

Regional water cooperation in the Hindu Kush Himalayan region

Arun B. Shrestha, Shahriar M. Wahid, Ramesh A. Vaidya, Mandira S. Shrestha and David J. Molden,
International Centre for Integrated Mountain Development

The Hindu Kush Himalayan (HKH) region is a vast complex of high mountains, intermontane valleys and plateaus; it contains some of the world's tallest peaks with over 60,000 km² of glaciers and about 760,000 km² of snow cover. This snow and ice represents a massive store of freshwater which supports food production, domestic water supply and sanitation, health, energy, tourism, industry, and the functioning of ecosystems. The region's 10 major river basins – the Amu Darya, Brahmaputra, Ganges, Indus, Irrawaddy, Mekong, Salween, Tarim, Yangtze and Yellow – connect upstream and downstream areas in terms of culture, communication, trade, commerce and resource management and, directly or indirectly, provide goods and services to 1.3 billion people including the 210 million that live in the HKH region.

While the river basins have been sources of great civilizations and routes of sociocultural movement, water-related transboundary cooperation in the modern era has been inadequate compared with many large river basins around the world such as the Danube, Mekong,

Murray Darling, Nile and Rhine. Fortunately the governments of the HKH region increasingly recognize that sustainable development of the economic potential of the river systems — for domestic use, fisheries, hydro-power, navigation and irrigation — can reduce poverty, improve livelihoods, conserve ecosystems and contribute to drought and flood management in the region.

Responding to the challenges of contemporary water management in the region will depend on regional water cooperation as an important mechanism to support informed decision-making. It will require a holistic understanding and appreciation of the services provided by water at the local, regional and global scales. It will also require understanding of the changing water dynamics and threats to water resource endowments in the HKH region, particularly in light of the impacts of climate change.

The nature of the hydrological regime determines water availability and quality, which are variable and continuously changing in time and space. In the HKH region



Khapalu Valley, Pakistan: the HKH region is a vast complex of mountains, valleys and plateaus

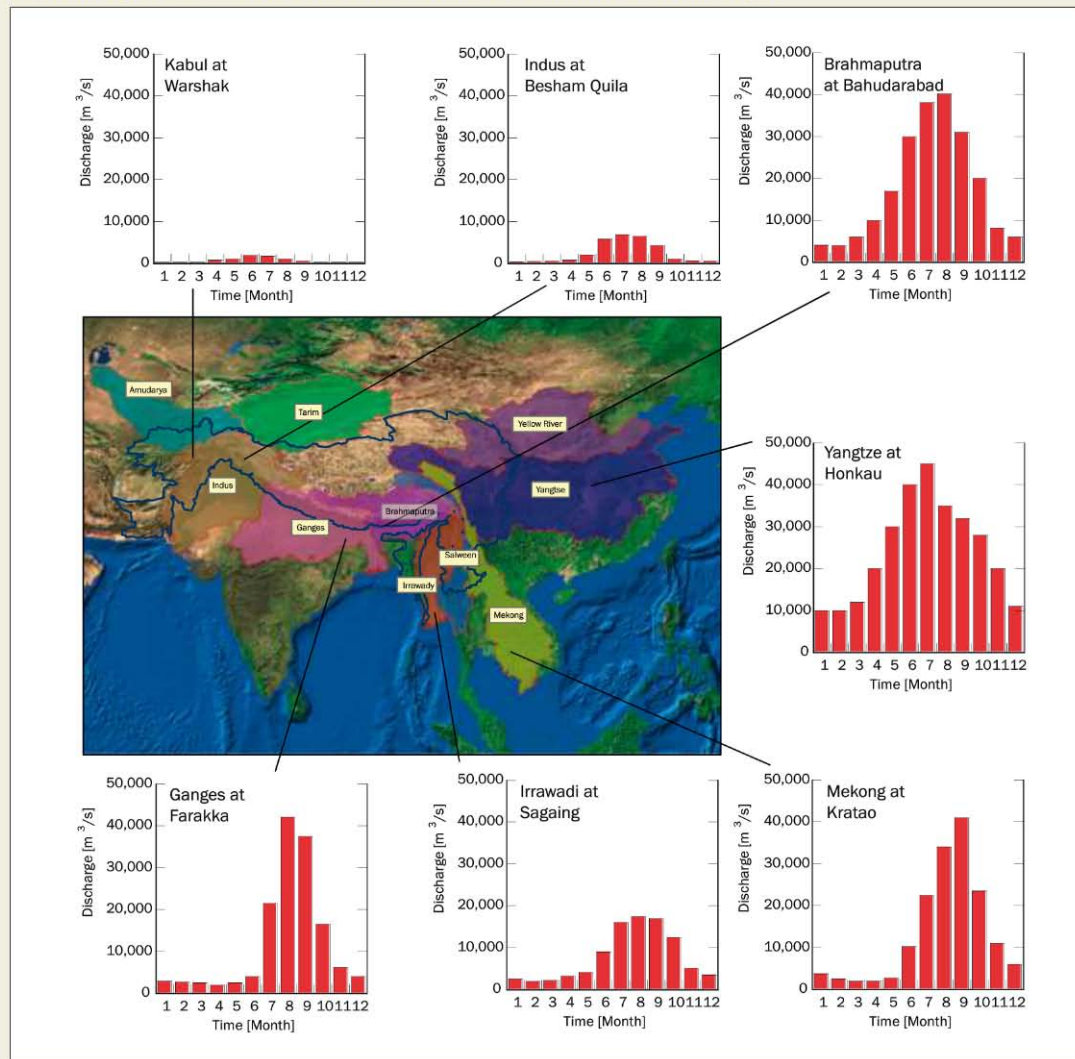
Image: Alex Treadway



Khumbu, Nepal: snow and ice represents a massive store of freshwater for the HKH region

Image: Alex Treadway

Map of 10 major river basins and seasonal variations in flow of selected rivers in the HKH region



Source: ICIMOD

the peaks in water availability usually do not coincide with the high demand periods. The eastern river basins depend mainly on monsoon precipitation, while the western basins are dominated by westerlies and heavily reliant on meltwater. While the region is known for its abundance of water resources, some areas are already water scarce, either physically (with more than 75 per cent of river flows withdrawn for agriculture, industry and domestic purposes) or economically (meaning that less than 25 per cent of water from rivers is withdrawn for human purposes, but significant improvements are needed in existing water infrastructure and management to make the water resources available for use). The western Himalayas and a large part of the Indus basin are recognized as physically water stressed areas. Large parts of the

Brahmaputra, Ganges and Salween basins are categorized as areas of economic water scarcity.

Climate change and associated changes could have a serious impact on the stability of water supply in the region. Observed warming in the region ranges from 0.01 to 0.06° C per year. The Intergovernmental Panel on Climate Change (IPCC) has projected that temperatures will be about 3° C warmer than the baseline by the middle of the twenty-first century and about 4° C warmer by the end of the century. Models project about 20 and 30 per cent increases in annual precipitation in the eastern Himalayas, with increased interannual and



Image: Alex Treadway

Panjshir Valley, Afghanistan: water management has traditionally been handled at state level, denying the transboundary nature of the resource

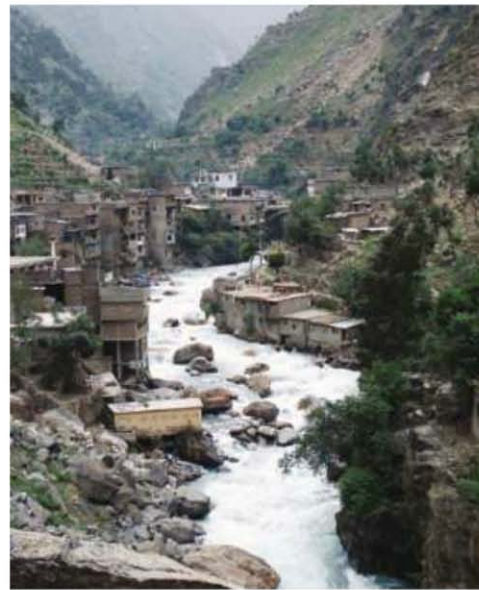


Image: Birendra Bajracharya

Settlements along the Indus river: river basins have been sources of great civilizations and routes of sociocultural movement

seasonal variability by the middle and end of the century respectively. The recession of HKH glaciers is a matter of great concern, particularly since the release of the IPCC's Fourth Assessment Report (AR4) in 2007. Several recent studies indicate that the rates of retreat are less than those originally suggested by the AR4, but across the region more glaciers show shrinking trends than advancing trends.

The region is also undergoing remarkable socioeconomic transformation. Consequently water demand has increased over the past decades and will continue to increase into the future. For example, the International Water Management Institute projects that in South Asia the annual water withdrawals for agriculture will increase by 9 per cent between 2000 and 2050, while non-agricultural water use will increase by a factor of five in the same period under an optimistic 'comprehensive assessment' scenario. Such a dramatic increase, coupled with environmental and socioeconomic changes, gives reason for major concern about the availability of an adequate quantity and quality of water to meet the demand.

Water vulnerability is uneven across the region. The Amu Darya and Indus river basins appear to be the most vulnerable to changes in water availability. Furthermore, water vulnerability has different causes; one study showed that vulnerability in India and Bangladesh stems from hydrological and ecological factors, while in Nepal it is linked more to poverty and lack of economic development. Poor political governance and underinvestment in the water sector add to vulnerability in Bangladesh and Nepal. Overall, Bangladesh was found to be the most vulnerable country, and Nepal that with the least capacity to adapt.

The changing HKH waterscape amply illustrates that the management challenges of today and tomorrow greatly differ from those of the past. Resource utilization today is vastly expanded and intensified through new technology, emerging markets and systems of governance, with decisions in one place influencing people and resources elsewhere. Thus there is a strong case for interaction and reconcilia-

tion of the interests of the various actors in the region. A more focused cooperative approach will entail a shift in the water resource development paradigm from 'development only' to 'cooperative development and management' in addressing water needs.

To date, water resource management approaches in the HKH river basins have not fully accounted for the social, cultural and political implications of water management and climate change adaptation interventions. Water management has traditionally been handled at the state level, denying the transboundary nature of the resource endowment and the need to accommodate the interests of many actors, especially in addressing challenges extending beyond stringent political boundaries. The rigid hierarchical management regimes do not support flexible, cooperative approaches for coping with the ever-changing environmental and sociopolitical landscape, especially changes related to transboundary waters and climate change. Furthermore, such regimes are not effective for meeting local or regional needs. The highly regulated data and information sharing protocols are counterproductive to good governance and fail to support informed decision-making. Lack of cooperation in information exchange and in the sharing of appropriate technology seriously hinders water resource development and management in the region.

The ecological and sociopolitical issues related to water management in the region are complex and do not easily lend themselves to agreement and collaboration among countries. A case in point is 'green' hydropower development. The hydropower potential of the HKH region is estimated to be more than 500 GW, much of which

is not harnessed. While touted by some as an important 'passport out of poverty' in the face of rising energy demands and fossil fuel prices, green hydropower development remains controversial and contested in the region, partly because of lack of knowledge of risks due to environmental change such as glacial lake outburst floods (GLOFs) or meltwater change; concerns about impacts on the water regime (such as downstream water availability) and on fisheries, livelihoods, aquatic ecosystems and environmental services as a whole; and unresolved mechanisms of benefit sharing. At the regional level, hydropower projects raise new questions about sharing transboundary water resources between countries, which has long been a source of dispute. Yet the ferocity of the debate around hydropower development should not defeat efforts to understand how development trajectories might reallocate regional land and water resources, incomes and risks, and the various consequences for different social groups in time and space. The challenge is largely to address the question of how different countries can initiate and sustain coordinated and collaborative actions to harness hydropower. This will require attention to the structure and interrelationships of organizations, sharing of strategies, and a sophisticated monitoring, communication and coordination mechanism.

Thus it is clear that regional cooperation requires both an adequate understanding of the potential hydro-economic benefits and a governance framework for extensive regional engagement for water resources management to overcome national or bilateral interests and address shared concerns in a concerted manner.

The notion of regional cooperation to ensure sustainable and equitable use of natural resources is not new. Regional strategic political and economic processes offer opportunities to link water management to emerging regional economic, energy and food security issues. Indeed the heads of state of the South Asian Association for Regional Cooperation at successive summits have reiterated the need to strengthen and intensify regional cooperation to preserve, protect and manage the diverse and fragile ecosystems of South Asia, and to address the challenges posed by climate change and natural disasters.

The countries of the HKH region have had some success in sharing real-time hydrological data, primarily through bilateral agreements, and this has proved useful in flood forecasting. However, achievements have been limited with regard to the sharing of real-time data and information on a regional scale, so critical for flood management.

Water cooperation has often been hindered by the lack of a sound knowledge base on the availability of resources and their distribution over space and time, and a lack of understanding on the impacts of various drivers of change on the supply of and demand for resources — for example, the impacts of climate change on stream flow variability, sedimentation and potential GLOF events. Regional hubs such as the International Centre for Integrated Mountain Development (ICIMOD) — whose members are the eight countries of the Hindu Kush Himalayan region (Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal and Pakistan) — can promote collaboration among knowledge institutions in the region and contribute to the development of the requisite knowledge and understanding. Such regional centres can also facilitate representation and participation and provide technical support for regional discussions. Over the past three decades, ICIMOD has provided a common platform for regional cooperation where policy makers, experts, planners and practitioners exchange scientific data, information, ideas and perspectives towards achieving common solutions at regional levels. Water issues, along with concerns of livelihoods and ecosystems, are integrated across ICIMOD's regional programmes addressing adaptation to change, transboundary

landscapes, river basins, cryosphere and atmosphere, and regional information collection and sharing. ICIMOD also supports transboundary collaborative research among its regional member countries through its projects. Such regional initiatives could be further strengthened through establishment of an adequately mandated regional group or body, hosted by a relevant organization, to independently facilitate and coordinate regional dialogue and strategic processes of regional water governance.

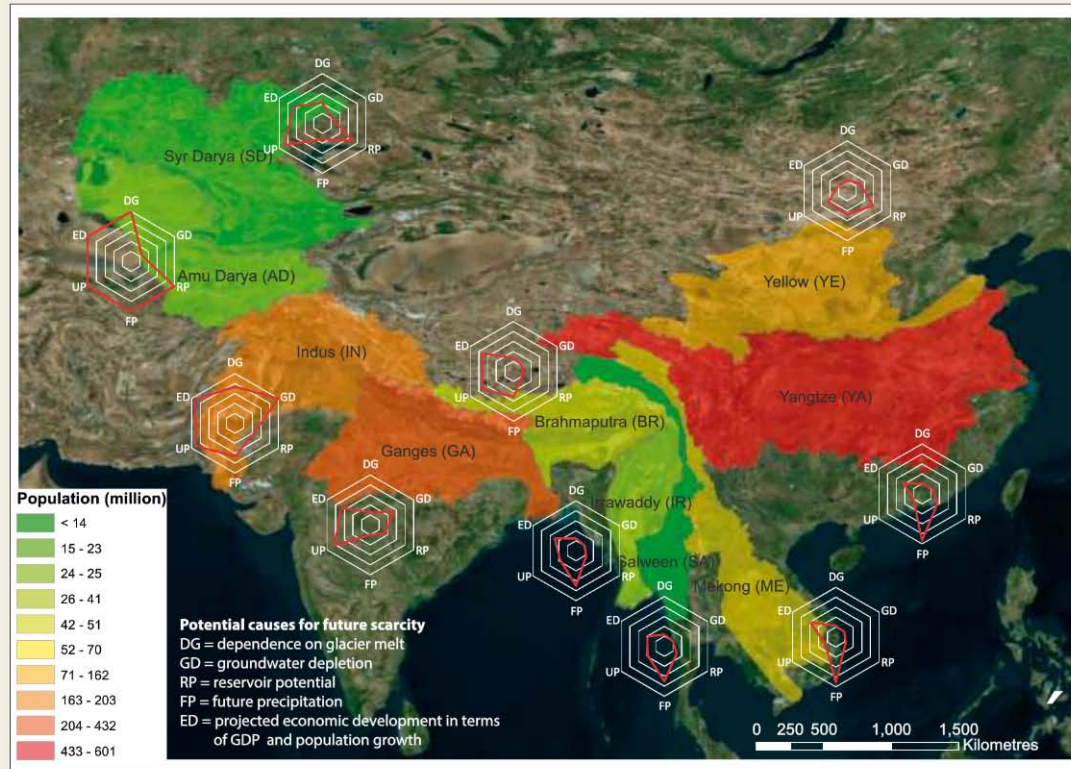
At the river basin level, where externalities are unidirectional from upstream to downstream, early success in regional cooperation can be achieved by identifying priority actions expected to provide common benefits across borders, for example hazard risk reduction. The non-structural flood management approach of providing end-to-end flood forecasting and warning services has the greatest potential for regional cooperation. Greater sharing of knowledge on the cryosphere is another area of potential cooperation that could improve understanding of cryosphere dynamics and possible downstream impacts. This is especially important for river basins highly dependent on meltwater.

Regional cooperation may also provide important opportunities for overcoming the economic, environmental, technological, financial and institutional barriers to hydropower development. Power trade and exchange between the Himalayan region and the core industrial belts of China and India could improve the capacity utilization factor of the power plants in the region, thus enabling the countries to supply power to their households at affordable prices. To enable the less industrialized countries in the region to trade power with the more industrialized ones, cross-border grid interconnections are vital.

In this regard there have been positive experiences in the region. Bhutan and India have engaged in some bilateral cooperation in developing hydropower. Construction companies in China and India have rich experience in hydropower development. Power grid interconnections in India were expanded from the local and provincial levels to the regional and national levels in the 1990s, facilitating cross-border interconnections to the grid networks. Furthermore, India has promoted the establishment of power trading companies, both public and private. More recently, electricity exchange markets have also been started in India.

Another entry point for cooperation may lie in transforming natural systems of water storage. The region is blessed with a host of such systems including snow cover and permafrost, glacial lakes, wetlands and groundwater aquifers. Transforming natural systems into planned active systems may have important externalities for downstream users including control of uncertain river flows, recharging of groundwater aquifers, sediment trapping, nutrient recycling and maintenance of the quality and quantity of the water cycle. However, the cost is high relative to returns, and the externalities are typically undervalued and not compensated. The introduction of policies for compensation for ecosystem services could help mountain people maintain healthy lives in a healthy environment

Susceptibility of 10 river basins of the HKH region to water scarcity and potential adaptation strategies



Radar charts show qualitative ranking between low susceptibility and/or large coping capacity (1) and high susceptibility and/or small coping capacity (5).

Source: By permission from Macmillan Publishers Ltd: Nature Geoscience (Immerzeel WW, Bierkens MFP (2012) Asia's water balance. Nature Geoscience 5:841-842), © 2012

while helping to maintain a steady supply of water for downstream users who are often across borders, especially in the HKH region.

In conclusion, the HKH region holds vast reservoirs of water and the origins of 10 major river systems. Climate change, directly through impacts on temperature and precipitation regimes and indirectly through changes in the cryosphere, is likely to have a serious impact on the region's water supply and pose a significant threat to environmental sustainability and economic development. Regional water cooperation offers an important mechanism to support natural resource management. The ideal of a transboundary river basin organization may not be envisaged in the immediate future because of the geopolitical realities and the inherent complexity of coordinating the activities of the various actors involved in shared water systems. However, important steps can still be made based on recent global and regional processes and conventions. Development of the regional knowledge base on climate change impact, green hydropower development, flood risk reduction, early warning and sharing of information and knowledge provide promising entry points for fostering water cooperation in the region. Knowledge hubs such as ICIMOD offer avenues for bringing together commercial, academic, government and civil society organizations to generate technically superior schemes, help secure financial resources and facilitate broader water cooperation.

ICIMOD: fostering regional cooperation on water

The HKH Hydrological Cycle Observation System (HKH-HYCOS) initiative aims to strengthen hydrometeorological monitoring capacity and is establishing a regional flood information system based on state-of-the-art communication and information dissemination technology to save lives and property in the region. By early 2013 the project had upgraded 24 real-time observation networks in four countries (Bangladesh, Bhutan, Nepal and Pakistan) and established an efficient data transmission and acquisition system to enable accurate forecasting and effective early warning in the region.

The Koshi Basin Programme, an example of ICIMOD's transboundary river basin approach, promotes cooperation among China, India and Nepal to maximize benefits such as irrigation and hydropower while minimizing adverse events such as floods and landslides. The programme fosters interaction and reconciliation of the interests of the various actors at the basin scale. Its approach to river basin management integrates scientific, economic, social and ecological knowledge to support policy and decision-making to promote the sustainable use of transboundary water resources and develop 'win-win' solutions that can be supported by all three countries. Particular focus is given to issues of gender and inequality and their linkages to drivers of change and river basin management, as well as to the potential of employing incentive-based mechanisms to improve water use efficiency and productivity.