

## Water Management, Impacts and Conflicts: Case of Indus water distribution in Sindh, Pakistan

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### ABSTRACT

Little attention has been devoted to water projects instituted to store and divert Indus water in the upper Indus basin, and causing water shortage in the Sindh province of Pakistan. The water shortage results in economic, social and ecological problems, which become a source of conflict between provinces. This article emphasizes the mismanagement and flawed water distribution policies, which are leading to inter-provincial social conflicts. It is descriptive in parts, where we have tried to evaluate the shortage of water in Sindh with respect to the planning, storage and distribution of Indus water, and the impact on the economic, social and environmental life of the province. Then we evaluate the impacts of water conflicts especially the downstream riparian, where the Indus delta is moving towards an ecological disaster and famine-like situation. Finally we recommend resolution measures. Attention to such conflicts, their resolution and prevention is an important area for research and policy development.

### INTRODUCTION AND BACKGROUND

Water is not equally or even equitably distributed to everyone, but the gap between the demand and supply of water across regions has increased the level of interprovincial and trans-boundary conflicts in Pakistan. Considerable literature is available on the Pakistan-India water frictions and accords on Indus River (Magsi, 2012; Polgreen and Sabrina, 2010; World Bank, 2005; Colombi and Robert, 2003; Mustafa, 2001; WAPDA, 1990), while at the same time the importance of development of new dams for water reservoirs or for hydro-electric generation and adopting water conservation measures has been highlighted. On the other hand, very little literature is available on regional water management studies, where interprovincial water conflicts are not even emphasized, which is the most controversial current issue (Memon, 2004). Similarly, water distribution has not only lowered agricultural production, but smaller provinces, i.e., Sindh, Khyber-Pakhtunkhawa (old name NWFP) and Balochistan, complain that the largest province, Punjab, is usurping their share of water (Baxamoosa, 2007; Talpur, 2001). Attitudes towards water consumption vary across regions, but this misconception can lead to further violent

conflicts, if serious attention is not paid (Magsi and Torre, 2012).

Conflicts over water often emerge when different groups have different goals, where the conflicting goals are common in water management scenarios. Water resources management increasingly requires compromise and consensus if solutions to problems are to be formulated and implemented. As issues of competing uses intensify, water decision makers are called upon to manage people as well as the water resource itself. Unfortunately, in Sindh province the current irrigation system suffers from deteriorating infrastructure and weak governance, so governance efficiency, reliability and equity of irrigation water distribution at watercourse levels needs to be improved and agricultural productivity enhanced. Research emphasizes the deficiency in the literature on water resource allocation in the country in general, and water resources geopolitics (Colombi and Robert, 2003), its distribution and impact in particular, in Sindh. This research is mainly descriptive in parts, while greater emphasis should have been paid to the hypothesis that inequitable water distribution not only created interprovincial conflicts but also became the source of a decline in agriculture in the country with many negative impacts.

### INDUS WATER DISTRIBUTION AND MANAGEMENT

Access to and control of water depends primarily on available technology and engineering feats, such as river diversion structures, canals and dams. As growing human pressure on water resources brings actual water use closer to potential ceilings, societies usually respond by adopting conservation measures and by reallocating water to more beneficial uses (Molle, 2003). The *Indus* is the lifeline of Sindh province. The river flows through the province on its way down from Punjab province, feeding numerous reservoirs and irrigation channels on the way, but the lifeline is gradually waning (Baxamoosa, 2007). Sindh has been prone to some of the harshest droughts and lowest supplies of freshwater over the past two decades. Scant rainfall and politicization of water distribution to the provinces is leading to economic and social hardship. Sindh has been at the bitter end of a raging controversy on water distribution.

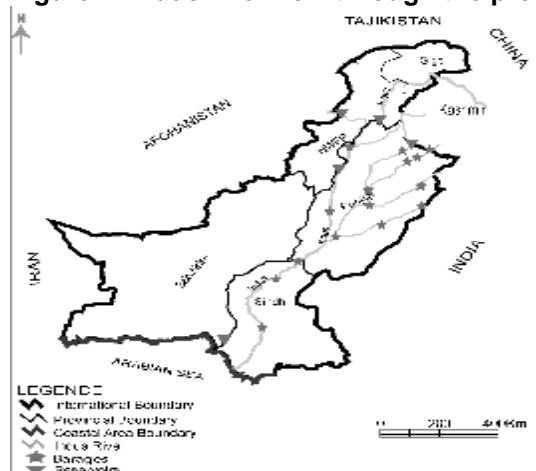
According to the water accord (1991), Sindh has to be allocated at least 48 million acre feet (MAF) for both the *Kharif* (dry season) and *Rabi* (rainy seasons), but the province is receiving much less (IUCN, 2007). This has not only created an agricultural and social crisis in the province, but has also politicized the issue to a great extent. A number of political groups have protested, claiming that other provinces are stealing their rightful share (Rinaudo, 2001). This also includes opposition towards the building of large and small dams/reservoirs upstream to control the flow of water. Sindh, being at the tail-end of the *Indus*, anticipates that these disputes will lead to even more limited supplies of water. There is an atmosphere of resentment among people who are trying to avert an environmental catastrophe due to the ever-diminishing share of natural resources.

The management and distribution of the *Indus* water is a volatile issue between the four provinces of Pakistan and the main source of conflict between Sindh and Punjab. The *Indus* River and its tributaries lie in the north of Punjab province and flow through Pakistan into the southern province of Sindh through the *Indus* delta until they meet the Arabian Sea. Punjab is the upstream province; it is also politically and demographically dominant (Nazir, 2008), therefore by all accounts, the province is in charge of decision-making in relation to water management and distribution, even though Sindh is highly dependent on the *Indus* water (see figure 1). The Punjab as the upstream riparian justifies its use

and the management of *Indus* water on the basis of "territorial sovereignty" (Kaya, 1998). This theory of territorial sovereignty claims any state may use any watercourse within its borders as necessary, without regard to downstream riparians. Conversely, Sindh promotes the theory of "territorial integrity", which indicates that downstream riparians have exclusive rights to the natural, uninterrupted flow of the river from the territory of upstream riparians.

However, both theories are inadequate solutions to the water-sharing conflicts and neither has received much international support. International tribunals prefer to abide by the principle of equitable utilization (World Bank, 2005) which is grounded in territorial integrity and restricted sovereignty within a given river basin. According to this principle, a basin state's sovereign rights to the waters of international rivers within or adjoining its territory are limited by the corresponding sovereign rights of other basin riparians. This implies that a riparian state may utilize the water of a river basin to a limited extent, so that this does not interfere with the reasonable utilization of other riparians (Kaya, 1998). In fact, sharing the waters of the *Indus* river basin is not so simple within the Pakistani context because bitter relations have been built as a result of years of mistrust and miscommunication between the provinces. Sindh feels that Punjab has deprived it of its historic rights to *Indus* waters. Moreover, Punjab is viewed with contempt because of its dominant and dominating positions in politics, economy and the military.

**Figure 1: Indus river flow through the provinces of Pakistan**



Source: Authors realization (2011)

It is clear that the River Indus is a pivotal water source for the Sindh (see figure 1), as it is the only source of freshwater that sustains the people, environments and economy of Sindh. It comprises seven rivers including the River Indus, the five

rivers of Punjab: Bias, Sutluj, Ravi, Chanab, and Jhelam, which discharge into the Indus at Mithan Kot and the Kabul River at Attock (see figure 2). Most of the lower Indus basin that constitutes Sindh today is an accumulation of silt, deposited

by Indus floods flowing over both banks and down below where it discharges into the Arabian Sea.

The *Indus* river is the main source of water for Sindh and is home to the delta, which is totally dependent on freshwater from the *Indus*, without which there would be no delta and no livelihoods and millions of fishing communities would be destroyed. The negative impacts of large dams manifest in the long run and are generally faced by those who live at the tail-end of the downstream riparian, known as the people of the delta. In Pakistan, the cost of development is paid by the people of the Indus delta in terms of the destruction of mangroves, depletion of fisheries, reduced drinking water supplies and devastation of their lives and livelihoods.

### PRESENT STATUS OF THE WATER IN THE INDUS BASIN

Before partition of sub-continent India, there was only one barrage, the Sukkur barrage (built 1932), on the river Indus. After 64 years of independence, there are now 19 barrages and 43 canal systems with 48 off-takes. The Indus river system in Pakistan is the world's largest contiguous man-made system of 61,000 km of canals and 105,000 water courses, irrigating about 35 million acres of land (WAPDA, 2008). Three big storage reservoirs were also built, Mangla on River Jhelum and Tarbella and Chashma on River Indus, with total storage capacity of 20 MAF. 12 link canals were built to transfer water from western rivers to eastern ones

or the tributaries of the River Indus (Talpur, 2001). This activity has largely been carried out without any proper consent from Sindh province.

After many commissions and interim arrangements in 1991, an Indus River System Authority (IRSA) was established for the purpose of fair water distribution among the provinces. The total water available was estimated to be 114.35 MAF below rim stations. It was allocated as 55.95 MAF for Punjab, 48.76 MAF for Sindh, 5.78 MAF for Pakhtunkhawa, and 3.87 MAF for Baluchistan (Abbas, 2002).

### Water availability

Total availability of water in the system is not enough to entertain the luxury of so many projects on the Indus River system. The flow pattern is highly irregular. Annual average water availability from 1922-2007 was 138.09 MAF, with super floods occurring approximately once in five years. This may increase the average to a respectable 137.27 MAF per year but in the remaining 4 years the availability of water is 123.59 MAF so Kabul River contributes an annual average of about 20 MAF to Indus main. Thus the water availability on annual average will reduce to 130.09 MAF and after five years go down to 116 MAF. On the other hand, the supposed escape below Kotri barrage, based on post *Tarbela* period (1976-77 to 2002-03) is estimated to be 48 MAF (WAPDA, 2008). The Indus water system summary is shown in the tables below.

**Table 1: Reservoir's storage capacity and availability of water**

Reservoirs	Storage capacity and availability MAF		
	Initial	2001	2025*
Mangla	5.3	4.4	4.0
Chashma	0.7	0.4	0.3
Tarbela	9.6	7.9	6.2
Total	15.6	12.7	10.5

Source: GOP 2004

(\*expected)

**Table 2: Water Scenarios in the Indus River System**

Scenario	Annual	Outflow to Sea from Kotri Barrage
Water Availability (MAF)	130.09	35
Required commitment (MAF)	146.9	48
Outflow to Sea from Kotri Barrage	-16.81	-13

Source: WAPDA, 2008

### Planning, storage and diversion activities

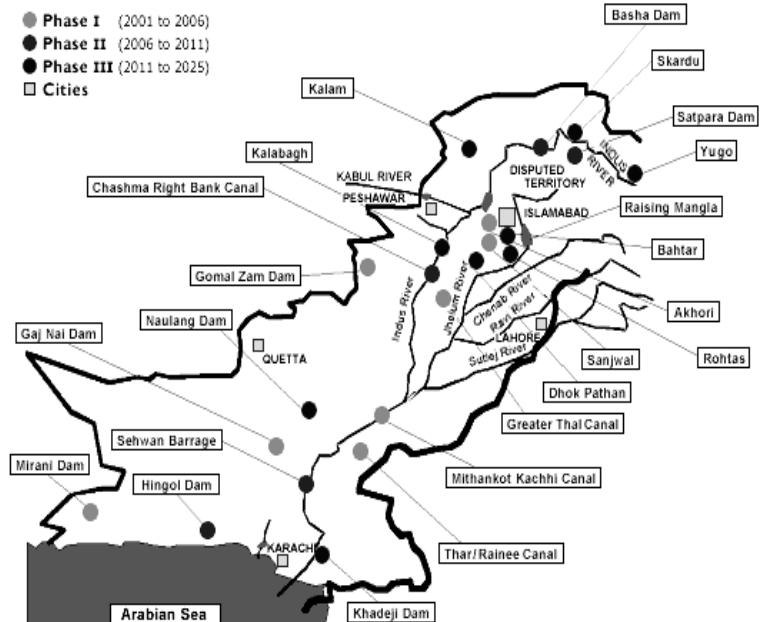
Under the *Vision 2025* program, Pakistan planned numerous projects and approved them for construction without appropriate consultation or consent from Sindh as required under agreements

between Sindh and Punjab. These projects include *Kalabagh* dam, *Basha* dam, *Sukurdu* dam, *Satpara* dam, *Dhok Pathan* dam, *Sanjwal* dam, *Akhorri* dam, *Bhater* dam, *Rohtas* dam, *Yugo* dam, *Chiniot* reservoir, *Hingol* dam, *Naulang* dam,

Gajnai dam, Mol and Khadeji dam, Rohtas dam, Mirani dam, Sabakzai dam, Gomal Zam dam, Kalam dam, Kachhi canal, Chashma right bank canal, greater Thal canal, Rainee canal, and

Sehwan barrage, (see figure 2). As has been the practice in the past, most of these projects have been designed to benefit only the upstream riparian.

**Figure 2: Location map of water sector projects**



Source: WAPDA (<http://www.pakwapda.com/vision2025/default.asp>)

If the Vision-2025 is implemented as planned, water will no longer be available in the lower basin even in the Kotri barrage (Kazi 2004). If the situation is not reversed soon and the upstream continues diversion and storage, it is not farfetched to see an imminent ecological disaster in the lower Indus basin that will eventually create a famine situation in Sindh.

## IMPACTS OF WATER SHORTAGE

### Socio-economic impacts

Katcho flooded area is about 810,000 hectares in the lower basin along the Indus, flooded by the Indus River. This area is rich in forests, grazing lands, poultry, animal husbandry, agriculture and fishing. About a million people were living there and were engaged in timber trading, firewood supplying, fishing and boating. With the shortage of water, the economy has declined and unemployment, migration to other areas and crime rates have risen.

With the reduction in Indus water flows, most of rural Sindh is in the grip of a severe economic downturn. People are unable to cultivate their lands due to lack of water and are quitting

cultivation altogether as it is not profitable any more. A decline in total cultivated area in Sindh of 9.03% was estimated for 1972-1990 due to shortage of water (Government of Pakistan, 2008). Because of continuous water storage, the coastal ecosystem has been damaged. Results of a survey conducted in 2001 by the government of Sindh indicated that over 486,000 hectares land were eroded or lost to seawater in Thatta and Badin districts, dislocating a quarter of a million people and inflicting financial losses of over 2 billion dollars. The seawater has destroyed at least one-third of the land (SAP, 2001).

### Environmental impacts

Sindh is home to many natural lakes - *Manchar*, *Kinjhar*, *Haleji*, *Hadero*, *Chotiari* and many more spread all over Sindh. Most of these are fed by the Indus. These lakes and wetlands are being degraded at an alarming rate. The lakes are an important source of drinking water, fish, agriculture and employment (IUCN, 2007). They are host to many species of birds, flora and fauna. Economic and aesthetic benefits drawn from the lakes are being lost due to the shortage of water. In *Manchar*, the largest lake, there were 400 fish and

726 bird species documented before 1960, but from then until 1999 there were only 70 fish and 100 bird species left. The total bird population has fallen to 40%. Edible vegetables harvested in the lake have also decreased by 70% (Bughio, 1999).

The Indus water discharge to the Arabian Sea keeps sea water at bay and does not let it intrude into the surface, but due to the shortage of water, saltwater intrusion has been witnessed up to 100 kilometers north of the sea. This will continue until adequate water is released in Kotri downstream. Seawater renders fertile agricultural lands useless, resulting in economic devastation. Hundreds of villages in Badin and Thatta districts have been migrated to other areas (Kazi, 2004).

### **Ecological impacts**

There are 242,830 hectares of riverine forests along the banks of the River Indus in Sindh which have been adversely affected by the shortage of water. Out of 242,830 hectares of damaged forest, an area of about 17,115 hectares was regenerated during 1995-98. Major damage to the natural habitat of many tree species was detected and wildlife in these forests is also threatened. Water shortage was the major reason for the loss of habitat. Deforestation followed by soil degradation, salinity and erosion will then lead to desertification, rendering fertile lands a barren desert (Sindh forest department, 2002).

Mangrove forests in the Indus Delta spread over 263,000 hectares and were the sixth largest in the world. The water, nutrients and silt deposited by the Indus when it discharges into the sea, sustained the mangroves. The forests support many species of trees, wild life and fish, and keep the river silt from reaching shipping lanes in the sea closer to Karachi and Qasim seaports (Kazi 2004).

Mangrove forests play a significant role in development of the fish that is caught near the Sindh coast. Inflow to the sea provides a channel for the migratory fish to swim upstream to spawn in the lower Indus basin. The annual catch of shrimps in Sindh was 27,541 tons accounting for 97% of total national catch, but now reduced to 92%. Other species like river turtles, frogs, birds and bees have also been hampered. Migratory fish, such as *Pallo* and *Barramundi*, have registered a significant decline (SAP, 2001). The biodiversity in Sindh is at risk as the biotic potential of many species is starting to be diminished and many of them may be lost forever if the environmental and ecological devastation due to water shortage is not properly controlled.

### **Cultural and health impacts**

Water has great importance in the lives and belief system of the Sindhi people. Religion, literature and many cultural and social aspects of their lives are closely related with water. Because of this, Sindhis are mostly known as Darya Panthis or river worshipers. Many festivities, religious rites and social events are held at or around the water. These facts point to a special psyche of Sindhis related to water. Fisher folk (Mohnas) mostly live around the rivers, lakes and coastal areas. Due to water shortage, their lives have been greatly disturbed, forcing them to move away and try to find alternative means of livelihood (Baxamoosa, 2007). It is not only devastating for these folks to adjust to a new way of life or location but also a great loss to the cultural diversity of Sindh.

The Indus civilization was the world's third ancient civilization after the Egyptian and the Babylonian. The demise of this earliest known civilization was due to shifting of the mighty Indus. Shortage of water has put the modern Indus under tremendous pressure and its lower riparian causing migration to other areas because of the destruction of the Indus River. Drinking water supplies have dwindled and degraded in quality in many parts and the incidence of diseases related to drinking polluted water have increased - kidney, stomach, intestine, eye and skin diseases. Due to the scarcity of water and resulting economic downturn, unemployment, poverty, crime-rates and other social problems have increased.

### **Political impacts**

In the present state of environmental awakening and global acceptance of lower riparian rights, this situation may be seen as a great violation of international norms, because Sindh is already under tremendous repression from the central government. The water issue may become a source of dissatisfaction, because the lower Indus basin is moving towards famine situations and ecological disaster. If a sincere effort is not taken to reverse the water shortage problems, the national aspirations of Sindh may then also be viewed as a legitimate human rights issue (Memon, 2004).

### **CONCLUSIONS AND RECOMMENDATIONS**

Many water projects were instituted to store and divert Indus water in the upper Indus basin causing water shortage in Sindh and resulting in economic, social and ecological problems. If sufficient water is not released below the Kotri barrage to meet the demands of the Indus delta and coastal region, then slowly but surely Sindh will be moving towards an ecological disaster and famine-like situation.

Fair Indus river system water policies should be developed and implemented based on valid Sindh-Punjab agreements and banning construction of any structures upstream until downstream needs of the lower Indus basin are met. A study should be conducted as visualized in the 1991 water accord to establish downstream water needs. A new agreement should be developed that must recognize internationally accepted lower riparian rights and ensure sufficient water availability in the lower basin and the ecological balance of the River Indus and the Indus delta. International monitoring and dispute arbitration should be included within the agreement to resolve disputes within the strategy of international laws.

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Directory: E:\VRI Website\vri-online\ijrs\Oct2012  
Template: C:\Users\Janet  
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Impacts  
Subject:  
Author: Nazir Ahmed  
Keywords:  
Comments:  
Creation Date: 06/07/2012 20:40:00  
Change Number: 22  
Last Saved On: 09/07/2012 18:01:00  
Last Saved By: Jyoti  
Total Editing Time: 961 Minutes  
Last Printed On: 01/01/2014 12:15:00  
As of Last Complete Printing  
Number of Pages: 6  
Number of Words: 3,795 (approx.)  
Number of Characters: 21,638 (approx.)