Securing and Governing Water in the Hindu Kush Himalaya

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Main Findings

Climate change is expected to drive consistent increases in the total runoff of the Indus, Ganges and Brahmaputra. In the Indus this increase will come from increased glacier melt, while in the Ganges and the Brahmaputra it is expected to come mainly from precipitation.

After mid-century, the Indus Basin may experience declines in total runoff resulting from declining glacial melt (inconclusive). Changes in future flow volumes will also have a seasonal dimension, with increased peak runoff and decreased low flow in some sub-basins. Pre-monsoon flows are expected to decline with implications for irrigation, hydropower, and ecosystem services.

Our knowledge of the amount and distribution of precipitation at higher altitudes [above 5,000 meters] in the HKH is poor. Meteorological stations at these altitudes are few and far between. The lack of reliable data has led to large anomalies in observed rain and snow data and observed glacier mass balances. More stations at higher altitudes are urgently needed.

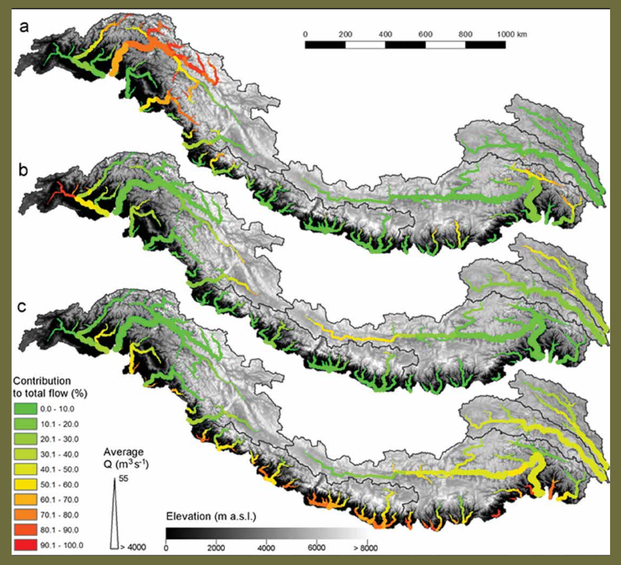
Another use of water—hydropower—is mostly non-consumptive. Yet hydropower entails changes in the timing and location of river flow, and these changes can harm other water users such as irrigation and capture fisheries. Such conflicts especially arise in the hills and the mountains, where most current and foreseeable hydropower sites are located. Mountain people very often do not derive commensurate benefits from these projects. Appropriate benefit sharing norms are needed to ensure that mountain people benefit from the region's vast hydropower potential.

To ensure water security in the HKH region, adequate water availability by itself is not enough—what is needed is good water governance. Such governance must be politically and culturally tailored to the local, national, and regional contexts. Challenges and opportunities vary at different levels: micro (watershed or springshed), meso (river basin), and macro (regional).

Key Messages

1. The Hindu Kush Himalaya (HKH) source ten major rivers that provide water, food and energy security, and ecosystem services for 1.3 billion people across Asia.
2. Water security is threatened by climate change and other human drivers. Equitable, productive, and sustainable water uses are limited by flood and drought cycles; by pollution from urban and industrial development; by poorly planned infrastructure; and by often-ineffective governance.
3. Good water resource governance entails balancing evidence-based policy with political imperatives at the local, national, and HKH regional scales.

Contribution to total flow by glacier melt (a), snow melt (b), and rainfall-runoff (c) for major streams during the reference period (1998-2007). Line thickness indicates the average discharge during the reference period [Lutz et al., 2014].



Policy Messages

1. Regional and local adaptive responses for water security will depend on increased HKH-wide cooperation, conflict management, open data sharing, and investment of funds for knowledge generation and action.
2. Trade-offs must be carefully managed—across geographical scales and among multiple sectors—in order to enhance water security, meet the Sustainable Development Goals (SDG) objectives, and achieve intended nationally determined contributions for emissions mitigation after the 2015 Paris climate accord.
3. Sustaining the HKH as a global asset means increasingly engaging the people and decision-makers of the region to ensure they continue to derive commensurate benefits, while acting to enhance water security at local, national, and regional scales.

Glacial Melt and Snowmelt

While glacial melt and snowmelt are important components of overall streamflow in the region, their importance varies widely—from very high in western rivers, such as the Indus, to low in eastern rivers, such as the Ganges and the Brahmaputra. In the eastern rivers, rainfall runoff contributes the largest share of streamflow. Still, this share varies substantially within each river basin: the relative contribution of snow and glacier melt, as opposed to rainfall runoff, increases with altitude and proximity to glacier and snow reserves.

Springs and Groundwater

Groundwater, in the form of springs in the mid-hills of the HKH, is an important contributor to river baseflow. Yet the role and contribution of springs to overall water budgets in the region is poorly understood. We urgently need better scientific knowledge of groundwater in the HKH—especially because millions of mountain people depend directly on springs.

Ecosystem Services

Despite the important role of HKH rivers in providing ecosystem services and maintaining environmental flows, these services and amenities are not well appreciated. Present law and policy frameworks are not adequate to ensure that infrastructure development does not impinge on ecosystem services.