Indus Waters and Pakistan:
Seeds of Future Conflict?

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In an article published in *The Express Tribune*, dated August 16, 2011, Dr Akmal Hussain warned of a water crisis emerging which could have major implications for Pakistan's economy and society.[1] Dependence on a finite resource in the face of increasing demands due to economic and population growth, coupled with inefficient water use and unsustainable development practices are slowly leading Pakistan to a situation which could have unpredictable consequences. An important dimension of the water issue in the years ahead is the phenomenon of climate change, which could take the crisis to a critical level. According to Hussain, existing water scarcity, when combined with the impact of climate change, could place critical stress on the economy and society of Pakistan in particular and South Asia in general: major food shortages, increased frequency of natural disasters, large scale dislocations of population and destabilising contention between upper and lower riparian regions. If the necessary collaboration for cooperative management of the Indus basin water resources is not undertaken expeditiously, the resultant economic crisis could lead to a war with India.[2]

Indus River: Pakistan's Lifeline

An arid country, Pakistan depends heavily on annual glacier melts and monsoon rains. Most parts of the country receive scant rainfall and have little or no access to surface water. The Indus river, thus, provides key water resources for the economy of Pakistan, especially its two major provinces of Punjab and Sindh. Originating from the northern slopes of Mount Kailash in the Gangdise range of Tibet near Lake Mansarovar, the Indus drains an elevated and tectonically active upper basin that lies across Western Tibet, the Himalayas and Karakorams. It

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receives water and sediments from the Shyok, Shigar, Gilgit and Kabul rivers from the north and west and from the Jhelum, Chenab, Ravi, Beas and Sutlej from the east. The latter five tributaries join the Indus immediately downstream of Panjnad at Mithankot. The Kabul river joins the Indus at Attock. In its 2,900-km journey to the Arabian Sea, the Indus river flows northwest on the Ladakh plateau till it crosses Skardu in Gilgit where it meets the Shyok river.[3] From here, the river moves southwest towards Tarbela where Pakistan has constructed a major dam. Downstream of Tarbela, the landscape changes and the Indus flows in a broad valley for about 50 km till the Attock gorge. The plains start 160 km further downstream at Kalabagh and thereafter the river flows another 1,600 km till its confluence with the Arabian Sea.

Most of the run-off north of the Tarbela Dam comes from snow and ice melt. About 37 percent of the Karakoram mountains and about 17 percent of the Himalayas in the upper basin carries glaciers. In the plains, it is the rain of the southwest monsoon that largely fills the Indus river, the high flows of the summer monsoons (June to September) augmenting the snowmelt in the north. The 970,000 sq km drainage basin is the 12th largest in the world and its 30,000 sq km delta ranks 7th in size globally. The waters of the Indus river and its tributaries are heavily utilised for irrigation in this relatively arid area and the river is the lifeline for the economy and culture of the region.[4]

As per the Pakistan Water Partnership (PWP), the total available surface water in Pakistan is about 153 million acre feet (MAF) and the total ground water reserves are approximately 24 MAF. A substantial part of the latter has been mined without allowing for natural recharge. Water being a finite resource has to be used for an ever expanding population. From 1975 till 2010, in a period of 35 years, Pakistan's population increased two and a half times from 68 million to 173.5 million and is set to double in two and a half decades.[5] By international standards, Pakistan was already a water-scarce country in 1992 at 1,700 cubic metres available per capita, according to UNFPA/Ministry of Population Welfare. By 2003, Pakistan's per capita availability of water declined to the extent that it was categorised as a water-stress country by the World Bank, surpassing Ethiopia and on par with African countries such as Libya and Algeria. Pakistan's water

availability in 2008 at 1,200 cubic metres per capita per year puts it in the category of a water-scarce country. Based on current projections, water availability (per capita) will be 855 cubic metres by the year 2020. Constructing additional dams or reservoirs cannot increase water availability as it is merely reappropriating what's already in the system.[6] Pakistan's water woes will, therefore, continue to aggravate unless efficient water use practices are put in place.

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Increasing pressures of population growth have resulted in about 90 per cent of the original forest cover being denuded.[7] Today, about 60 per cent of the Indus water is used for irrigation in Pakistan, supplying water to about 80 per cent of its agricultural fields. More than 150,000 sq km of farmland is irrigated, giving rise to the highest national irrigated to rain-fed land ratio (4:1).[8] The irrigation network built by Pakistan consists of three major storage reservoirs, 19 barrages or headworks, and 43 major canals with a total conveyance length of 57,000 km.[9] While this has sustained Pakistan's agricultural base, it has, at the same time, led to the systematic removal of water from the Indus. Moderate estimates suggest that by 1999, the annual fresh water flow downstream had reduced from 150 billion cubic metres to less than 45 billion cubic metres. The actual effect of the engineered diversions from the Indus river, however, is much more alarming, especially regarding the future conditions in the delta. The sub-surface hydrology of the basin is also affected. Between 1972 and 1997, the contribution of ground water to irrigated agriculture nearly doubled in Pakistan, from 32 billion cubic metres per year to 62 billion cubic metres. In 1998, it declined to 50 billion cubic metres, equivalent to 38 percent of the surface water diversion. The prevalent canal irrigation system has resulted in large scale problems of water-logging and salinity. Approximately 60 percent of the aquifer underlying the Indus Basin Irrigation System (IBIS) is of marginal to brackish quality. The increase in salinity due to depleting fresh water contribution by the Indus river has reduced the suitability of the delta for the cultivation of red rice, the production of exotic fruit, and raising of livestock. The mangrove ecosystem has also been degraded, impacting the lives of the people living in the coastal areas. In 1955, before the Kotri Barrage was constructed, there was not a single day with zero flow of water in the Indus. Zero-flow days were observed during 1962-67, the maximum number in a year rising to 100. This

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increased to 250 days in the year in the post-Kotri and post-Mangla period (1967-75). The present situation is even more alarming due to the current trend in low rainfall in the basin of the Indus river. At present, the Indus flows downstream of the Kotri Barrage for only two months: August-September. The major impact is on Sindh. Throughout its history, the Indus has occupied a relatively stable course and has been the source of water that supported the economy of the region, nurturing old and modern civilisations. That sustenance is now in danger.

The Indus Waters Treaty

With partition of the country arose the problems of water sharing between India and Pakistan. The issue was eventually resolved in 1960 with the signing of the Indus Waters Treaty (IWT) on September 19, by Prime Minister Jawaharlal Nehru and President Ayub Khan. Rather than distributing the waters of the Indus and its tributaries, the rivers themselves were partitioned. The waters of the three eastern rivers, viz. Ravi, Beas and Sutlej, were accorded to India for exclusive use whilst the waters of the three western rivers, viz. Indus, Jhelum and Chenab, were accorded to Pakistan. The mean water flow from the eastern rivers is 33 MAF as compared to 136 MAF from the western rivers. As such, based on the IWT, Pakistan got 80 per cent of the waters from the Indus river system. However, at the time of partition, Pakistan was dependent on the water supply from the eastern rivers. Accordingly, India agreed to pay a sum of 62 million pounds sterling to Pakistan to build replacement canals from the western rivers and other sources. As per the IWT, India was also given the rights to tap the considerable hydropower potential of the western rivers before they entered Pakistan, without affecting water flows. Besides domestic and non-consumptive use, India was also permitted to draw water from the western rivers for agricultural purposes, up to a maximum permissible irrigated crop area of 1.34 MAF. The treaty also allows India storage capacity on the western rivers to the tune of 3.6 MAF, in addition to the storage that already existed on these rivers before the treaty came into force; 1.25 MAF of the total is general storage. The remaining

quantity is split between 1.6 MAF for the generation of hydroelectricity and 0.75 MAF for flood control. In terms of rivers, 0.4 MAF of storage is allowed on the Indus, 1.5 MAF on the Jhelum and 1.7 MAF on the Chenab. These allocations were made on the basis of the water flows and usage in April 1960.

Water has long been seen as a core strategic interest in the dispute over Jammu and Kashmir. By abandoning customary international norms governing internationally shared rivers and offering geo-physical partition of the river system itself, the Indus Water Treaty was conceivable only in the unique geographic and political circumstances of the Indus basin. Often cited as the only major bilateral agreement between India and Pakistan to have stood the test of time, the IWT is today coming under extraordinarily close, in some cases, highly critical, scrutiny. There are observers on both sides of the border, and representing opposite points on the political compass, who complain that the treaty is out of date, that it obstructs rational exploitation of the Indus river's resources, and that it ought at least to be amended, if not entirely scrapped.[10]

At present, India has not built any storage on its entitlement of 3.6 MAF on the western rivers (pondage for the Baglihar Dam is 32.58 MCM or approximately 0.026 MAF). India is currently irrigating only 0.792 million acres of the 1.34 million acres permitted for irrigation. Even if India starts using its full entitlement of water from the western rivers, it will amount to no more than 3 percent of the mean flow in these rivers. Yet, over the years, Pakistan has consistently raised the decibel level over the IWT. Such shrill cries have not been confined to the political class, but have extended to the military and bureaucratic circles as well. Sardar Aseff Ali, education adviser to Prime Minister Yousuf Raza Gilani, has gone to the extent of stating that the issue could trigger a war.[11] In June 2009, Majid Nizami, chairman of the Nazria Pakistan Trust, stated that the water dispute between India and Pakistan could trigger a nuclear war between both countries.[12] Not to be left behind, Hafiz Saeed, the chief of the Jamaat-ud-Dawa and a key conspirator in the 26/11 attack on Mumbai, has threatened further mayhem over the treaty.[13]

An Emotive Issue for Pakistan

While the treaty allocates the waters of the three western rivers to Pakistan, it allows India to tap the considerable hydropower potential of these rivers before they enter Pakistan. However, there is a rider that such usage must not affect either the quantity of water reaching Pakistan or interfere with the natural timing of those flows. The former aspect has little relevance, as hydropower does not consume water and can have no impact on the total quantity of water reaching

Pakistan. However, the critical issue is of the timing of those flows. When a dam is constructed, there is a one-time effect when it is initially filled. If this filling is done in the wet season, it would have a negligible impact on agriculture in Pakistan. But if such filling were to take place during the critical low flow period, there would be a significant one-time effect.[14] Of greater concern to Pakistan, however, is the permanent perceived threat of a large number of hydro projects on the Chenab and Jhelum rivers.

After the Baglihar project, some other projects in the pipeline are the Kishanganga (a 330 MW project to be completed by 2016, in which the station will be constructed on the Kishanganga river in northern Kashmir, near the town of Gurez, and will transfer water to Bandipur in the valley of Kashmir), Sawalkot (a 1,200 MW run-of-the-river plant on the Chenab, located upstream of the already finished Salal hydroelectric power project and downstream of the Baglihar project), Pakuldul, Bursar, Dal Huste, Gyspa and potentially many more. The cumulative live storage of all these projects will, in the perception of many in Pakistan, give India the capacity to have a major influence on the timing of flows into Pakistan. Theoretically, India could manage to store about one month's worth of low-season flow on the Chenab, in such a manner as would impose major reductions on water availability in Pakistan during the critical planting season. As agriculture in Pakistan's heartland depends not only on how much water there is, but the timing of the same during the planting season, the issue assumes immense importance.

While India has never used water as a pressure point against Pakistani interests, the fear in Pakistan is that it can do so in the future, with catastrophic results to agriculture in the Punjab province. In addition, Pakistan contends that the design parameters of the Baglihar and Kishanganga projects provide India with the potential to accelerate, decelerate or block the flow of the respective rivers, thus, giving India a strategic leverage in times of political tension or war. Political or military aspects, however, fall outside the ambit of the IWT. In any case, the provisions of the IWT have been scrupulously observed by India, despite the various conflicts that have taken place between the two countries.

The Baglihar project, the Kishanganga project, as well as the Tulbull (Wular) project, are all being opposed by Pakistan on the narrow definition of what it means by storage. In the case of the Baglihar project, Pakistan objected to the dam's storage capacity, its power intake tunnels and the design of the spillways (which were gated). The two power intake tunnels were objected to on the grounds that they were not authorised by the treaty, as also not positioned high

enough (the higher the power intake tunnels, the less the chances that they can be used to release large quantities of stored water). Pakistan applies the same logic to the gateways, which reach 32 metres lower than the effective top of the dam. The Indian argument rested on the premise that the pondage was within the limits set out by the IWT, the power tunnels were a technical necessity and the spillway gates were essential, else the dam would soon fill with silt and become useless. The neutral expert appointed by the World Bank to adjudicate these differences agreed with India's contention, though he did call for minor design changes, including a reduction in the height of the dam by 1.5 metres.[15] In April 2008, Pakistan's Indus Waters Commissioner, Jamaat Ali Shah, stated that "in compliance with the IWT, India has not, so far, constructed any storage dam on the Indus, the Chenab and the Jhelum rivers. The hydroelectric projects being developed by India are the run-of-the river projects, which India is permitted to pursue, according to the treaty," thereby conceding that the water projects undertaken by India did not contravene the provisions of the treaty.[16]

Ground Realities

While the three western rivers originate in Tibet and India, the major portion of their catchment area—approximately 65 percent—lies either in Pakistan or territory controlled by Pakistan. For the most part, the Indus is exclusively controlled by Pakistan and its tributary, the Jhelum, has no outlet except through Pakistan. While the Chenab originates from Himachal Pradesh in India and runs through the Jammu region before entering Pakistan, no canals have been built on this river to divert its waters to other parts of India. It is obvious that the waters of the western rivers must flow in their entirety into Pakistan. Thus, repeated assertions by Pakistan that India is misappropriating water meant for Pakistan have no basis in fact, though they come in handy as political tools to whip up anti-India sentiment and divert attention from the real issues which plague Pakistan.

Pakistan has three main river basins – the Indus, Kharan and Mekran. The latter two basins form the Balochistan plains, while the Indus forms the largest and most important river basin with the fertile plains of the Punjab and Sindh provinces.[17] Pakistan's vast irrigation network has come with tremendous environmental and resource degradation in the ecosystem. The Tarbela, Mangla and Chashma reservoirs in Pakistan have lost about 6 MAF due to sedimentation, impacting negatively on agriculture in Punjab. The upstream Punjab province makes up its requirements at the expense of Sindh which has caused friction

between the two provinces. According to Arif Hassan, two dams at the Tarbela and Chashma reservoirs resulted in the siphoning off of 74 percent of the Indus waters before it reached Kotri, the last barrage point on the Indus in the southern Sindh province, reducing the deltaic area from 3,000 sq km to 250 sq km.[18] Controlled irrigation and increased diversions have also resulted in excessive water-logging and land salinisation.

Pakistan's major industries viz textiles, sugar and wheat not only require a great deal of water but waste a great deal more. As a result, raging rivers have been reduced to streams or even puddles. The coastal districts have been seriously impacted, losing their share of the Indus' flows. Water shortages have triggered food and energy crises that ignited riots and protests in some cities of Pakistan. Islamabad's diversions of water to upstream communities with ties to the government are also inflaming sectarian loyalties and stoking unrest in the lower downstream region of Sindh.[19]

Mountain glaciers in Kashmir play a central role in regulating the river's flows, acting as a natural water storage tank that freezes precipitation in winter and releases it as melt water in the summer. The Indus is dependent on glacial melting for as much as half of its flow. So its fate is uniquely tied to the health of the Himalayas. Lurking in the background are fears that climate change is speeding up the melting of the glaciers that feed the river. A study carried out by the Geology and Geophysics Department of Kashmir University has shown that glaciers are melting due to average temperature increase in this Himalayan region with average precipitation also showing a declining trend. Data of the last 40 years reveals that the glacier cover in Suru Basin which has around 360 glaciers has been reduced from 567 sq km to 474 sq km. Fourteen smaller glaciers in Suru Valley have already vanished and the overall loss is about 16.43 percent.[20] In the short term, higher glacial melt is expected to bring more intense flooding, like the devastating floods of 2010. In the long term, depleting water availability, with a rapidly increasing population, will have serious consequences.

Pakistan's poor state of infrastructure results in transmission and seepage losses, which have been assessed at two-thirds of its total capacity. This translates to about 68 MAF of potentially usable water, if the canal system is adequately repaired and maintained. Of the total sweet water availability of approximately 144 MAF, 97 percent is already used in agriculture. Thus, there is a need to improve farming methods to conserve water and increase productivity, rather than demanding more water only to maintain some of the lowest productivity rates in the world per unit of water and per unit of land.

Management of water in Pakistan is, therefore, a complex geographical, hydrological, economic and environmental problem which should be discussed in relation to uses and users. This would pit the discussion in terms of head, middle and tail farmlands in irrigated areas and water for survival, subsistence and pastoral livelihoods in non-irrigated areas. Rain-fed and arid areas should also be a part of the discourse on water equity and water use. Besides agriculture, water requirements for domestic use, industry and for the environment need to be incorporated for a robust water policy for Pakistan. All citizens are stakeholders in this game which calls for a collective approach to problem resolution: a holistic approach to water resources where the interaction and economic linkages among water, land, the users, the environment and infrastructure is necessary to evade the impending water crisis. Only an amalgamation of policies, regulations, guidelines and actions will help solve Pakistan's water problems, which are likely to get more complicated due to climate change and environmental instability.[21]

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Conclusion

While Pakistan has been categorised as a water-stress country, the situation in India is only marginally better. Population growth in both countries, in a situation where water inflows are constant, will further worsen the situation. And as climatic changes reduce water flows due to glacial melt, the situation can only deteriorate further. The need of the hour for both countries is better water management in their respective countries and greater cooperation on water issues. As of now, both sides are seeking more water and neither is satisfied with the IWT. A renegotiation of the treaty, as suggested by some experts, is not an option, for if one side gets more water, the other will not accept it. In addition, too many changes have taken place in water use in the two countries since the treaty was first implemented and any changes now will cause massive upheavals. It is, however, a positive sign that the treaty has survived major conflicts and still remains a viable basis for cooperation and peace between the two countries.

The need is to build a climate of trust between the two countries, which would allow India to exploit the vast hydro potential of these rivers unhindered and, at the same time, give Pakistan an assurance on their flows. As an immediate step, the collection and dissemination of data on the water flow of the Indus and its tributaries, all along their length(s), will dispel any fear that India is poaching on water which has been allotted to Pakistan, as also give Pakistan an assurance that the timings of the flows are not being interfered with. Both countries also need to delink the issue of river waters from both historic grievances as well as the Kashmir issue. They can opt to play a win-win game. The alternative is continued hostility and a loss to both sides.

Notes

1. Akmal Hussain, "Pakistan's Water Crisis," *The Express Tribune*, August 15, 2011; Dr Hussain is a distinguished professor of economics at Beaconhouse National University, Lahore.
2. Ibid.
3. Cited from, http://www.britannica.com/EBchecked/topic/286872/Indus-River
4. Hussain, n. 1.
5. Information cited from the World Bank Data.
6. Simi Kamal, "Pakistan's Water Problems: Do We Care Enough to Act?" *Triple Bottom-line*, October 21, 2008.
7. Asif Inam, Peter D. Clift, Liviu Giosan, Ali Rashid Tabrez, Muhammad Tahir, Muhammad Moazam Rabbani and Muhammad Danish, "The Geographic, Geological and Oceanographic Setting of the Indus River," available at, http://mit.whoi.edu/cms/files/c16_46983.pdf
8. Ibid.
9. These are: the Tarbela Dam completed in 1974; the Ghazi Barotha Dam, 7 km downstream of Tarbela, completed in 2003; and the Mangla Dam, located in Mirpur in Pakistan Occupied Kashmir, completed in 1967.
10. Robert G. Wirsing and Christopher Jasparro, "Spotlight on Indus River Diplomacy: India, Pakistan and the Baglihar Dam Dispute," A study published by the Asia-Pacific Centre for Security Studies, Honolulu, May 2006, available at http://www.apcss.org/Publications/APSSS/IndusRiverDiplomacy.Wirsing.Jasparro.pdf
11. "Unresolved Water Issue Could Trigger Indo-Pak War, says Gilani's Advisor," *ANI* report cited at http://www.thaindian.com/newsportal/southasia/unresolved-water-issue-could-trigger-indopak-war-says-gilanis-advisor_100298147.html, January 3, 2010.
12. "Indo-Pak Water Dispute Could Trigger a Nuclear War: Nizami," *ANI*, June 7, 2009.

13. "India Imposed War on Pak by Constructing Illegal Dams: Saeed," *The Indian Express*, March 7, 2010.
14. John Briscoe, "War or Peace on the Indus?", *The News*, April 5, 2010.
15. However, the World Bank has made it clear that it was not a guarantor of the treaty; Professor Raymond Lafitte, at the Swiss Federal Institute of Technology, Lausanne, Switzerland was appointed as a neutral expert.
16. S Chandrasekharan, "The Indus Waters Treaty–Its Dynamics and Reverberations," *South Asia Analysis Group*, Paper No. 3676, February 19, 2010, available at http://www.southasiaanalysis.org/papers37/paper3676.html
17. For further details, see Aijaz Nizamani, Fauzia Rauf, and Abdul Hakeem Khoso, "Case Study: Pakistan—Population and Water Resources," in Alexander de Sherbinin and Victoria Dompka Markham (eds.), *Water and Population Dynamics: Case Studies and Policy Implications* (New York: American Association for the Advancement of Science, 1998).
18. Arif Hassan, "Death of the Indus Delta," in the Board on Earth Sciences and Resources/ Earth and Life Studies (eds.), *Down to Earth* (Kenya: RIOD, 1992).
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21. Kamal, n. 6.