Water Diplomacy in South Asia

The Need for a New Conceptual Framework for Water Engineering

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The large population and the high level of poverty in South Asia have often been shown as reasons for concern about the water future of the region. Traditionally the main sources of water used in South Asia have been the rivers originating from the Himalaya, namely Brahmaputra, Ganges and Indus. The snow and ice melt flows in these rivers improve their perennial character. The very large storage of ice in the Himalaya, only less than those in the two poles of the Earth, has made the Himalayan region increasingly being known as *The Third Pole* of the Earth.

On the basis of the diverse disputes on trans-boundary rivers and the resulting lack of strategy for basin level cooperation, an impression has got created that in the future decades the region would face a great deal of water related disputes and conflicts. Their resolution would need more water in large quantities. Water for irrigation, which promotes food security in a region where the largest number of the world's poor live, constitutes the main consumer of water supplied in South Asia. This makes water scenarios politically sensitive. In addition, the region is also trying to promote urbanization and relatively high rates of economic growth, both of which are significantly adding to the total water requirements.

These Himalayan rivers are trans-boundary and water related disputes exist not only at the inter-country level, but also between provinces within the countries as much between farmers owning adjoining pieces of agricultural land. Many sensationalist writers have made unrealistic predictions of water wars breaking out in the region while the traditional diplomatic processes have remain stagnant for decades. Even initiatives pushed by The World Bank, like the Abu Dhabi Dialogue, has not brought much advancement. In the future decades, will there be an escalation of the traditional conflicts or there are wise new options for cooperation and poverty alleviation without intensifying political and environmental instability related to the use of the trans-boundary waters? This article addresses the future of water security in South Asia, in particular in the Ganges-Brahmaputra-Meghna (GBM)

basin. The basin area of 1,745,000 sq. kms is shared by Bangladesh, Bhutan, China, India, Myanmar and Nepal (Fig. 1).

Figure 1: Ganges-Brahmaputra-Meghna basin

Home to about 750 million people, the GBM basin drains significant parts of both the South and North aspects of the mountain Himalaya. The Ganges sub-basin within this basin has the highest population density in the world and related challenges. Though the land area of the GBM basin in China (Tibet) is quite large, in terms of the water output of the Himalaya or the share of the population residing in the basin, South Asia is the most significant. Hence, the role of the flow of rivers in China (Tibet), particularly the Yarlung Tsangpo, in the discourses on water future of South Asia, has not yet become an important consideration. However, for China the water of Yarlung Tsangpo is important both from the point of water supply and hydro-power generation.

In the case of India, the GBM basin alone accounts for about 60 percent of the total potential flows of all the rivers. Through the domination of the summer monsoon in the climate of South Asia, the total annual precipitation and the amount of river run-offs are not quite insignificant. If the temporal and spatial variations of the precipitation over the GBM basin would have been more uniform, meeting water requirements in South Asia would also have been much easier. However, in a monsoon dominated climate, the spatial and temporal distribution of this good amount of precipitation is quite skewed. For example, in the eastern part of the GBM basin the average annual precipitation of 11,600 mms is not uncommon in the Meghalaya Hills, while at the western extremity of the basin, in Rajasthan, the annual precipitation may go down to a low of 200 mms. Further, about 80 percent of the annual precipitation is concentrated during the summer monsoon months of July to September. The cumulative impacts of such temporal inequity are reflected in the hydrographs of the rivers Brahmaputra and Ganges in Bangladesh shown in Figure 2[1].

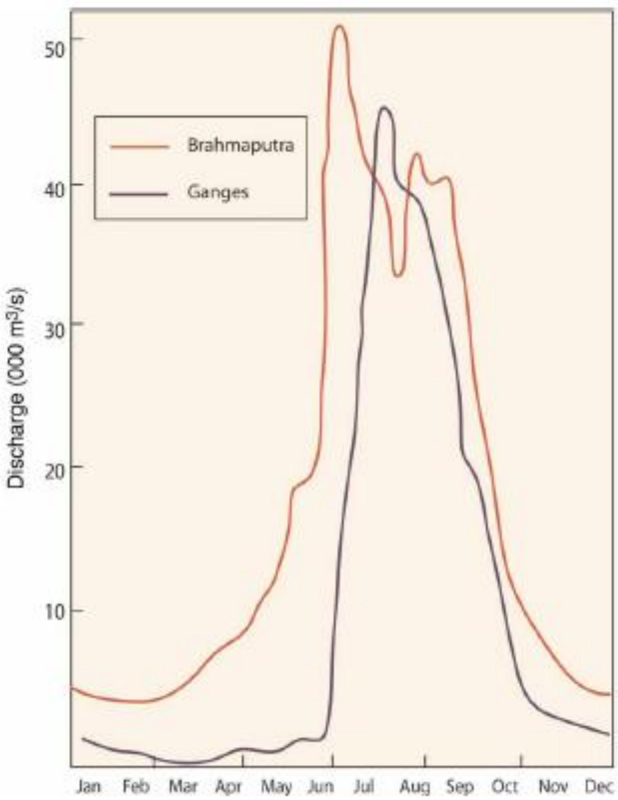

Fig. 2. Seasonal variation in river discharge in the Eastern Himalayas (drawn by Sagar Ratna Bajracharya, ICIMOD; source: Bandyopadhyay, 1995).

Moderating this quantitative picture of high spatial and temporal unevenness in the natural distribution of precipitation to come closer to the growing and changing patterns of needs and demands, has so far been the driving force for water engineering in South Asia. Following independence of very large parts of South Asia in 1947, pushed by the need for food security, irrigation projects received very high priority in governmental policy. The Himalayan rivers made the largest contribution in this direction. India's irrigation potential rose from below 20 mha in years after independence, to about 110 mha at present. More recently, with the

[1] Bandyopadhyay, Jayanta (1995) 'Water Management in the Ganges-Brahmaputra Basin: Emerging Challenges for the 21st Century' *Water Resource Development* 11(4):411-442.

objective of meeting the power requirements from the industries and the growing urban areas, a large number of hydro-power projects on the Himalayan rivers have been built or are planned on tributaries to Brahmaputra, Ganges and Indus.

Another objective of water engineering in the GBM basin has been the moderation of the impacts of monsoon high flows, generally termed as flood control measures. Through the construction of both storage dams and embankments, engineering interventions and large financial investments have been made with the objective of restricting the spread of the monsoon high flows across the natural floodplains. The conceptual framework of such engineering interventions has remained reductionist, dominated by dependence on large structural interventions. It was because the tradition of water engineering of initial British origin continued even after independence in South Asia. Further, for various reasons, including the confidentiality of river hydrological data, research on the science of Himalayan rivers has not received the openness needed for the growth of an interdiscipline and hence the related knowledge has not grown very much. The complex ecological character of the Himalayan rivers were, thus, kept away from entering in water engineering education and research. In addition to ecological knowledge, new interventions also needed new institutional and legal framework, which also remained underdeveloped. In the background of this stagnancy of the knowledge base, the typicality of the monsoon precipitation pattern, the ecological complexity of the Himalayan rivers and the huge population pressure in the region, South Asia is one of the most challenging parts of the world in terms of the potential use of modern water systems engineering and diplomacy**.**

The post-Dublin, post-Rio global rethinking on water engineering has also initiated discourses in South Asia A review of opinions expressed in the past decades on the need for a more comprehensive and inter-disciplinary approach to water systems research and engineering interventions in the Himalayan rivers, knowledge and innovations on several directions can be noted. These directions basically constitute the background for creating a new framework for water diplomacy in South Asia that may improve the ecological state of the Himalayan rivers while extending water security to the region. . In this article one of such directions, the need for ecological enrichment of policy and water engineering, will be addressed. The issues of ecological conceptualization will be considered because this has been neglected even in the search for a new approach to South Asian waters, popularly known as the Track-2 diplomatic process. The institutional structure and economics related to a new approach to water diplomacy, are no less important> However, yese will not be addressed in this article, due to the limitation of space as well as the large and negative environmental impacts of water engineering interventions made in the past.

In the background of the rapidly growing water requirements in South Asia, particularly in India, such a comprehensive and new water systems science and diplomacy can bring the much needed balance among the multifaceted demands on the Himalayan waters to ensure that human interventions do not trigger ecological un-sustainability and they have a general acceptance from the people concerned, especially those affected negatively by the interventions made, like involuntarily displaced.

As mentioned above, water future of South Asia needs to be addressed on the basis of several types of water diplomacy interventions, many of which require a fundamental reorganization of basic concepts of water science and engineering. In this article the interventions needed for making them ecologically informed, will be identified. Other important interventions, such as .in terms of institutions, economics, cultures, etc, notwithstanding their importance, will be outside the limited scope of this article. These five directions are given below. These are based on the objective of stabilizing the ecological status of water systems and then make allocations for sustainable water use.

Firstly, and most importantly, the available water from the precipitation over South Asia needs to be assessed more acutely and mechanisms for the allocation of the utilizable water among diverse ecological and human requirements, as well as economic demands, arrived at. Due to the existence of the Himalaya, South Asia receives quite a large precipitation but the topography of the same mountain offers great difficulties in the assessment of the water it generates. Applying diplomacy on the whole of the basin area, human well-being at the regional level, including protection of necessary ecosystem processes and services, may be ensured. Secondly, loss in quantity of utilizable water by pollution needs to be brought to a complete stop, so that decline in water quality does not cause de facto reduction in water availability. Thirdly, end-use efficiency, especially in irrigation should be lifted upwards to release a great amount of water for meeting other needs. Fourthly, both the engineering interventions for water supply and power generation and discharge of used water into them have threatened the ecosystem functions and services, initially in the Ganges sub-basin and now in the Brahmaputra sub-basin. Water related projects need to be evaluated in their economic viability on the basis of a basin-wide ecological assessment. Fifthly, and not the least in importance, impacts of climate change needs to be assessed as early as possible by developing appropriate regional climate models suiting the topographical peculiarities of South Asia. The problem of water security in South Asia is more from the rooted in the spatial and temporal variations, and not an absolute scarcity per say. If successful corrective interventions are made on these directions, the water security in South Asia may well be a not very difficult target. In the specific context of the GBM basin, the following points of entry are identified for a new and ecologically informed water science and diplomacy intervention to be successful:

- A hydro-meteorological data base for the Himalayan uplands and mountains to be created with spatial density comparable to that as recommended by the WMO for mountain areas. This is needed for an accurate modeling and assessment of flows in the Himalayan rivers.
- Strengthening of regional climate models that is specific to the orography of the Himalaya – urgently needed for the projections of future climate scenarios and related hydrological parameters
- The view that water in the Himalayan rivers is a stock waiting to be stored and supplied away for use by humans without any damage to the ecosystems and other economies based on the same river. The Himalayan rivers need to be recognized as an interlinked flow of water, sediments and energy. The nature of the interaction among the three constitutes an important segment of river ecology in all parts of their respective basins, starting from the high mountains to the floodplains, delta and estuaries of the rivers and the coastal areas.
- Identification and assessment of the diverse ecosystem processes and services of the Himalayan rivers in all parts of their basins – this is basic for developing ecologically informed and comprehensive methods for design and evaluation of water related projects (example: what to do with sediment accumulated behind storage dams).
- In the backdrop of the well-known temporal inequity of monsoon precipitation, monsoon high flows need to be accepted as an expected natural event and not as an aberration or a sudden disaster. The monsoon high flows need to be seen also as crucial sources of water for use in the off-monsoon periods, and to support a host of ecological processes. There is an urgent need for finding diverse uses of storage dams, including for generating mock high flows. With storages designed for serving ecological needs also, addressing the impacts of storage projects on the downstream areas and communities may become quite positive.
- The GBM basin, due to the geological fragility of the young mountain Himalaya and the intensity of the monsoon precipitations, is characterized by high sediment content in the flow of streams and rivers. The GBM carries the highest annual suspended sediment load of the world, at 1.29 billion tons. This results in high geo-morphological dynamism in the foothills, floodplains as well as the delta. The GBM delta has been constantly advancing southwards into the Bay of Bengal as the Bengal Fan, upto a distance of about 1000 kms. This dynamism and the morphological implications of large mass wasting events in the Himalaya, make the river channels subject to large scale shifting that traditional engineering has not adequately internalized. Traditional engineering did not quite grip these processes.

- Generate water systems engineering to optimize and sustain ecosystem services in all parts of the basins for basin wide advancement of well being rather than uninformed efforts at the maximization of economic returns from individual projects.
- Realize the fact that supply side solutions are to get exhausted some day and research on and implementation of technologies to achieve far greater efficiency in demand management for water use (surface and ground), particularly in irrigation, should be a priority for water diplomacy.
- Develop an informed hydro-diplomacy towards the creation of approaches and policies for the use of ecological engineering knowledge for economic advancement with poverty removal and water security in South Asia. New dimensions in education of water systems engineers is to be added to provide the engineers ability to address water future of South Asia with confidence.