Indus Consortium
Humanitarian, Environmental & Development Initiatives

OXFAM

Sindh Water Briefing

Lower Indus Basin Irrigation System: A Critical Analysis of Sindh Water Challenges 2014-15

Organization of Provincial Water Brief

This provincial water brief is divided into six sections. The next second section will be divulging upon the provincial water challenges or, in other words, the necessity of addressing the provincial policy issues hinderingbetter governance and management of water resources in Sindh Province. The third section establishes the background and history of irrigation of Sindh as well as the hydraulic reframing of the Indus River Basin in the nineteenth and twentieth century. The fourth part is actually a wake-up call to emergent harsh realities constituting the present hydraulic crisis that needs immediate redressal. The fifth section elucidates the typical problems of policy framing especially in common resources management such as water, forests, pastures and grazing lands, etc. The last and sixth section clues about the Next Steps in the formulation of Sindh Water Policy.

Water Challenges in Lower Indus Basin

The costs and benefits of building the Indus Basin and maintaining vast and intricate water infrastructure and irrigation system are controversial and endless. One thing that is however unmistakably clear is that, in the absence of the redressal of growing problems and meeting of varied challenges, the prevalent crisis of irrigation water sector would continue to push costs escalating and thus, ultimately rendering the whole system unbearably inefficient in the near future and unsustainable in the long run.

Sindh is the lower riparian of the Indus River system and therefore most vulnerable to a variety of environmental, economic and social costs associated with the upstream water development. The Indus Delta has been unbelievably shrunken. The natural drainage system is disrupted and deteriorated. While the benefits of artificial drainage go to the upstream areas, again the Indus Delta is ironically the main site of the induced environmental and social catastrophe. The design failure of Left Bank Outfall Drainage Project (LBOD) has further escalated the risk of flooding and seas intrusion to the deltaic region and coastal belt of Sindh.

Water infrastructure especially Sukkur barrage and associated canal network needs immediate maintenance and rehabilitation in

order to keep it efficient and free of risks. The most alarming fact is that the problems of barrages and other water infrastructure cannot simply be fixed with the help of reductionist and conventional river engineering. Many of these problems are related with hydro-morphologic changes and therefore needs effective implementation of basin management approach.

The general assessment is that the collection of irrigation tax (*Abiana*) does not even cover the modest 20 percent of the overall operation and maintenance costs.

The actual system for irrigation supplies itself is facing the chronic problems of inefficiency as well as rising costs of environmental externalities including the problem of waterlogging and salinity. Water scarcity especially in the critical peak demand periods adversely affects farm yields and makes it impossible to accomplish the full yield potential. The problem of freshwater shortage becomes chronic in the view of unusable saline groundwater in most of the lower floodplains.

The problem of water shortage further compounds due to the uncertain transition of institutional structures of water control and management. After the establishment of Sindh Irrigation and Drainage Authority (SIDA), the prevalent institutional edifice of irrigation management is built upon the principle of duality. Management of some canal areas hasbeen transferred to Area Water Boards (AWBs) and Farmers' Organizations (FOs) under the SIDA Ordinance of 1997 and then Sindh Water Management Ordinance of 2001, while other remaining canal areas are still being managed by Sindh Irrigation Department. To end this uncertainty and transition risks, it is of paramount importance to have an independent and objective evaluation of the impacts of institutional changes introduced under the auspice of the World Bank financed Institutional Reform Component of the National Drainage Program (NDP).

We can continue with this list of water woes faced by Sindh to the great extent. They would however convey the same message that survival and well-being of Sindh is dependent upon the fixing of these problems and, for that purpose, the provincial government needs to initiate the study to identify and evaluate in detail the key

policy issues at the first place. Sindh claims, and rightly claims, that it has become the most vulnerable region in terms of risks pertaining to ecology, water availability, crop production and natural drainage, mainly due to the building of river basin. However, the words should match the actions. Until and unless, the provincial government does not formulate its own provincial water policy and thus provides the guidelines for future, its claim would not have much political weightage. Moreover, the region has long history for supporting the claims and cause of provincial autonomy. The formulation of provincial water policy would certainly bolster that cause as well.

History of irrigation and hydraulic reframing of the Lower Indus River Basin

From the time immemorial, Sindh has remained a complex hydraulic society. Both the rise and fall of polity and economic well-being of this ancient historic region have been dependent upon the vagaries of the Indus River as well as human potential to harness water regimes. The emergence of the great Indus Valley Civilization could notbe possible without appropriate irrigation technologies to create surplus production in order to sustain high level of urbanization. However, ironically, the demise of the great ancient Indus metropolis-Mohenjo Darois also believed to be caused by the sudden avulsion of the Indus River[1].

M.H. Panhwar, the renowned native historian, has elaborately shown how the social history of past in Sindh has repeatedly been moulded by the Indus River[2].The pattern of change has almost remained cyclical until the advent of the British colonialism. As per this pattern, some old riverbeds were actually used as natural inundation channels to divert and control flood flows in order to irrigate nearby fields. However, laden with high loads of silt along with very low ground slope, the Indus River used to deposit the silt

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[1]Gregory L. Posseh. 2002. The Indus Civilization: A Contemporary Perspective, AltaMira Press, Lanham.

[2]M.H. Panhwar records that there is a change in the course of the Indus River at least once in every two centuries. Not surprisingly, the highly populated and urbanized areas get de-populated leading to migration and shifts towards pastoralism. For more details, see M.H. Panhwar.2011. "Six Thousand Years of History of Irrigation in Sindh", M. H. Panhwar Trust, Hyderabad.

more on its banks and less in the riverbed. After continuing this process for several decades, it was used to leave the ridge andstarted flowing in a low-lying area, gradually raising itagain[3]. In the case of major shifts in main rivercourse, all the existing inundation channels were destroyed bringing about mass migration, political anarchy, famine and consequently reduction in population.

The success of any political regime has been historically dependent on its capacity to cope with the destruction wrecked by the changing river courses as well as constructing new inundation channels in order to create and enhance the community of water sharers. This is evident in the late medieval period when Kalhora and Talpur rulers of Sindh sought to construct a series of inundation canals in order to provide agricultural base for their control of local and regional elites[4].

The advent of the British colonialism proved a significant hydraulic break into this ancient design of adoption of and living with peculiar monsoon river patterns in the Indus Basin.Technologically, the modern colonial hydrology empowered with river engineering made it possible to construct permanent weirs and barrages across the riverbed.With the help of a series of shutters, these barrages and weirs were equipped to regulate variable seasonal river flows for the planned releases of waters to intricate and extensive canal system. The introduction of water reservoirs and dam building in the post-colonial eraespecially in the aftermath of the Indus Water Treaty, 1960 has further exacerbated the process of river engineering and control.

The result was the entire transformation of the Indus River Basin. New technologies initiated a rapid expansion of canal irrigation and brought millions of hectares of arid lands under crop cultivation[5]. Moreover, allied with the process of river engineering,

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[3] *Ibid, p.15*

[4] *David Gilmartin.1994. Scientific Empire and Imperial Science: Colonialism and Irrigation Technology in the Indus Basin, The Journal of South Asian Studies, vol. 53, no. 4, p. 1129*

[5] *According to some careful estimates, during the period between 1885 and the end of British rule in 1947, the canal-irrigated area in the Punjab, excluding the princely states, increased from under*

the completely new project of social engineering was initiated to effect major changes in the hydraulic basis of local historical communities. For this purpose, new corpus of irrigation laws, rules and administrative institutions were introduced and evolved. Finally yet importantly, the whole project was fabricated and mythologized as a dream of blooming deserts and attaining some kind of eternal human prosperity[6].

Notwithstanding the celebration of its dynamism and notion of progress, the project of colonial hydrology and river engineeringhadbrought along with a new specter of challenges and risks of catastrophes. This is especially true in the case of Sindh as a lower riparian of the Indus River system.

Addressing theharshrealities

The optimal water withdrawal resulted into the disintegration and closure of river basin[7]. The immediate causality was thus the Indus Delta which experienced serious and, in many ways, irreparable environmental and social deterioration. *The active Indus delta has been now reduced to about one tenth of its original size. One of the major reasons is the indiscriminate cutting of*

3,000,000 to around 14,000,000 acres. The similar expansion of perennial irrigation was also witnessed in Sindh province after the construction of Sukkur and other barrages. Completed in the early 1930s, the barrage itself is 1,440 meters long, and spans the Indus River at Sukkur. The barrage has 66 gates and was the largest barrage in the world at the time. Seven canals take off from the barrage, three on the right bank (Northwestern, Rice, and Dadu) while four canals take off from the left bank (Khairpur West, Khairpur East, Rohri, and Nara). The total canal command is 7.47 million acres, served by a network of canals 47,800 miles long. For more details on the expansion of irrigation in Punjab and Sindh, see respectively Imran Ali. 1988. Punjab under Imperialism, 1885-1947, Princeton University Press, Surrey; and Luther H. Gulick, Jr. 1963. Irrigation Systems of the Former Sind Province, West Pakistan, Geographical Review, Vol. 53, No. 1, pp. 79-99.

[6] Many historians and social scientists tend to trace back the ideal project of blooming deserts as an impact of Christian theology and missionary culture to which colonial engineers and administrators were then fairly acquainted and accustomed. For details, see Bellanta, M. 2002. Irrigation Millennium: Science, Religion and the New Garden of Eden, Eras Journal, vol. 3.

[7] According to experts, basins are closed when additional water commitments for domestic, industrial, agricultural or environmental uses cannot be met during all or part of a year. The basin closure is directly related to the fact of the development and over-building of water resources. For more details, see FRANC¸ OIS MOLLE. 2008. Why Enough Is Never Enough: The Societal Determinants of River Basin Closure, Water Resources Development,vol. 24, no. 2, 217–226; Malin Falkenmark and David Molden. 2008. Wake Up to Realities of River Basin Closure, Water Resources Development, vol. 24, no. 2, 201–215

mangroves and clearing lands for infrastructure development. Seawater intrusion has been significantly increased, mainly because of extended zero flow periods during the winter season. Millions of the people, particularlyfisher folk, cattle herders and subsistence farmers, who earlier depended on flood recession agriculture, are now deprived of their means of subsistence.

Realizing this situation, IUCN recommended in its one of studies conducted in 2004 that the continued well-being of the deltaic ecosystem would require the releases of 27 MAF below Kotri Barrage[8]. However, Water Accord in 1991 recommended at least 10 MAF environmental flows for the downstream deltaic ecosystem. The recent *studies have even suggested much less flows to the tune of 3.6 to 5 MAF but assured flows. These recommendations have not been fully realized*[9]. ***What is the most impending in this regard is the reduction of zero flows downstream of Kotri Barrage in winter season***[10].

Much of the vast water infrastructure, the edifice of the new hydraulic society, has been significantly decayedand is turning to be a white elephant due to its ever-increasing operation, maintenance and replacement costs.Moreover, the risk of critical failure of barrages-the most crucial element in the irrigation system- can put the whole region into turmoil, thereby exposing it to a variety of catastrophes.

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[8] *IUCN report asserts that best scientific evidence suggests that the minimum level of freshwater flows to the Delta area set by the Indus River Accord (12,300 million m3 per annum) is inadequate to maintain effective ecosystem functions of the wetlands of the Indus Delta. For more details, see IUCN Report. 2004a. The lower Indus River: balancingdevelopment and maintenance of wetland ecosystems and development livelihoods. The World Conservation Union.*

[9] *Syed Mehmood Nasir and Ghulam Akbar. 2012. Effect of River Indus flow on low riparian ecosystems of Sindh: a review paper,Rec. Zool. Surv. Pakistan 21: 86-89*

[10] *Tarbela Dam Case Study conducted under the auspice of the World Commission on Dams (WCS) presents some detailed picture of river flows downstream of Kotri Barrage. It states that in the pre-Kotri period (1940-61), the rabi flows averaged 13.5 bcm and always exceeded 1.0 bcm. In the post-Kotri (1962-75) and post-Tarbela periods (1975-98), the rabi flows downstream of Kotri were less than 1.0 bcm for 7 out of 10 (54%) and for 10 out of 23 (43%) years respectively. The scenario further becomes clear when we look at zero flows downstream Kotri Barrage. For example, zero flow days were recorded to 14 years (61%) in the kharif season and 22 years (96%) in the rabi season in the post-Tarbela period (1975-98). In the rabi season it was effectively the same at 96% compared to 100%.For more details, see.*

Take the example of Sukkur barrage. It has significantly lost its capacity, which was once 1.5 million cusecs and is now 900,000 cusecs. The latest reports suggest that 13 out of 65 barrage gates are dysfunctional.

For the last several years, the barrage is being operated without proper compliance with crucial de-silting procedures and standards. The gradual formation of sand islands in the immediate upper reaches of the barrage, mainly because of the confined channel and obstructive weir, has rendered inefficient the barrage function of silt transportation[11].

There are serious concerns that the river can out-flank the main barrage in the event of a major or medium flood. By all signs, the river threatens avulsion, i.e. sudden course change, to return to its primordial position of some 3,000 years ago.

The breach of the Tori Bund during the Indus floods of 2010 had already increased the likelihood of such avulsion. For five weeks, one-fourth of the river flows were diverted from the main channel, which, in turn, helped to scour and widen its new/old path. If the trend persists, not only will there be valley-level destruction the barrage structure too will be rendered purposeless[12].

One of the adverse effects of the overbuilt basin is the disintegration of natural drainage system. As being the lower riparian, the problem of drainage in Sindh gets worsened owing to the fact of low slope, high sediment deposition and peculiar sensitive formations of deltaic ecosystem formations.Furthermore, the design failure of artificial drainage infrastructure especially Left Bank Outfall Drainage (LBOD) Projecthas scaled up the

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[11] *Mushtaq Gaadi. Barrages under Threat, Daily DAWN, February 13, 2014. http://www.dawn.com/news/1086636*

[12] *For more details on complex hydro-morphological processes and the risk of river avulsion, see James P.M. Syvitski and G. Robert Brakenridge. 2013. Causation and avoidance of catastrophic floodingalong the Indus River, Pakistan, GSA Today, v. 23, no. 1. http://www.geosociety.org/gsatoday/archive/23/1/pdf/i1052-5173-23-1-4.pdf*

problem of drainage to a serious risk of environmental disaster in the form of flooding and sea intrusion in the deltaic and coastal region[13]. The agriculture and drainage system of the province is also vulnerable to the fact and effects of upstream drainage of Punjab and Baluchistan province.

The importance of dynamic social institutions for better water resource management is a well-acknowledgedfact. Before the advent of perennial irrigation during the British colonial period, regional elites and local communities were more responsible for the excavation and maintenance (especially de-silting) of inundation canals and construction of *sailaba bunds* (irrigation embankments) in the riverine and deltaic region. These institutions became irrelevant and dysfunctional after the introduction of centralization and bureaucratization of irrigation management practices. For the long run period, this overwhelmingly techno-bureaucratic approach enmeshed with a kind of fossilized body of rules and laws resulted into the alienation of farmers and local communities in everyday management and operations of irrigation canals and associated distribution network.

In the mid-1990s, a sort of jumbled and half-hearted effort to institute irrigation management reforms was initiated under the thrustof the World Bank and allied international donors.The original World Bank's proposal was the privatization of canal waters and introduction of irrigation water markets. The plea argument for irrigation water market was summarized in the World Banks report entitled Pakistan Irrigation and Drainage: Issues and Options. The report emphasized that the government should not

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[13] The fact of design failure of LBOD was confirmed by no-one less than the financer of the project. The report prepared by the World Bank Inspection Panel notes that the failure occurred primarily because of wrong design assumptions and faulty structures and confirms that the design of the LBOD and Tidal Link was not in harmony with the prevailing winds and natural flow of water. For more details, see World Bank Inspection Panel. 2006. Investigation Report on National Drainage Program Project, Washington D.C, p. xvi

treat irrigation water as public good and private markets must be allowed to trade water. However, after stiff resistance from provincial irrigation bureaucracy, farmers' groups and political elites, the compromise was somehow made on the initiation of institutional reforms component under the World Bank's financed National Drainage Program (NDP) that aimed at handing over management responsibilities as well as shifting operation and management costs to irrigation users at canal level[14].

The results of now almost a decade long experience of irrigation management transfer to farmers in selected canals have not been so far very successful. The main irrigation reform objectives of improved collection of irrigation tax and enhanced water supplies especially at the tail end areas through Farmers' Organizations (FOs) have not been satisfactorily accomplished. Rather, the evidence suggests that the management system tends to work in duality without any vision and plan for change and way forward.

A number of personal interviews with irrigation officers and farmers indicate how much pervasive is the culture of mutual denial, blame-game and confrontation between them. The irrigation officers working under Sindh Irrigation and Drainage Authority (SIDA) tend to consider themselves kind of abandoned children of their department. Many of them think that they have been posted to SIDA regulated canal areas as a punishment. While, on the other hand, majority of the representatives of Farmers' Organization felt themselves helpless due to the lack of capacity, limited authority and absence of enforcement powers.

Because of the lack of future vision and sustained confrontation between irrigation bureaucracy and farmers, irrigation management reforms have become static and part of the status quo. Without instilling energy and changes, they seem to fail and thus further compound the prevalent institutional crisis in irrigation management.

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[14] For more details on the origin and development of irrigation reforms under the World Bank financed National Drainage Program (NDP), see Mushtaq Gaadi. 2003. Re-colonizing the Indus Basin Irrigation System, in Kaisar Bengali (ed.) "The Politics of Managing Water", SDPI, Islamabad. Karachi: Oxford University Press, pp. 97-105.

Harsh realities concerning the present hydraulic/governance crisis are numerous and might require a lengthy space to cover all of them. It would be therefore appropriate to close this discussion by highlighting two emergent problems. The first is burgeoning crisis of water shortage given static supplies in the face of fast increasing population and enhanced water demand from agriculture, industrial and urban drinking and sanitation fields[15]. The second problem relates to future uncertainties unfolding in the context of climatic change especially the melting of Himalayan glaciers and flooding.

Review of Concepts of Framing Water Policy

A cursory comparative analysis of water policies across diverse countries and regions confirm that "they embody, tentatively or permanently, formally or informally, several traits that are part of the global "toolbox" of what is being promoted as "best practices," "internationally recognized principles," or "modern management"[16]. In this regard, A. K. Biswas notes that the hegemony and popularity of such principles have something to do with their vagueness. The excessive use of adjectivized terms such as "integrated," "participatory," "decentralized," "pro-poor," "transparent" or "accountable" signify a "brave new world[17]."

This striking similarity of water policies applied in diverse ecological, social and political environments actually indicates how a standard global policy toolbox is being promoted by a set of actors including multilateral and bilateral institutions, academia, world conferences and influential international NGOs.

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[15] Take the example of Karachi. Based on a demand and supply forecast for water until 2025, the Feasibility Study (F/S) conducted by Mott Macdonald of U.K. in 1985 proposed to increase water supply by 910,000 ㎥/day by 2000 and expand water treatment capacity at the existing facilities by 523, 000 ㎥/day. For details, see JICA (Japan International Cooperation Agency). 2009. Evaluation Report on Karachi Water Supply Improvement Project. Accessed from http://www2.jica.go.jp/en/evaluation/pdf/2008_PK-P40_4.pdf

[16] Molle, F. 2005. Irrigation and water policies in the Mekong region: Current discourses and practices. Colombo, Sri Lanka: IWMI. 43p. (Research report 95).

[17] Biswas, A. K. 2004. Integrated water resources management: A reassessment. Water International 29(2):248-256

While there is no doubt that the sharing and transposing of "success stories", "best practices", or "appropriate technologies" can be of the great source of inspiration and mutual leaning but the adequacy of their application outside of their particular context remains a valid question.

A solution to resolve this conundrum of policy formulation, as suggested by Brian Steensland, offers a reasonable way forward. According to him, the public task of policy framing should be accomplished through the integration of two approaches, namely actors' representation approach and adoption of actual policy frames. The first, an actorrepresentation approach, emphasizes the changing positions and distribution of actors in policy deliberation and decision-making. The second, a frame adoption approach, aims at the changingdistribution of frames that actors attach to a policy/practice/rule. While both approaches are,most often treated separately in policy framing butthey canwork contemporaneously to produce best results[18].

If we simplify the above argument, the success of any policy framing is usually contingent upon two crucial factors. The first is the democratization of decision-making process through the involvement of diverse interest groups and stakeholders. Doubtlessly, it enlarges not only the definition and set of policy actors but also involves both the confrontation of interests and worldviews as well as dialogue, trust building and mutual social learning. Therefore, it must allow for a degree of"messiness and unpredictability" that is usually not recognized in classical approaches toCommon Property Resource management[19].

The second factor relates to the identification of core issues and ideas, which can become the basis for policy deliberation and dialogue.

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[18] For more discussion on the dynamic relationship of these two approaches, see Brian Steensland. 2008. Why do Policy Frames Change? Actor-Idea Coevolution in Debates over Welfare Reform, Social Forces, vol. 86, issue 3, p. 1027

[19] Cleaver, F. 2000. Moral ecological rationality: Institutions and the management of common property resources.Development and Change, vol. 31, no. 2:361-383.

Next Steps

Sindh is encountered with the unique hydraulic crisis of its history. In the past, as explained earlier, the major source of crisis had always been the changing river courses and destruction of irrigation networks. Repeatedly, civilizations emerged and declined in almost a cyclical fashion owing to this problem.

However, the present crisis has been caused due to the disintegration of river basin, massive disruption in natural drainage and slow death of the Indus Delta. Moreover, canal irrigation system is increasingly becoming less productive, mainly due to the lack of proper operation and maintenance, institutional uncertainties and absence of future vision. Both climatic change and enhanced risks of flooding add to this crisis.

So what is the way forward? The typical answer would be formulating a provincial water policy that should set legal and institutional reforms into motion in order to address these problems. However, as experience shows, a policy comprising the standard toolbox with all fancy jargons is bound to fail in addressing the scale of crisis and its diverse manifestations.

For this purpose, it is imperative to adopt dialogic and democratic approach so that the representatives of all old and new actors should be able to participate, confront and forge consensus on the key areas of policy challenges. However, it would require the strong ownership of policy deliberations and reform processes by the government.

Secondly, the process should start from the identification of key frames of debate, which should guide it in realistic directions. It is recommended to take the following Next Steps:

- What are the most pressing issues regarding water and irrigation practices, laws and institutions and in which locale are these issues more salient?
- What are the realistic practical measures that the provincial government can practically deal with, given its current power and the political-economic environment?

- What can be learnt from the present policies, laws and practices on the ground? What scope is there to enhance social learning, build trust and favor endogenous processes?
- What is the nature, and what are the implications of private-sector involvement? How are community and private conceived in each case as alternatives to state roles?
- What kind of role external aid agencies and groups of civil society can play in the process of deliberation and change?

IMPROVING WATER GOVERNANCE AT LOCAL LEVEL

Project's background: The canal water irrigation system in Sindh and Punjab needs to be improved drastically to benefit small farmers who draw water from the tail-ends of canals and water courses. These small farmers receive little or no water compared to their entitlement. Water theft, water losses due to seepage and leakage, delayed supply, absence of information, large landholders' exploitation, unmaintained water courses and over-installation of tube wells are the main causes of hardship for small farmers at the tail-ends.

Besides that, there is a need to expedite the process of policy formulation at the provincial level ensuring that the policy formulation is informed by the real problem of the tail-end farmers.

Keeping in view all these problems, Indus Consortium has launched a project of Improving Water Governance (IWG) at Local level with the financial assistance of Oxfam Novib. The project covers the area of Rangpur Canal (Muzaffargarh), Daajal Canal (Rajanpur) and Akram Wah (Badin).

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