

Sharing of Natural Resources: The Case of South Asian Waters

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1. Introduction

South Asia that consists of Afghanistan, Bangladesh, Bhutan, India, Pakistan, Maldives, Nepal, and Sri Lanka, is home to 1.4 billion people. Forty four per cent of the world's deprived population lives in this region.

The economies of all these countries are mainly driven by primitive sectors and the region faces poverty and fluctuating inequitable sustainable economic development.

Topographically very diverse and climatically a variable region, the boundary of South Asia is spread out from the Kirthar Range in Pakistan in the North to the Indian Ocean in the south with lofty mountain ranges, large floodplains, deserts, and numerous perennial rivers and streams fed by the mountain glaciers.² The lofty mountain range, known as the Hindu Kush Himalayas, is bestowed with abundant natural resources, vast forest cover and biodiversity, and mineral and petroleum resources.

Monsoons and the 60,000 km² glaciers of the Hindu Kush region are the sources of water in the 10 large river systems, i.e. the Amu Darya, Brahmaputra, Ganges, Indus, Irrawaddy, Mekong, Salween, Tarim, Yangtze, and Yellow River (ICIMOD 2011). The Ganges and the Indus are the biggest and most important trans-boundary rivers in the region.

The southwest or summer monsoon and the northeast or winter monsoon are the two monsoon systems regulating the rainfall pattern in the South Asian region. The summer monsoon contributes 70 per cent to 90 per cent of the yearly rainfall in great part of South Asia, excluding Sri Lanka, and Maldives where the northeast monsoon operates. North part of South Asia receives substantial rainfall from Western distributaries (Mirza et al. 2005).

Water accessibility in the region is mainly determined by two reasons. First, there is a severe difference among the countries in terms of water accessibility and consumption, and secondly, all the countries have abundant water resources. Water is surplus mostly in the monsoon season, especially from June to September causing floods. However, in some parts of the region, water scarcity causes severe drought conditions. Both drought and flood have occurred in Pakistan, India, and Bangladesh (Mirza et al. 2005). In the context of sharing of natural resources in South Asia, the waters of the region need to be discussed. The major river systems are discussed below.

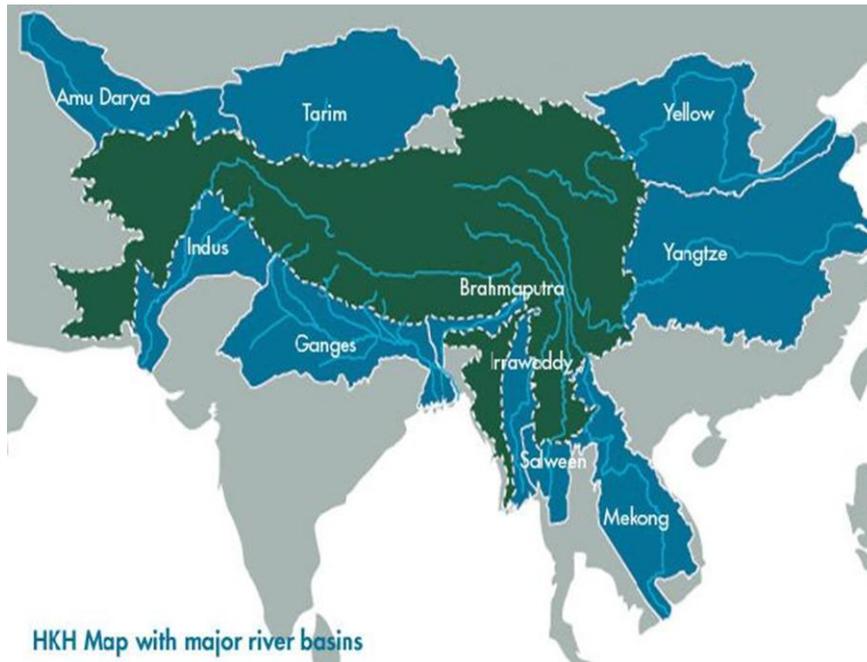
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² <http://www.learningace.com/doc/saarc-beyond-indo-pak-2014>

2. Major Trans-Boundary Rivers of South Asia

Most of the river systems in South Asia are trans-boundary with the rivers' head in the Himalayan glacier. The major trans-boundary rivers of the region are: Indus, Ganges, and Brahmaputra.

Fig.1 Major Rivers Of South Asia



Source: ICIMOD 2011

2.1. Indus

The Indus is the major river among trans-Himalayan rivers of South Asia, covering an area of 1,165,500 sq-km to the Arabian Sea with 33832 MWMW of economically feasible hydropower potential. The Indus flows through four countries: China, Afghanistan, Pakistan, and India. Of the total area, 47 per cent flows through Pakistan, 39 per cent through India, 8 per cent in China, and only 6 per cent in Afghanistan as shown in figure 3. The basin houses over 300 million people in the Indus basin.

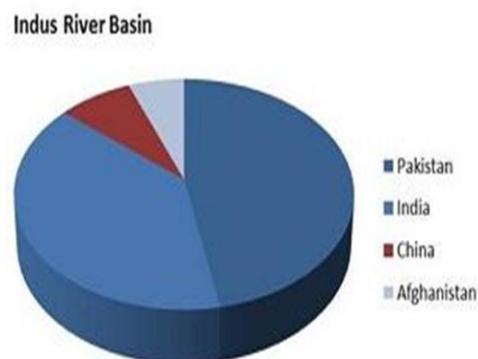
It originates from the Southwestern Tibet region near Mansarovar lake and flows across Jammu and Kashmir in North India. The most important five branches: Beas, Chenab, Jhelum, Ravi and Sutlej join Indus in Punjab then flow southwest into western Punjab in Pakistan (Chintan 2011).

Fig.2. Indus River Basin



Source: Tiwari 2013

Fig.3. Indus River Basin Share



Source: Tiwari 2013

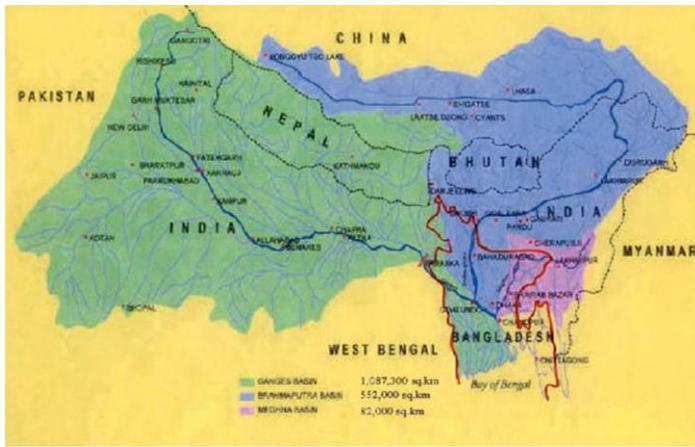
The Indus is the most important river of Pakistan, covering 520,000 km² from the Punjab and Sindh provinces till the eastern Balochistan. Flowing 440,000 kms² in India, the river runs through the states of Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, and Rajasthan (Chintan 2011).

2.2. Ganges, Brahmaputra Meghna River Basin

1.7 million km² Ganges Brahmaputra Meghna (GBM) Basin is the largest trans-boundary river basin in South Asia, that supplies freshwater to five countries. 92 per cent water requirements in Bhutan, 88 per cent in Nepal and India, 80 per cent in Bangladesh, and 89 per cent in China are fulfilled through this basin.

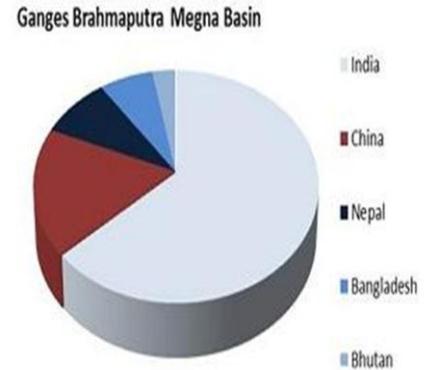
The Ganges river originates from Uttarakhand and meanders southeast through Bihar and West Bengal in India (SASIA 2013). In central Bangladesh, the Ganges is joined from the north by the great Brahmaputra and from the northeast by the Meghna and drains in the Bay of Bengal. The Brahmaputra river's course starts from China and, flowing down into eastern India, reaches Bangladesh to join the Ganges and Meghna rivers. Originating in the eastern flanks of Himalayas in India, the Meghna river connects the Ganges and Brahmaputra in southwest, draining in the Bay of Bengal.

Fig.4. Ganga Brahmaputra Megna Basin



Source: Tiwari 2013

Fig.5. River Basin Share



Source: Tiwari 2013

The GBM basin in figure 4 is a highly populated belt with 630 million people living along the basin, deriving their livelihood from agriculture. The basin is a highly cultivated area with 35.1 million ha cultivated land, of which the largest cultivated area 82.2 per cent lies in India, followed by Bangladesh, which cultivates 14.0 per cent, Nepal uses 3.3 per cent area, while 0.4 per cent and 0.1 per cent respectively in China and Bhutan (FAO 2011).

Figure 5 shows the share of the Ganges-Brahmaputra-Meghna river basin as 64 per cent, 18 per cent, 9 per cent, 7 per cent and 3 per cent among India, China, Nepal, Bangladesh, and Bhutan respectively. The supply of water comes from the perennial glacier-fed rivers to the monsoon flooded river water. Demand is generally generated from increases in population, agriculture, urbanization, and industrial growth.

3. Factors Affecting Water Demand in South Asia

3.1 Increase in population

South Asia is one of the heavily-inhabited regions of the world with 1,220 million people living in the GBM basin. The population rise has both immediate and incidental effects on the demand of water. The immediate effect is mainly visible in the increasing need of water for domestic use. Rise in water use is affected by factors like growth in per capita income and rural to urban migration. As per capita, urban water need is measured to be two times greater than rural areas (Mirza et al. 2005). Thus, the increase in population will generate higher water demand.

3.2 Agriculture

The South Asian economy is mainly driven by agriculture. Sixty per cent of the labour force is employed in the sector and has 22 per cent share in the regional GDP (World Bank 2011). With the steady growth of population and demand for food in the region, water demand for agricultural purposes is also expected to rise. In the light of growth in population and need for food, the demand for non-food manufactured and farm produce, the cultivable areas in the dry lands needs to be extended with irrigation channels improved (Mirza et al. 2005).

3.3 Industrial Growth

With rapid growth of the industrial sector, industrial water demands will rise. The demand for water for industrial purposes, like mining, manufacturing steel and non-ferrous metals, heavy chemicals, thermal power, fertilizers, paper petro-chemicals, cement, and textiles will increase (Mirza et al. 2005).

Water demand fluctuates from country to country in the region. From the seven countries of South Asia, India's industrial water needs are comparatively higher than other South Asian countries due to its high population growth, growing economy and high foreign direct investment. As per estimates, industrial water need in India rises two-fold every 10 years. Similarly, 5 per cent per annum rise in industrial water demand is proposed in Bangladesh (Mirza et al. 2005).

4. Sharing Terms of the Rivers

The Indus, Ganges, Brahmaputra and Megna rivers share a trans-boundary basin in the South Asian countries, thus they have come under various sharing terms and treaties; the most important and notable treaty being the Indus Water treaty between India and Pakistan and the Mahakali Treaty.

4.1 The Indus Water Treaty 1960

There were a series of World Bank facilitated talks on sharing of the Indus river due to partition and the recurrent conflicts on the Indus river between India and Pakistan. During the partition of India and Pakistan, the borderline was drawn transversely through the Indus Basin. India was in the upstream and Pakistan at the lower part of the river.

Two vital irrigation headwaters — one at Madhopur on Ravi river and another at Ferozepur on Sutlej river — from which the irrigation supplied water in the Punjab, Pakistan, required to be fully reliant on, were given to the Indian space.

Thus, differences related to the water use between the two countries became clear. So, in 1960, a treaty was settled on the Indus river sharing the Indus Water Treaty (IWT) with 12 Articles and

9 Annexures, addressing matters on the division of river, ceiling on water use, and ways for tackling problems (Chintan 2011).

The IWT stated that the Indian part of the eastern rivers, the Sutlej, the Beas and the Ravi, were given over to India to use, provided that any major water works that it constructed does not affect the overall pattern and volume of flow of the basin. The Indian part of the western rivers, the Jhelum and the Chenab were not available for consumptive use or storage, with some limited technical margin (Chintan 2011).

Even after the signing of the 1960 treaty, instances of conflict sprung regarding use of the Chenab and the Jhelum rivers over which, in the Indian state of Jammu and Kashmir, a 450 megawatt Baghlihar Hydropower Project was to be built in 1999. When the building was commenced, Pakistan raised alarms about the project, saying it surpassed the obligatory storing requests, thus giving India the power to regulate the flow of the river (Chintan 2011).

During 1999-2004, another sequence of talks between India and Pakistan were held and in January 2005, six protest applications were submitted to the World Bank. A Swiss engineer was appointed as the nonaligned professional to resolve the matter in May 2005. After the submission of the report in February 2007, Pakistan's objection was proved to be wrong on the elevation and gated regulation of the spillway, yet India had to decrease the dam height by 1.5 meters, increase the power intake tunnels by 3 meters, and lessen the storage size from 37.5 million cubic meters to 32.58 cubic meters (Chintan 2011).

Similarly, further Indian projects in the Jhelum and its tributary continued to lead to conflict. The 330 megawatt Kishanganga Project on the Kishanganga river in 1997, to which Pakistan said that in 1989 it had sought India's cognizance on its plan to construct a 969 megawatt project on the Neelum river. While Pakistan could not initiate the project, complaining India's project transferred water from Kishanganga to the Jhelum at Wullar lake and, in doing so, affected not only its own project on the Neelum but would modify pattern of flow in the Indus river basin. In response to Pakistan's complaints India justified that the height of the proposed dam was lowered from 98 metres to 37 metres (Chintan 2011)

The Ganges Brahmaputra Meghna basin is spread across four countries: Bangladesh Bhutan, India, and Nepal. The basin is mostly located in India and holds the upstream and downstream rights.

The first treaty on sharing of the water was the Sarada Barrage Letter of Exchange between the British India and the administrators of Nepal in 1920 for the alteration of the Mahakali-Sarada water for irrigation. The other treaty was the Koshi Agreement of 1954 in which Nepal's previous privileges to draw water from the Koshi river and its tributaries,

when necessary, was secured. Yet another agreement was signed in 1959, the Gandak Agreement, analogous to the 1954 Koshi agreement for the welfares of Nepal.

Nepal got 15,000KW of power and 20 cusecs of water for irrigation from each of the western and eastern canals. The remaining power and water was for India. Similarly, the 1991 Tanakpur Barrage settlement safeguarded the usage of 2.9 hectares of Nepali land to build a 577 meter long afflux bund (boundary) to generate electricity for India. In reappearance, Nepal got 10 MW of power annually and 150 cusecs of water for irrigation (Chintan 2011).

4.2 The Mahakali Treaty 1996

The most important of all the water-sharing treaties in South Asia was the 1996 Mahakali Treaty. For the first time in the water-sharing agreements, the treaty talked about the India-Nepal water relations and set definite codes on sharing waters of the trans-boundary river. It acknowledged *“the principle of equal rights over the waters of the river”* and *“equal entitlement in the utilisation of the waters of the Mahakali River”*.

It was agreed that Nepal would get 1000 cusecs of water from May 15 to October 15 and 150 cusecs till the next May. It was obligatory on India's part to sustain flow of at least 350 cusecs water downstream of Makhali river to sustain the river ecology.

4.3 Ganges Water Treaty 1996

India and Bangladesh share 54 trans-boundary rivers. The conflict between India and Bangladesh over the question of sharing the trans-boundary rivers, especially Ganges, erupted in 1975 for the construction of 2246 metre long Farakka barrage, which is 17 km above Bangladesh.

Bangladesh and India formed Joint River Commission (JRC), signed two Memorandums of Understanding (MoUs) and two treaties to solve the Ganges water-sharing. An official remonstrations by Bangladesh in the United Nations General Assembly in 1976 led to the signing of an Agreement of Sharing of the Ganges' Waters on 5 November 1977 between India and Bangladesh for five years. Subsequently, India and Bangladesh signed a new treaty for sharing the Ganges water on 12 December 1996 for 30 years stating that:

1. The flow at Farakka was calculated on the basis of average flow.
2. Percentage of distribution among Bangladesh and India is 45:55 and in few instances the share will be 30:70.
3. Between 1st March to 31st May, the distribution will be on the basis of hydraulic cycle when one side will have 35,000 cusec assured flow and the other will receive the remaining. In such a cycle when the flow is 50,000 cusec, India shall get 35,000 cusec and Bangladesh 15,000 cusecs.

4. When flow is lower to 50,000 cusecs, no distribution clauses will be valid; Bangladesh and India will assemble to resolve rightful allocation.
5. The same clauses will be functional in the distribution of flow of other trans-boundary rivers.

5. Water Resources and Climate Change

Water resources of South Asia in the present era are challenged by the problem of climate change like other parts of the world.

The average global temperature in the last 100 years shows a rising trend. The temperature is expected to rise by 0.3 degrees to 1 degree warmer by the year 2035. Highlands are the most vulnerable to climate change. Significant impact of changes in climatic parameters are visible in mountainous region, like the widespread retreat of glaciers witnessed in the polar and tropical regions in recent times.

The Hindu Kush Himalayas, including the Tibetan plateau is of great significance in global atmospheric circulation (ICIMOD 2011). Great variation is observed in diurnal rainfall in the Asian summer monsoon, which is attributed to augment greenhouse gases, especially decline in rainfall.

The arid and semi-arid regions in South Asian provinces can face severe dearth due to changes in climatic parameters.

5.1. Floods and Droughts

Variations in the appearances and extent of monsoon can intensify the possibility of incidences of numerous droughts in South Asia. Incidences of droughts are a recurrent hazard in Bangladesh, India, Sri Lanka, and Pakistan. In the year 2000, India and Pakistan had severe water scarcity.

In the Himalayan country, Nepal, landslides and floods happen virtually each year. The Himalayan region is mainly vulnerable to Glacier Lake Outburst Floods (GLOFs). Particularly Bhutan and Nepal are most vulnerable to GLOFs. In India, 40 mha of land are susceptible to floods annually. Monsoon in Bangladesh inundates huge tracts of land every year like the dangerous floods in 1987, 1988, and 1998 (Mirza et al. 2005)

5.2 Irrigation

Farming in South Asia is extremely irrigation-concentrated. Forty per cent of the crops cultivated in summer in Bangladesh require substantial irrigation (Mirza et al. 2005). Agriculture becomes vulnerable to climate change as crops are sensitive to water requirement. Not only the fluctuations in water but minimal changes in ground temperature can change the need and time of irrigation. Greater dryness would require more water and greater moisture in the soil would reduce water requirement. Changes in the climatic parameters simultaneously alter the cropping season.

5.3 Glaciers and Water Supply

The Himalayan glaciers are understood to be melting fast with rising global temperatures. As predicated, the world possibly will see 0.3 degrees to 1 degree rise in temperature by 2035 (IPCC 2001). Almost all the river systems of the South Asian Himalayas are fed by glaciers. The Dokriani glacier, and the Gangotri glacier have retreated 26 km in between 1842 to 1935 whereas between 1977 and 1990, the glacier retreated 28 m/year (Mirza et al. 2005). This will have negative impact on the water supply.

5.4 Food Security

Crop sector is extremely vulnerable to variable climatic parameters. Changes in climatic variables have the potential to change agricultural systems.

Floods and drought affect crop production, causing food insecurity in South Asia. The 1974 floods in Bangladesh destroyed the monsoon crop, resulting in undernourishment besides taking lives of 250,000 people. Similarly, the drought in 1979 led to a famine and the 1998 floods destroyed 3.5 million tons of crops (Mirza et Al. 2005). In 2000, droughts in Gujarat (India) and Pakistan caused severe food shortage in South Asia.

5.5 Dams and Reservoirs

Hydropower generation from the fast-flowing rivers of South Asia is evident in the countries like Bhutan and Nepal, deriving a major source of income from it and other countries like India and Pakistan, generating energy from water resources.

150,000 MW of hydropower generation has been planned to be generated by 2024 by Pakistan, India, Nepal and Bhutan (International Rivers 2008) and over 1,500 reservoirs in India alone (Mirza et al. 2005).

Hydroelectric production will be hampered due to climate change as river runoff patterns will be erratic with increased climate variability. Climatic change will also affect the sediment discharge with added soil eroded by rise in precipitation. Dams and reservoirs built for hydropower production will be at risk.

6. Conclusion

South Asian countries being heavily populated, agriculture-intensive, and showing rapid pace of industrialization and urbanization, it has become a water-stressed area. Climate change will further intensify the demand for water in the future.

To combat water scarcity and rising demand, efficient water management becomes a priority. Thus, a proper system to reduce waste of water and ensure conservation is essential. Bilateral, regional, and multilateral cooperation within the South Asian countries becomes very important. Regional cooperation agencies, like the SAARC in South Asia, have a crucial role to play in the effective management of the water resource.

Individual governments and development partners supporting investment in various developmental infrastructure can play a critical role in water management by formulating clear and durable norms and institutional arrangements for the management of water resources. Various water agreements and treaties, signed earlier on the sharing terms of the trans-boundary rivers, need to be reviewed from time to time as conditions change and treaties become outdated. Knowledge management for coordinating information exchange among agencies and stakeholders to adopt regional cooperation for improved water governance is essential.

References

Chintan, GS 2011, 'Trans-boundary River Basins in South Asia: Options for Conflict Resolution', International Rivers, Kathmandu.

FAO 2011, Ganges-Brahmaputra-Meghna Basin: Geography, Population and Climate, Food and Agriculture Organization of United Nations, viewed on January 18, 2014. <http://www.fao.org/nr/water/aquastat/basins/gbm/index.stm>.

ICIMOD 2011, From Rio 1992 to 2012 and beyond: Sustainable Mountain Development Hindu Kush Himalaya (HKH) Region, Regional Assessment Report for Rio+20: Hindu Kush Himalaya and SE Asia Pacific Mountains, ICIMOD, Kathmandu, Nepal.

Mirza, MMQ & Ahmad QK, 2005, 'Climate Change and Water Resources in South Asia', Taylor & Francis Library, London.