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Indus Basin Floods of 2010: Souring of a Faustian Bargain?

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ABSTRACT: The great flood of 2010 in Pakistan was not an accidental, unpredictable and random episode in the hydrologic development of the Indus basin, but rather a by-product of national decisions on water use, integrally linked, as well, to the design of the social landscape. In immediate and mid terms, acute impacts are expected to be concentrated among households with fragile and sensitive livelihoods. To attenuate an evolving low-level humanitarian, social and political crisis, and to prevent backsliding to Pakistan's development progress, attention should focus on water drainage and rapid rehabilitation of farmland. Local government structures can be engaged in the distribution and implementation of recovery programs. In Pakistan, the hydrological priorities have always been irrigation and power generation, but in the interest of preventing a costly recurrence, Pakistani flood management and early alert systems require structural revision.

KEYWORDS: Flood management, hazards, hydrology, crisis, Pakistan

INTRODUCTION

The great Indus flood of 2010 and the unprecedented extent of devastation from it cannot be understood or mitigated against in isolation from the 'routine' river management in the basin. It is our contention that the cultural, economic and social geographies of water use, distribution and regulation in the Indus basin are integral links in the causal chain of events that led to the disaster. The disaster therefore is deeply human in its genesis, even to the extent that the anomalous monsoonal pattern that triggered the floods may be linked to anthropogenically induced climate change – after all the weather anomaly observed in 2010 has recurred in a milder form about three times in the past decade, whereas it was seen every few decades in the last century (NOAA, 2010a). Our hope in writing this essay is that our brief intervention to examine the causes of the Indus flood will serve as an invitation to Pakistani water managers and their colleagues globally to critically re-evaluate their basic assumptions and procedures for river management and perhaps lead to greater integration of flood hazard and issues of social vulnerability in water resources management. Vulnerability here is understood as a socially determined state of being where people are more likely to suffer damage from an environmental extreme and are less able to recover from those extremes (Cutter 1996; Mustafa, 1998).

The great floods of 2010 in the Indus basin of Pakistan have been declared by its Prime Minister, with some pardonable rhetorical flourish, to be the worst calamity to have hit the country in its history and the world in the 21st century (BBC, 2010). Although the death toll of more than 1700 lives at the time of the writing of this manuscript is relatively modest in comparison to other disasters such as the Asian Tsunami, the Kashmir earthquake or the Haiti earthquake, the scale of inundation and the material damage from the floods seem to be greater in scale than the three signature disasters of the 21st century combined, according to Maurizio Guiliano 2010, UN-OCHA spokesman (AP, 2010). Furthermore, with stagnant water in inundations zones becoming a major disease vector as has been reported by the time of the revision of this manuscript in January 2011 by assorted press and humanitarian organisations, the indirect death toll, especially of children and the elderly is likely to move upwards (e.g. see Walsh, 2010; ReliefWeb, 2010; Government of Pakistan, 2010).

After a brief overview of the flood situation in Pakistan we undertake a brief review of the literature on flood disasters, to conceptually and topically contextualise the Indus floods of 2010. In particular, we will be drawing upon the experience of flood hazards across the world to highlight the point that the Indus flood and the pattern of damage from it, constitute an extreme example of something that happens with depressing regularity across the world. Following that, we outline our core argument that the Pakistani water managers have kept a sharp eye on the benefits they could extract from the Indus basin rivers, without regard for the hazards that are also integral to living in river basins. Pakistani water managers – like the proverbially ambitious Faustus – bargained with the devil of technocratic vanity to pretend they could ignore the river system's natural rhythms, in return for the agricultural productivity and prosperity (for some) that it could deliver. Now that the gains from the river have been realised, it is time to pay the price. We argue that approaching the river with a view to controlling and taming it is bound to fail. A better tactic would be to learn to adapt to the Indus basin's hydro-meteorological regime, particularly in view of the looming uncertainties from climate change. An adaptive flood strategy will involve not only different behaviour vis-à-vis the physical system but also towards the social systems that depend on it. Greater attention to issues of differential vulnerability to floods, and equity in distribution of the irrigation system's benefits will be an integral part of a resilient adaptive flood management strategy.

OVERVIEW OF THE FLOOD SITUATION

The year's flooding stems from a confluence of events possibly associated with a warming planet. In July, when the monsoonal rains began in Pakistan, 2010 was already the hottest year on record, and high glacier run-off had already filled rivers to capacity (NOAA, 2010a). Evaporation rates over the hotter-than-average Indian Ocean soared, leading to especially active monsoonal weather (PMD, 2010), and the oceanic phenomenon, La Niña, is thought to have exacerbated the severity of monsoonal activity (NOAA, 2010b; Riebeek, 2010). As Michael Blackburn from the University of Reading explains, both the fires in Russia and the precipitation activity in Pakistan were globally linked through an unusually strong polar jet stream, which stalled unprecedented levels of moisture over the Himalayas (Marshall, 2010; NOAA, 2010a), pouring into the Indus valley a quantity of water equivalent to the entire land mass of the United Kingdom (UN-OCHA, 2010). Although evidence of climatic changes cannot be deduced from a single meteorological event the number of exceptionally heavy monsoons over India has doubled in the last 50 years, while at the same time moderate and weak precipitation has decreased (Goswami et al., 2006; Pal and Al-Tabbaa, 2010). South Asia is becoming more arid during dry seasons, and wetter during monsoons. In the Arabian Sea, data from 1880s to the present indicate that in past decades severe cyclonic events have increased threefold during intense cyclone months (Singh, 2010). In the past 15 years, Pakistan has directly received four considerable low pressure cyclonic systems, of similar orders of magnitude to this year's, in 1993, 1999, 2004 and 2007, as well as other lesser systems in 1998 and 2001 (ibid). Variability of weather like we have witnessed this year *may be* part of long-term trends for the Arabian Sea.

By 22 July 2010, record levels of rainfall had begun falling across Punjab, Khyber Pakhtunkhwa and Balochistan (PMD, 2010). Tens of thousands were immediately displaced, and up to a million more in the following week as flash flooding surged through riverbeds and canals (UN-OCHA, 2010). Flooding started along major tributaries, overpowered flood barriers and spread through canals, and generally overwhelmed water management capacity, and eventually inundated large swaths of farmland (Ellick, 2010). By early August, flooding had reached the lower Indus valley, and red alerts were announced for Sindh and Balochistan provinces. According to Pakistan's National Disaster Management Authority, one-fifth of the entire area of Pakistan was submerged at the high water mark (Sayah and Desta, 2010), affecting 84 out of 121 districts (UN-OCHA, 2010). By August 31, Punjab, Sindh, Khyber Pakhtunkhwa, and Balochistan provinces along the Indus river valley were still flooded, and some 800,000 people were still physically cut off (ibid). Some levee surfaces, already saturated for nearly a month, began to deteriorate and burst, which exacerbated the crisis in several notable instances, as in the case of the historic Thatta city where 95% of the population, some 170,000 persons, were displaced (Tran, 2010). By the first of September, though rain had largely ceased, contaminated flood waters continued to rise in the southern provinces (UN-OCHA, 2010), and roughly one million people in the Sindh province alone were in the process of migrating away from submerged villages to higher ground, urban areas and IDP camps (ibid). Whilst some of the flooding was on account of the overwhelming of the levees and flood barriers a considerable amount of inundation was also the result of deliberate breaching of the embankments by irrigation authorities to keep regulatory infrastructure from suffering damage. This has been a cause of considerable controversy in the country and something we will discuss later on.

At the time of writing, 21 million people have been affected; at least 1700 people have perished due to flooding – probably more; and 1.8 million homes have been destroyed or damaged (ibid). According to the World Health Organisation, 10 million people have been left with unsafe drinking water, a figure that will likely increase as time goes on (MacFarquhar, 2010), expanding epidemiological potential for the spread of water-borne and vector-borne diseases. Cholera outbreaks have already been confirmed, as of mid-August, raising the alarm of a secondary health crisis (AlJazeera, 2010). Floods destroyed 2.3 million ha of standing crop, and caused a loss of US$5 billion to the agriculture sector and around US$2 billion each to the physical and social infrastructure (World Bank, 2010). With agricultural production severely disrupted, food distribution systems disrupted, food prices spiking, and household economies in tatters, the spectre of food insecurity is beginning to take physical shape (MacFarquhar, 2010).[1] Moreover, with 3.6 million ha ruined, and a next season's planting is in serious jeopardy (WFP, 2010), food shortages could have a destabilising effect on some of the most affected areas of the country.

Certainly, the brunt of impacts has been borne by the most vulnerable and impoverished populations in low-lying areas, e.g. the farming communities in the relatively remote districts of northern, central and southern Pakistan. With farmland trapped beneath water and silt, and at least 1.6 million head of livestock dead (WFP, 2010), small-scale and subsistence agriculturalists and cattle herders are especially sensitive to and least able of coping with impacts. According to earlier research on flood hazard in Pakistan, livestock is a key asset used for recovery in the aftermath of floods, and the loss of as much livestock is likely to stretch the Pakistani rural livelihood and recovery systems to the limits (Mustafa, 1998).

According to the IMF, the total economic impact of flooding to rural livelihoods, agricultural output, industrial input and infrastructure, including lost economic productivity, is expected to total US$43 billion, raising the possibility of financial insolvency (AFP, 2010). The World Bank however, has recently given a figure of more than US$10 billion for the total direct and indirect damage cost of the disaster (World Bank, 2010). Already deeply indebted, Pakistan will have to make trade-offs in order to recover from impacts, and inevitably discussions will occur around scaling back essential social services, including education, rural healthcare, and poverty reduction programmes. As government priorities drift toward flood response, rehabilitation and reconstruction, many expect illusive development goals to slip farther away still (WFP, 2010; Conway, 2010; Crilly, 2010).

INDUS FLOODS IN CONTEXT

Extensive river engineering on the Rhine river in Germany to improve navigation and for flood control based upon the design and engineering insights of the German military engineer J.G. Tulla was one of

[1] Much of the country's power infrastructure has also been severely affected, including some 10,000 transmission lines, hundreds of transformers, seven major power stations, and 150 sub-stations, and while the country is back to 70% capacity, it is yet uncertain how long the shortages will persist and how shortages will be distributed (Arsahd, 2010).

the earlier examples of modern flood protection (de Bruin, 2006). Contemporary flood management, however, was largely influenced by the attempts of the US Army Corps of Engineers at river engineering in the Mississippi, Colorado and Tennessee river valleys for flood protection in the early 20th century (Platt, 2006). The river engineering paradigm for flood protection was built into the experiment in integrated water management for regional development in the form of the Tennessee Valley Authority (TVA) in the 1930s, which was actively marketed by the US government overseas during the cold war (Schulman, 1994; Pelling, 2001). Like biological organisms, societies were thought to deterministically adjust to adverse environmental conditions through linear stages of technological interaction with the environment, whereby they developed the capacity to control nature (McLaughlin and Dietz, 2008). Modernist engineering approaches preferred technological, infrastructural adjustments to hazards – liked flood barriers, reservoirs, canals and barrages – that could influence the risk equation by limiting exposure and serve as survival buffers between societies and the homeostatic limits of the natural environment (Mustafa, 2005; McLaughlin and Dietz, 2008). This deterministic view – that development ought to transform environmental threats into opportunities – proved to be highly exportable, and thus the modern flood management was born (Pelling, 2003).

Armed with the vanity of modernist engineering techniques and the doctrine of economic growth, international financial institutions and donor countries – even the Tennessee Valley Authority administrators – began to promote and incentivise mega-projects, like the 1960 Indus Basin Development Project (IBDP) in Pakistan and the Helmand-Arghandab Valley Project in neighbouring Afghanistan, offering enormous loans to developing countries. This international one-size-fits-all engineering approach to hydrological mega-project spread to developing countries around the globe, in spite of important regional peculiarities (Jacobs and Wescoat, 1994). With plans drawn as early as the 1950s, similar agreements in other regions paved the way for similar projects: Corpus Itaipu River Agreement was signed among South American countries in the La Plata basin; the Mekong Hydropower Development Strategy in South East Asia; and the Zambezi Southern African Development Community, among others (Lee, 1995; Bakker, 1999; McDonald and Ruiters, 2005).

These water projects, while credited for transforming developing countries into the world's producers and exporters of commodities like wheat and cotton, are also generally critiqued for their environmental impacts (e.g. see Moore et al.*,* 2010; Richter et al.*,* 2010, among others in the June 2010 special issue of *Water Alternatives*). Depending on the level of intervention, water engineering can transform water systems from flourishing ecosystems with an array of natural ecological functions that benefit human economic activities – including soil nutrient regeneration, groundwater regulation and natural flood resistance – into water resource conveyor belts. Species biodiversity plummets in the face of habitat destruction, and consequently the benefits of speciation on environmental quality are lost, oil erosion increases, grazing land disappears and waterborne diseases proliferate. In addition, the nature of riverine sediment aggradation and erosion processes changes in engineered systems, which can result in accentuated flood events. Some of these consequences in case of the Indus were even recognised under the British Colonial administration in the Indus but were generally deemed to be the price of development (Michel, 1967; Whitcombe, 1982, 1995).

Questions also arise about the relevance of large-scale projects to goals of poverty reduction. In social-ecological coupled systems, upon which many of the world's poor depend for livelihoods, engineering projects can exclude and marginalise the vulnerable poor whose livelihoods are already sensitive to shocks. A great deal of rural, subsistence agriculture in developing countries is based on flood recession irrigation. Both the Kainji dam in Nigeria and the dams on the Lower Omo river in Ethiopia, which are famous examples from Africa, have resulted in massive disruptions to flood recession agriculture livelihoods, on which hundreds of thousands of vulnerable poor depend (Drijver and Marchand, 1985). The Manantali dam in Mali, another example from Africa, illustrates the disruptive nature of canals and reservoirs to rural pastoralists' grazing routes and the pastures, watering sites and other ecosystem services on which they depend (deGeorges and Reilley, 2006). Not only are the poor excluded by technology but their livelihood vulnerabilities are exacerbated, and their governments' capacity for delivering upon the social goals of development – such as education, healthcare and basic services, to say nothing of social safety nets – is constrained due to the orientation of national budgets around paying the tremendous cost for such projects. Moreover, developing countries like Pakistan whose rural livelihood systems, infrastructure and economies are utterly transformed become suddenly vulnerable not only to flooding events but also to fluctuations and shocks in international commodity markets. Market-led growth in the absence of social programmes in Pakistan had another consequence, the persistent and acute disparity of wealth between the haves and have-nots, who incidentally became the most vulnerable to riverine flooding (World Bank, 2007, 2010).

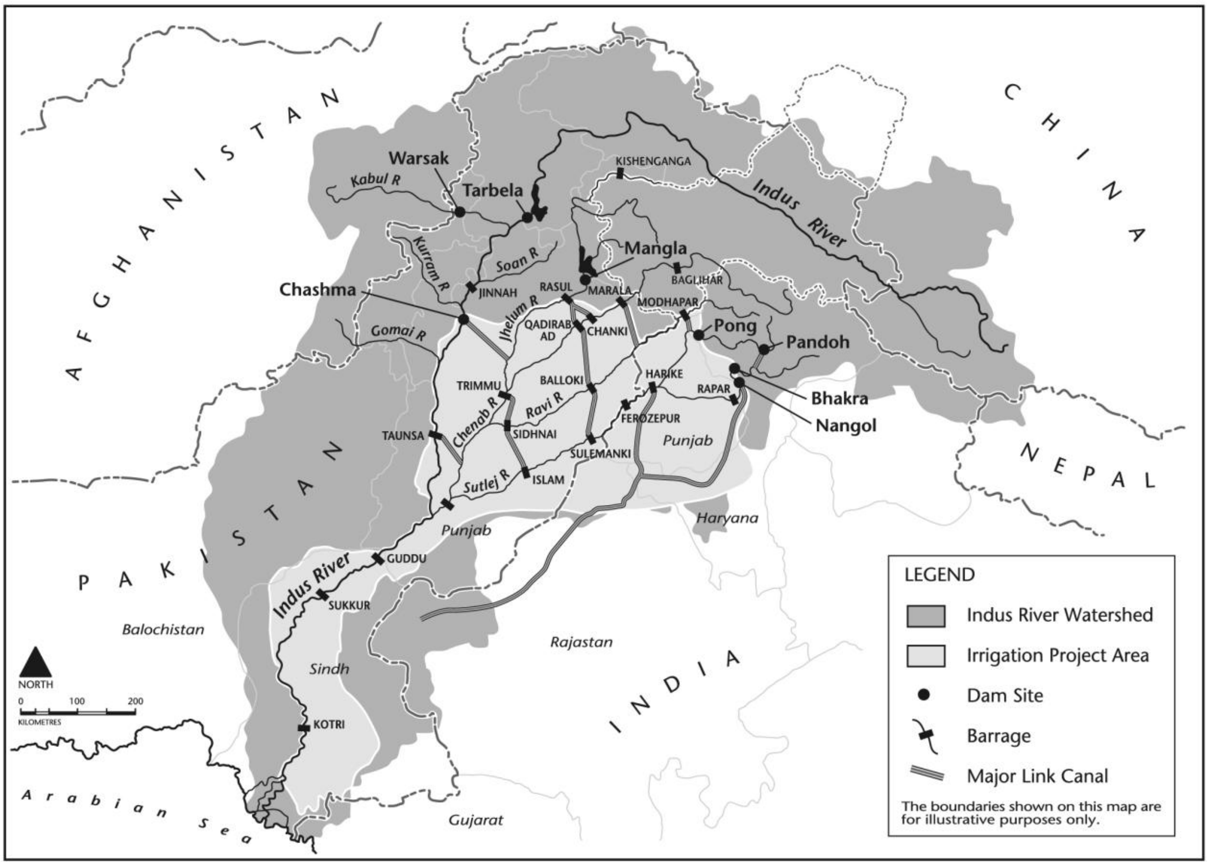
The relationship between anthropogenic environmental degradation, river engineering and catastrophic flooding in Asia, Latin America, Europe and North America is well documented (Adnan, 1991; Alexander, 1992; Kusler and Larson, 1993; Smith, 2001; Wisner et al., 2004; Gregory, 2006; Dixit, 2009). Conversely, we know there is an established link between healthy watersheds with flow capacity – wetlands, marshes, estuaries and mangroves – and flood mitigation (DEFRA, 2002). In case of the Kosi river, in Nepal and northern India, for example, Dixit (2009) convincingly demonstrates how construction of embankments along the river for flood protection may have provided protection in the short to the medium term but the sediment deposition in the channel eventually exacerbated the flood peaks when the embankment was breached in 2009, leading to catastrophic flooding. Earlier on in his review of flood research in Bangladesh, Paul (1998) outlined how research in the country has demonstrated that flood damages are in fact, worse in the reaches of the rivers that are supposedly protected by embankments than those that are not protected. Singh (2008) and D'Souza (2006) taking a more historical perspective outline how even the colonial engineers in India in the late 19th and early 20th century came to hold the view that river engineering worsened flood peaks, but were prevented from following through with embankment removals by local powerful farmers. In the case of Pakistan though, with the twin intervention of excessive water withdrawals and levee construction, the aggradation of the river channels is the dominant process, as per established geomorphological understanding (Dunn and Leopold, 1978). The reduction in channel capacity is partially to blame for the worsening of the flood peaks, just the same as in other rivers in the world in general and in South Asia in particular, as reviewed by the research cited above. Since disasters have been shown to be costly to long-term development goals, questions are raised about the need to invest in risk reduction, and with the rising challenges of climate change, we must ask ourselves: can our engineered systems keep pace with climatic trends?

FLOOD POLICY AND ACTUALITY

Pakistan benefits from an extraordinary water supply originating mainly with swift-flowing glacial melt from the Himalayas in late spring, and monsoonal activity between June and October. To take advantage of this tremendous resource, the country has been highly engineered in hydrological terms (figure 1), with irrigated areas representing 82% of all farmland, and 43% of the population of 170 million directly dependent on farming activities (Mustafa and Wescoat, 1997; Wescoat et al., 2000). However, irrigated areas are exposed to flooding hazards, and consequently, the largest sector of the economy and the majority of Pakistanis are vulnerable (Mustafa and Wescoat, 1997). Additionally, many villages are situated on river terraces, or in lowlands, and urban migrants tend to informally settle in low-lying high-risk areas (Mustafa, 1998, 2002a, 2005). For example in the case of the geography of exposure to floods in rural Pakistan, Mustafa (1998) found that areas dominated by small farmers were generally in low-lying areas, which were either inundation zones in the event of a levee breach or were naturally more exposed. Similarly, in the case of urban Pakistan, Mustafa (2005) described how recent migrants, the poor, and religious minorities tended to have their shanty towns in low-lying areas on the banks of the flood-prone stream in the Rawalpindi/Islamabad conurbation in Pakistan. The systematic evidence is further borne out by observations during extensive field visits, though admittedly no systematic census of the social profile of the populations in the Indus flood plain exists.

Seasonal flooding precipitated by spring snow-melt and then by monsoonal rains occurs regularly in the Indus basin. Twenty major floods, and more minor floods, have occurred in the 50 years from independence in 1947 to 1997. With the exception of Malhotra, 1951, there are virtually no published geomorphological studies of any of the Indus rivers that systematically document the impact of its highly regulated hydrology on channel geometry and flood peaks. Whereas dams dominate other major, highly sedimented dryland river regulation schemes, the Indus basin is regulated with weirs in addition to dams, which interrupt upstream velocity fomenting sediment delivery (Thoms and Walker, 1993). The evidence from other regulated rivers in comparable climatic zones such as in the western United States, that have been studied systematically, suggests that dam construction and water diversions result in reduction in channel width downstream, reduction in floods peaks with a 50 year and lower return period and channel degradation closer to the dam and aggradation further downstream (Wolman, 1967; Schumm and Hadley, 1967; Williams and Wolman, 1984; Grams and Schmidt, 2002; Petts and Gurnell, 2004). In other words, dams in regulated river systems do moderate the low-to-medium flood flows. It is rare for dams to be able to moderate high or exceptional flood flows. Consequently, when high flood flows do happen they happen in narrower and more aggraded channels, which cannot contain them and cause much wider inundation than in the pre-dam period. In the Indus basin therefore, the society has swapped high-frequency, low-intensity flood events for low-frequency high-intensity flood events. Systematic international geomorphological research in the Indus basin could go a long way towards enhancing understanding of the behaviour of this great river system and the consequences thereof for millions who depend on, and are threatened by, it. Such research might face challenges in terms of data availability and/or accessibility, but the significance and relevance of such research cannot be overestimated.

Figure 1. The Indus basin and its major infrastructure.



The development of Pakistan's flood management system can be characterised by two dominating approaches and two corresponding periods: 1947 to 1973, a period of risk acceptance and limited risk management; and 1973 to the present, a period of comprehensive physical risk management (Mustafa and Wescoat, 1997). Although flood irrigation techniques had dominated farming along the Indus river since prehistoric times, the original canal network, upon which the current system is based, was conceived and executed under British colonial rule beginning with the Upper Bari Doab canal in 1859. Throughout the colonial era, the system was maintained and expanded, such that on the eve of independence there were 150 major canals extending thousands of kilometres throughout the country. The colonial approach to flood management depended on a network of *bunds* (linear levees along rivers and ring levees around cities), which the army could strategically breach when waters approached flood stage. During periods of high water, barrages and cities with bunds were protected, but massive flooding would occur in breached areas and regions without protection from bunds. The general public had little influence on flood management, though public opinion in affected areas fell decidedly against risk acceptance. The bund system of flood management was carried forward after independence. In 1960, the Indus Basin Development Programme (IBDP), a colossal engineering project signed into existence with the Indus Waters Treaty between India and Pakistan, considerably expanded the regulation of the system by not only increasing water withdrawals from the river system but also introducing mega-dams and inter-river water transfers for the first time. The focus of flood planning was shaped through the lens of the Indus Waters Treaty, on drainage procedures to avoid international flood damage. Upon completion of IBDP in 1970, Pakistan's agricultural production expanded substantially. However, shortly thereafter, in 1973 massive flooding became the first test of the new system and revealed its vulnerabilities as well as the capacities that the new infrastructure enabled for basin-wide flood management. The risk acceptance paradigm was therefore abandoned in favour of risk management (Mustafa and Wescoat, 1997).

In 1978, the Federal Flood Commission was established to implement a comprehensive risk management strategy, the National Flood Protection Plan. The tool kit of the new strategy included greater resources for reservoir operations, including procedures, inspections and training; schedules for bund maintenance and reinforcement, and bund breaching plans; expansion and modernisation of data collection techniques, including satellite monitoring, run-off modelling and flood forecasting, as well as the implementation of a flood warning system (ibid). In spite of these improvements to the flood management system, weaknesses remained evident, and flooding events disastrously recurred, most notably in 1988 and in 1992. Mustafa and Wescoat (1997) noted several institutional limitations to adequately address the fundamental issue of flooding. First, a failure to adapt the system to natural processes like aggradation and erosion was causing a mismatch between the design assumptions of the infrastructure, such as embankments and barrages and the dynamic reality of the channels' carrying capacity. Of the 144 MAF[2] of water entering the system about 106 MAF are withdrawn for irrigation purposes, leaving little water in the system to flush the channels and either deposit the highest silt loads in the world on the flood plain or to carry them out to the sea. This long-term reduction in channel capacity to carry floods was one of the key reasons for exacerbating the effects of the exceptionally high floods in 2010. In the past flooding episodes such as the one in 1992 monitoring stations were, in some instances, unable to take measurements and report them in a timely fashion due to their own physical location relative to flooding. The gauges were submerged and therefore no readings could be issued to inform decision making. It is highly likely, given the magnitude of the flows in 2010 that that may have been the case for the recent floods as well. Historically, just as in 2010, when measurements are taken and alerts are issued, public warning, evacuation and safety measures are often ineffective and haphazard. The district administrative heads and irrigation officials who are the key people in charge of disaster management are frequently transferred and therefore have neither

[2] A volumetric measure signifying million acre feet, i.e. the amount of water it will take to cover one million acre of land with one foot of water.

the requisite local knowledge nor the public accountability to be effective (Mustafa, 2002c). On the flood management side, canal and reservoir operators are generally not empowered to make important split-second decisions about flow adjustments that can attenuate flood hazards, and in some cases, as in 1992, reservoir managers, for lack of system coordination, released waters exacerbating deadly downstream flows. There are institutional standard operational procedures in floods and the system rewards adherence to those procedures rather than innovation and initiative that are a requisite for effective flood management (Mustafa, 2002c; Mustafa and Wescoat, 1997).

Besides the systemic weaknesses at the macro scale, the negative consequences of flood hazard at the local scale are often disproportionately experienced by the poor and most powerless segments of the population (Mustafa, 1998, 2002a, 2000b). Spatially, because of canal colonising policies practised by the British colonial administration and then the post-independence Pakistani government, which were often exercises in hierarchical social engineering, the small farmers were often disadvantaged by virtue of being at the low-lying tail end of canal commands (Gilmartin, 1994, 1995; Michel, 1967). Beyond the spatial disadvantage, the canal administration system has strong colonial ethos in its enabling legislation, and bureaucratic practices that discriminate against smaller farmers in terms of redress of complaints, water delivery, and the all-important decisions on levee breaching (e.g. see Gilmartin, 1994; Mustafa, 2001). All the infrastructure on the Indus basin rivers has a safe design capacity, which has been exceeded quite often in the past (Mustafa and Wescoat, 1997). To protect the infrastructure, the levees upstream are often breached to relieve pressure. The operation of the breaching section is a decision taken by the local canal officer but that canal officer is often under the influence of local large farmers (Mustafa, 2002c). In such situations it becomes a question of which large farmer has the most influence to either prevent a levee breach or to affect the breaching of an alternative levee-breaching section. There are accusations in the Pakistani press that, in fact, some of the levees were breached to protect the lands of specific influential interests (e.g. see Rodriguez, 2010). The veracity of the media claims is under judicial investigation but suffice it to say here that political influence in levee-breaching decisions is a routine occurrence in Pakistan, and given the stakes involved may be it is a perverse way of ensuring public oversight over technocrats in the absence of other mechanisms for ensuring public oversight.

DISPELLING A FEW MYTHS

So what can one expect to change in the aftermath of this mega-disaster in Pakistan? One may be tempted to say that nothing will change given the more than a century and a half of institutional inertia on the part of the Pakistani water establishment. Furthermore, a considerable number of communities and sizeable populations in the basin have come to depend upon the relative certainty afforded by the flood protection works and existing system operating procedures. Consequently, there is an element of path dependency of both institutional set-up and the production systems that militates against prospects for radical change, as has been noted in the case of the Mekong delta by Biggs et al. (2009). But changes in the aftermath of a disaster of this magnitude are not always planned and deliberate and not limited to formal governmental institutions (Wisner et al*.,* 2004). One-fifth of Pakistan's population has been affected by this disaster and to expect that somehow after a while the affected Pakistanis can go back to normal is short-sighted. The new normal is likely to be very different from the old normal, and whether that normal will be for the better or worse is something that the Pakistani and international decision makers can affect and need to be attentive to. As documented before, in Pakistan the normal conditions for the rural poor are characterised by their virtual invisibility to the decision makers, limited access to water, subjugation to larger landowners and fragile livelihoods (Dove, 1995; Mustafa, 2002a, 2000b, 2000c). But those same normal conditions also have stories of adaptation to adversity, creative exercise of agency and of social mobility on the part of some (Mustafa, 2002a, 2004). The point is to strengthen the latter to mitigate and undermine the former. Dispelling of some misconceptions and pointing out avenues for intervention might be in order here to achieve that end.

In the post-flood period the greatest urgency is dedicated to the usual basic needs such as food, shelter, clean drinking water and so on. But two key issues have not received much attention as yet – the first is of drainage, and the other is targeted assistance to small farmers and the rural poor. First, the issue of drainage is going to be key – after all according to Pakistan's National Disaster Management Authority (NDMA) as of December 2010, more than 4 months after the river floods subsided up to 421,000 ha of land is still inundated in the southern Sindh province (Reliefweb, 2010). Most of the flooding in Pakistan is from breaching of embankments, which typically occurs on the right bank of the rivers, to allow water to drain right back into the river once the flood peak has subsided. In Pakistan, the density of canal, road and levee development means that water that has entered the inundation zone has its drainage path back to the main-stem river interrupted by levees, roads, railway lines and canal embankments with the result that the water does not drain back, becoming a cesspool of diseases and preventing return of those affected for long periods of time. Drainage or even pumping of water – if need be – from such inundation zones should be a high priority but there is no evidence to suggest that that is being done or was even attempted. Water, if drained before the winter sowing season, could give a sporting chance to displaced people to get back on their feet. Delay in water subsidence has consequences not just for livelihoods but also for the proliferation of diseases and mortality levels. The drainage of flood water should not just be an episodic reactive measure but should be a higher priority in infrastructural design or redesign and modification.

Second, the Pakistani government, like most other governments inevitably deals with aggregate numbers when it comes to relief and rehabilitation aid. The need here is to specifically target small farmers who, with the loss of livestock and summer crop, are particularly vulnerable. There have been no systematic vulnerability assessments in Pakistan, except some piecemeal ones undertaken by a few NGOs. The need is for there to be more systematic vulnerability assessments using some of the insights from recent literature in vulnerability assessment, e.g. attention to diversity of livelihoods and people's access to survivable infrastructure and social capital, (e.g. see Anderson and Woodrow, 1989; Mustafa et al., 2010). But in the interim, local-level governance structures that used to exist, may be resurrected, even if briefly in order to get the local-level knowledge to national- and international-level agencies so that they can target the most vulnerable. There is a sufficiently robust moral economy in rural Pakistan to provide some level of support to the rural poor, but that moral economy has been strained to its limits and is in need of support.

On the institutional side, the Government of Pakistan (GoP) – as usual – has received considerable criticism for its slow response to the disaster. While the GoP merits criticism on many, many counts, in the context of flood response much of the domestic and international attention is unfair. First, the extent of the disaster is such that any government in the world could not have fulfilled the type of retrospective expectation that the press and the public seems to have attached to GoP's response. Second, both hazard theory and experience from around the world suggest that the local level is the first and the most appropriate level for responding to environmental disasters, not the national government (Wisner et al., 2004). The present 'democratic' government unfortunately and ironically has eviscerated local-level representative government. Third, disaster response in Pakistan is constitutionally a provincial subject, and not a federal subject. The federal government has no constitutional basis to intervene in disaster response unless requested by the provincial government. And when it is requested the only institution it has to offer is the armed forces – which by all accounts played an effective role (Haider, 2010). So the criticism that the military is doing everything and the federal government is not is incomprehensible. National governments can and do play a useful role in disaster response but that is ideally limited to making financial, technical and human resources available to local authorities as well as to undertake much needed coordination between different sub-national jurisdictions. Lastly, even at the provincial government level, populations and geographical areas are so enormous that the functionality of a federalist structure to ensure a more efficient devolved government would not hold. Consider that just the Punjab province in Pakistan has a population of more than 90 million. If it were a country by itself, it would be one of the 15 most populous countries in the world. In the absence of local government structures, which the present provinces themselves have eliminated, their efforts for flood relief were also inevitably inadequate.

CONCLUSION: TOWARDS VULNERABILITY MITIGATION

Flood policy in Pakistan has been somewhat of a peripheral area for Pakistani water managers and then, it has also been limited to concerns with physical risk and exposure reduction. On the physical risk-management side, the priority for dam and barrage management has always been irrigation and power generation, and then flood control as an afterthought. There is an urgent need for Pakistani water managers to be trained to do multi-criteria management of the system, where long-term flood management is a priority on par with other priorities. The managers, if trained and given the autonomy, could operate infrastructure in such a way as to periodically flush channels and reduce the need for costly levee-breaching during flood events. Secondly, Pakistani water managers need to be sensitized to the need for adapting to the rhythms of the Indus basin rivers, instead of maintaining the attitude of heroic engineering to control the rivers. Allowing some natural inundation zones and restoration of wetlands could go a long way towards moderating high flood peaks, in addition to providing important ecosystem services such as groundwater recharge, carbon sequestration and biodiversity benefits – from which the poor tend to benefit the most (Desakota Study Team, 2008). As argued by Biggs et al. (2009) in the case of the Mekong, what applies to certain parts of Indus applies just as much to stretches of riverine land in central and southern Pakistan "where communities have always lived more on the edge separating prosperity from any number of natural and man-made disasters, perhaps there are more opportunities for state authorities to experiment with alternative small-scale and adaptive strategies", such as the ones suggested above.

Thirdly, for exposure reduction, flood warning systems could also be improved. Pakistan has some of the highest cell phone penetrations in the world – 86% of the men and 40% of the women in Pakistan use cell phones (Qamar, 2009). The cell phone penetration could be effectively used as a conduit for emergency information and warning.

Fourthly, the Pakistani public needs to be made aware of flood response strategies and what is expected of them. Greater communication and trust between the flood managers and the people is the ultimate guarantee of safety. It is appropriate that the federal government of Pakistan should limit itself to undertaking technical assistance to the provinces and then physical assistance if need be through the National Disaster Management Authority (NDMA). But NDMA has very little budget during normal times and has dubious constitutional authority to intervene in disaster situations. Those constitutional and budgetary issues should be resolved.

But for long-term flood hazard mitigation it is essential to be attentive to issues of vulnerability reduction. At the national level, this flood could provide the impetus for the GoP to undertake some painful but necessary tax reforms to bring larger segments of the privileged Pakistani's income into the tax net. With a tax to GDP ratio of only 10.2% the long-term ability of the government to devote resources for vulnerability mitigation and development is likely to be very limited (Chaudhry, 2010).

Lastly, representative and accountable local-level governance structures are a must to tap information on vulnerable populations and then to target them. International donors and the Pakistani government could fruitfully engage the Pakistani provincial governments to restore local-level governance structures so as to facilitate local-level development as well as vulnerability mitigation.

The 2010 floods have been a disaster, but the disaster can be used strategically to build better and to address the problematic social and physical factors that contributed to the disaster in the first place. Climate change may not have been a top priority for the Pakistanis but with anomalous meteorological events becoming alarmingly frequent, it is important that Pakistani managers start being attentive to a future world where their past experience of mean conditions is not going to hold. That will mean reworking of their operating procedures and their managerial outlook. Vulnerability reduction is the best defence they can have against future uncertainty and that is where they need to focus. Hopefully, this intervention coming fresh in the aftermath of a disaster will serve as a reminder to focus on vulnerability, adaptation and even some humility in the face of river systems like the Indus.

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