environment that influences water resources in the Upper Indus Basin, Marcus Nüsser and co-authors offer a social-ecological analysis of irrigation in Central Ladakh, within the context of recent development efforts and other factors of socioeconomic change that have influenced an age-old system of water use in a semiarid high mountain area. Sandeep Tambe and co-authors describe a "springshed development" approach to tackle the water availability problem in another South Asian area, the Sikkim Himalaya, and identify major challenges in efforts to revive dying springs. The focus on water resources continues with Rovshan Abbasov's paper indexing the environmental vulnerability of mountain streams in Azerbaidjan. The final paper in the MountainResearch section, by Li Hongqiang et al, presents a study identifying carbon, vegetation, and nitrogen as important parameters for assessing the ecological effects of solar energy development in Tibet.

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