

**FLOOD 2010 – A PROBE, A QUEST**



## FLOOD 2010 – A PROBE, A QUEST

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### A. FLOOD IN ITS MEANING AND DEFINITION

Flood is a temporary rise of water level, as in a river or lake or along a seacoast, resulting in its spilling over and out of its natural or artificial confines onto the land that is normally dry. Floods are usually caused by excessive runoff from precipitation or snowmelt, or by coastal storm surges or other tidal phenomena.

Floods are often defined further according to their statistical occurrence. A fifty year flood is a flood having a magnitude that is reached in a particular location on average once every fifty years. In any given year there is a two percent statistical chance of the occurrence of a fifty year flood and a one percent chance of a hundred year flood.

### B. OUR WATER PROFILE

By its coordinate location Pakistan lies between 24°N to 37°N latitudes and 61°E to 77°E longitudes. Major part of the country lies within the tropics, i.e. up to 30°N, beyond 30°N is extra tropical region.

Pakistan has diversified climate mostly comprising of arid and semi arid regions beside some natural deserts within 25°N to 30°N and considerable areas of irrigated land with insignificant forest cover. Total area under irrigation in Pakistan is in excess of 15 million hectares out of which about 9.6 million hectares is arid, 3.8 million hectares is semi arid, 1.0 million hectares is sub humid and remaining 0.6 million hectares is in transitional climate zones. The Thal desert stretches over an area of 2-6 Mha in Khushab, Mianwali, Bhakar, Leiah, Muzafargarh and Jhang districts of the Punjab. The Thar desert is located between latitudes 24° and 28° North and between longitudes 68° to 71° East in the Sindh province. It comprises of the eastern parts of Tharparker, Sangar, Nawabshah, Khairpur, and Sukker districts. The desert is bounded by Punjab province in the north; eastern Nara in the west; Arabian Sea in the south and by Rajasthan (India) in the east. Area of desert is 2.65 million ha out of which 1/4th to 1/3 is cultivated. Coastal sandy belt of Pakistan extend over 560 km from Karachi to Jiwani.

Floods have been recognized as a major natural calamity in Pakistan and the country has a long history of flooding from the Indus River and its tributaries. Floods of 1928, 1955, 1973, 1988, 1992 and that of 1997 are few of events entailing tremendous damages to the life and property. The need for establishing an early flood forecasting and warning system was thus recognized soon after the creation of Pakistan in 1947. The devastating floods of 1973 in Pakistan further strengthened the feeling that the flood forecasting arrangements in the country were still inadequate and did not meet the real requirements. These floods, thus, paved way to full-fledged activities for the further augmentation of the flood forecasting system (FFS). The subsequent floods of 1988, 1992, 1996 and 1997 again revealed some system discrepancies pertaining to areas of flood forecasting and dissemination and it was felt that the system was needed to be further reviewed.

In the year 1973, more than three million homes were destroyed and 160 persons lost their lives. The 1976 floods demolished over 10 million houses while 425 lives were lost with the financial damages amounting to Rs.6 billion. In 1988, an unprecedented flood occurred towards

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the end of September inflicting about Rs.17 billion worth of damages to the country. The catastrophic flood of 1992 surpassed all the previous records with damages estimated at Rs.50 billion.

### **C. A PERIPHERAL ANALYSES OF FLOOD 2010**

The Indus Valley Civilization thrived on the banks of the Indus before which the Mehargarh Civilization thrived in the area. Throughout these ages the Indus (or Sandhu) people lived separate from the rest of the area. During Greek invasions Bactria included Pakistan but even the Alexander's invasions did not extend beyond the Indus. The Indus Pakistanis, three thousand five hundred years ago and beyond were living together as a separate and distinct political unit which traded with Egypt, Mesopotamia and China the other superpowers of the era. The Indus Pakistanis in 3500 B.C were also known as Mulhullans (or sailors) because of their superb navigation skills, with one thing in common indeed, the Indus System. The system gave them sustenance just like today. As the Egyptians are tied together by the Nile, the course of Kashmiris, Baloch, Punjabis, Sindhis and Pakhtuns is pretty much tied to the Indus System.

Pakistan of the Indus Basin has been facing floods both in its recent and past history and if weather patterns are any indication, Pakistan is likely to face even heavier floods in the future. The flood of 2010 is one of such events, but highly distinct and marked due to its magnitude. Though scientists have described the flood of 2010 as a once-in-a-century flood but it is important to see whether the indicated weather patterns and probable climate change, as is being talked about, means that flood of this magnitude, or even bigger, becomes a more regular occurrence? If so, what should be strategy and if not so what should be plan and the way to continue otherwise with the sustenance.

Before entering into the above referred discussion let's first have a look at some basic facts or the characteristics about the flood in Indus Basin:

- Although an appreciable quantum of water comes from melting Himalayan glaciers, the major proportion is contributed by the summer monsoon.
- As torrential rain sweeps in from the Indian Ocean, floods are triggered almost annually.
- The Indus floodplain was a cradle of civilization 9,000 years ago. It has been concluded that it was this valley where the people first gave up the nomadic ways to farm the livestock and cultivate crops.
- Today, the valley is home to 100 million people, who rely on Indus for drinking water and irrigation.
- Monsoon intensity in the basin is sensitive to the surface temperature of the Indian Ocean. During times of cooler climate, less moisture is picked up from the ocean, the monsoon weakens, and the Indus river flow is reduced.
- For the near future what all the climate models predict an uneven distribution of monsoon rains. Total rainfall may stay the same, but it may come in shorter but more intense bursts.

**Table – 1:** Major Floods of Indus Basin in Pakistan

Year	Monetary Losses (Billion Rs.)	Lives Lost (No.)	Villages Affected (No.)	Area Flooded (Sq. Mi.)
1950	9.08	2,910	10,000	7,000
1955	7.04	679	6,945	8,000
1956	5.92	160	11,609	29,065
1973	5.52	474	9,719	16,200
1975	12.72	126	8,628	13,645
1976	64.84	425	18,390	32,000
1978	41.44	393	9,199	11,952
1988	15.96	508	100	4,400
1992	56.00	1,008	13,208	15,140
1995	7.00	591	6,852	6,518

In August 2010, more than half of the normal monsoon rains fell only in one week, which typically is spread over a period of three months. This aspect is directly related to the models referring to the regional and global climatic change. But this climatic change may not be the only cause of Pakistan's woes experienced during the flood of 2010. There is also a sense that the floods of 2010 have also been exacerbated by the way the main stem of Indus system, i.e. the Indus itself has been managed. The problem has been made worst by deforestation. Trees protect the headwaters from erosion. As the forests have been cut over the past half a century, more sediment has been flushed down the rivers. Additionally, the flood risks are generally reduced by building levees (embankments) along vulnerable part of rivers. Its a system which served well for generations. But their behavior during the flood of 2010 (or how they have been made to behave during the recent floods) has left number of question marks. As the issue now has currently been taken-up by the apex courts of country, the debate on this aspect, which was the part of discussion herein earlier, has now been excluded. Number of other dimensions of mismanagement also exists. River bed settlements is one of such instance.

The atmospheric anomalies on the other hand, which are dominantly being believed to have led to the floods in Pakistan are also being considered as the same which caused the record heat wave in Russia and flooding and mudslides in western China. According to the state media the hottest summer ever recorded in Russia in 130 years has sparked thousands of wildfires, burning some entire villages to the ground, killing and leaving 3,500 homeless. Cooler temperatures finally brought some relief, shrinking the extent of the flames from more than 100,000 acres to down. Normal air patterns could generally have dispersed the precipitation over as wide an area as possible. But an abnormal airflow caused by La Niña created a ridge of pressure that blocked the warm, saturated air from moving west to east. This same ridge prevented the rains from reaching western Russia, where a severe drought has been blamed for raging wildfires and the destruction of 20 percent of the wheat crop.

With nowhere else to go, Pakistan and China in just a close proximity bore the brunt when the clouds became too saturated with moisture and opened up. The record rainfall and subsequent flooding and mudslides in western China during the same period were estimated to

have left roughly 1,200 dead. Chinese government handled that crisis on its own with no appeal for international support.

Russia's drought has reduced its wheat crop by 20 percent, and on the other side of the globe, the droughts in Canada has also reduced the crops by an equal proportion. Though the Food and Agriculture Organization said at that time that the United States alone has enough grain in storage to meet any thing unfavoured, the U.S. Department of Agriculture put out a warning that reduced yields from droughts in Europe and Africa have lowered food stores to levels close to those seen just before the onset of the 2007 food crisis in the developing world. Less reported is another event on 05 August 2010 when a sensor on a NASA satellite recorded a massive chunk of ice breaking off a glacier in Greenland. The huge block measures more than 77 square miles in size and is one of the largest calving incidents witnessed in the Northern Hemisphere. WMO officials state that the evidence linkage was not anything but triggered due to the climate change. With such shifts in view and further if the forecasts by the Intergovernmental Panel on Climate Change (IPCC) are correct, then the experts state that vis-à-vis Pakistan the event of 2010 is just a sign of more to come.

**Table – 2:** Flood Damages/Losses (06 March 2011)

Deaths	1,985
Injured	2,946
Household damaged	1,744,471
Population affected	20,184,550
Cropped areas (Hectares)	2,244,644
District Affected	78

**Source:** NDMA – Pakistan.

The flooding in Pakistan started slowly at the end of July 2010 and gradually accelerated. Disaster assessment maps show that almost the entire northern part of Pakistan and most of its central region was hit. During the most intense storms, about a foot of rain fell over a 36-Hour period. Parts of the affected areas, in particular the Khyber-Pakhtunkhwa province (formerly Northwest Frontier province) received about 180-200 percent higher precipitation than what is expected in a normal monsoon cycle.

Records also show that the famed Indus River was at its highest water level ever recorded in the 110 years, i.e. since the regular record-keeping began. Estimates put the number of displaced people beyond 20 million. The flood, inundation map for the 2010 event, as has been made available by the concerned authorities is placed below:

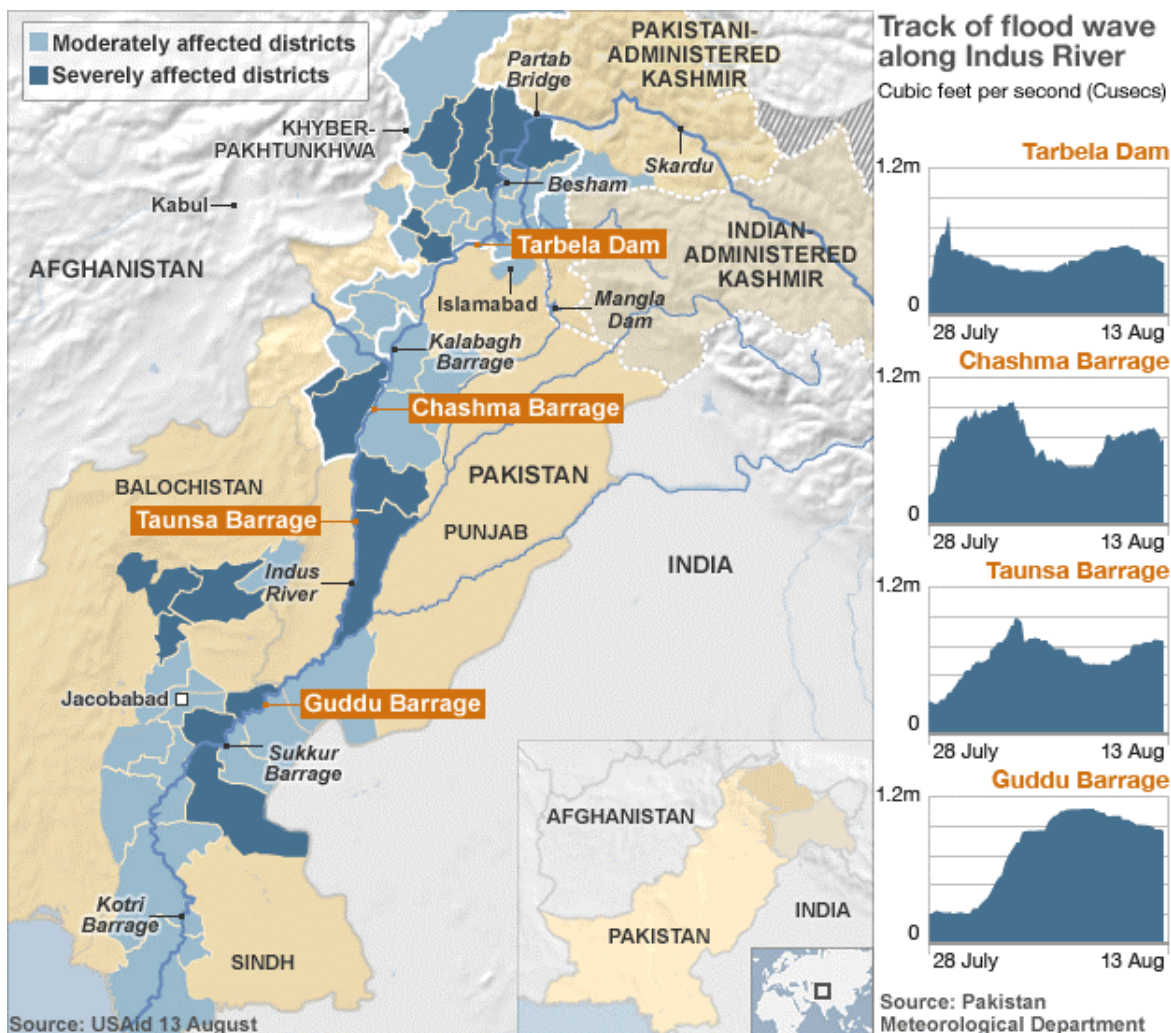


Figure -- 1: Inundation Map of the Flood of 2010

**D. A SHORT PROBE - THE KACCHA CASE**

The advancements in the river engineering during the early decades of last century introduced a new era of water management marked by increased control of human beings over river waters. Completed in 1930s, Sukker Barrage was the first water diversion structure on Indus to be followed by Jinnah Barrage, Taunsa Barrage, Tarbela Dam, Chashma Barrage, Guddu Barrage and Kotri Barrage. These dams and barrages, accompanied by an extensive network of water controlling structures like river training works, flood protection embankments, dykes, spurs, irrigation canals, inter-river link canals and drains, considerably altered the Indus river regime.

These dams and barrages, which made power generation and perennial irrigation supplies possible, gradually contained the once mighty, multi channel Indus into a singly social and environmental entity in the low lying floodplains of Indus, locally known as Kaccha – which stretch actually from Mianwali to Badin on its left bank and from Dera Ismail Khan to Thatta on its right bank. With a width varying from 25 km to 50 km and a length of more than a thousand kilometer, the Kaccha or low-lying floodplains was once known for its proverbial prosperity.

Before the advent of dams and barrages, Kaccha had a peculiar economy that depended much on the floods. The land use patterns and water management systems, which

unlike the modern ones, were in harmony with the natural river regime and provided the local populace multiple livelihood choices. All the land, notwithstanding its fertility, was not used only for crop production purposes. Instead much of it served as pastures, forests and lakes. Similarly, all the water was not used for irrigation purposes, notwithstanding the canal system; persian-wheel and other local irrigation technologies were developed in the floodplains of Indus. Much of it was meant for ecological purposes like enriching pastures and forests and replenishing underground water reserves, lakes and delta.

There also existed appreciable community knowledge. The houses and villages were built on elevated platforms to avert potential threat from inundation. Food and fodder were stored at safer places. The fisher-folk and ferrymen, who lived in close vicinity of the river, served as early warning authorities. In case of an emergency, the local people knew when, how and where to move. They had boats available to them. They knew their neighbouring communities to stay with until the flood waters are receded. The host communities, who also directly or indirectly depended on the river based economy, welcome them to reciprocate the generosity of their guests in normal times.

In contrast to the normalcy of the gone days, the later river engineering developments have considerably put down the frequency of benevolent and seasonal flooding in the Kaccha area while increasing the people's vulnerability to floods over the decades. Accumulation of silt in the reservoirs and embanked riverbeds has reduced the drainage capacity of the river. The hill torrents from Suleman Range and Khirthar Range, which discharge into Indus, bring high loads of silt in their water which ultimately gets dumped into the system.

Though the population growth and ill-planned settlement patterns in last several decades has resulted in aggravated flood menace, the flood protection embankments also created a false sense of security and further encouraged the ill-settlement patterns in the area. The forests, pastures and lakes have been turned into agricultural lands and the traditional flood preparedness strategies have been abandoned, particularly in the new settlements, as they were no more needed in the presence of flood protection embankments.



**Frame – 1: Flood 2010 Timeline:**

- **29 July:** Floods triggered by heavy monsoon rains in north-west Pakistan cause rivers to burst their banks and entire villages of mud-brick houses are destroyed.
- **31 July:** The UN describes the monsoon floods as the worst in living memory, while Pakistani authorities put the death toll at over 800.
- **2 August:** Officials say the death toll has passed 1,100 as 30,000 troops join the rescue efforts.
- **4 August:** The UK's Disasters Emergency Committee launches an appeal for aid to help people hit by the flooding.
- **6 August:** The UN says that at least 1,600 have been killed and 14 million people affected.
- **8 August:** Heavy rain hampers rescue efforts and a red alert is issued for the south of the country.
- **9 August:** Flood levels rise above danger levels at a key flood barrier in the southern province of Sindh.
- **11 August:** The UN launches an appeal for \$459m (£290m) to provide for the immediate needs of those affected.
- **12 August:** Pakistan's food minister tells the BBC there have been "huge losses" to his country's crops.
- **14 August:** Pakistan's Prime Minister Yusuf Raza Gilani says 20 million people have been affected by the country's floods.
- **15 August:** UN Secretary General Ban Ki-moon says the scale of the disaster was worse than anything he had seen before.

When the river swelled after extraordinary rains in the 2010 monsoon, it is being learnt that this resulted perhaps in the increased pressure on the embankments, most of which were already fragile. The embankments, therefore, could not sustain the pressure and developed breaches, which loosened the hell in the area. As if the devastation in the Kaccha was not enough, the water obstructed by the embankments found its way through the canals to inundate the areas, which have never been flooded by the Indus in past.

**Table – 3:** Major Committed Donations at the Onset of the Event

Country	Donation (Million US\$)
USA	102
Saudi Arabia	65.3
United Kingdom	64.76
European Commission	54.15
Australia	31.62
UN Central Emergency Response Fund	16.60
Norway	14.81
Japan	14.44
Germany	12.44
Turkey	11.77
Denmark	11.74
Sweden	9.98
China	9.26
Finland	5.77
Spain	5.51
Total:	430.15

**Source:** The Dawn, 23 August 2010

Following the breach in Abbas spur at Taunsa barrage on August 2, the flood water found its way to Taunsa-Panjnad Link Canal and Muzaffargarh Canal. The canals allowed the Indus to make a new channel to fall into Chenab River after inundating hundreds of villages and towns in Muzaffargarh district.

Besides, the drainage of hill-torrents obstructed by road and canal infrastructure complicated flooding in the Pakka area. Much of the havoc wreaked by flood in Dera Ismail Khan, Dera Ghazi Khan and Rajanpur districts has been due to obstruction of hill-torrents – Kaanh, Looni, Sanghar and Vohoa, to name a few – by Chashma Right Bank Canal (CRBC), DG Canal, Kachi Canal and Indus Highway.

**Frame – 2:** Flood Facts as Reported by the Prominent World Press

- (8-27-10) – One-fifth of the country affected (nearly 62,000 Sq. Mi.) NYT
- (8-27-10) – Nearly 20 million people have been significantly affected NYT
- (8-27-10) – The total cost of the flood damage at \$7.1 billion NYT
- (8-27-10) – More than 400 health care facilities have been destroyed NYT
- (8-27-10) – More than 5,000 miles of roads/railways washed away NYT
- (8-27-10) – 7,000 schools have been destroyed NYT
- (8-27-10) – Eight million people are in urgent need now NYT
- (8-17-10) – 1,500 dead; Afghan refugee camps ruined BBC
- (8-17-10) – 1,270 official death toll; 474 still missing Xinhua News
- (8-11-10) – 1,600 casualties UN
- (8-11-10) – 2.6 million acres of crop land inundated UN
- (8-11-10) – 14,000 cattle dead UN
- (8-10-10) – 14 million people affected CNN
- (8-10-10) – 1,245 confirmed casualties CNN
- (8-10-10) – 1,334 people injured CNN
- (8-10-10) – 337,282 people rescued CNN
- (8-10-10) – 302,000 houses damaged CNN

Hence the flood of 2010, aggressive and protracted though, exposed the effectiveness of dams and barrages in flood protection, asking for an appropriate review of our water sector management plans.

**E. THE QUEST AHEAD**

When flood forecasts of the meteorological department started assuming shape in the week of July, our dams (on 25-07-10) had substantial 8.6 million acre feet (MAF) water – 4.3 MAF in Tarbella Lake, 4.19 MAF in Mangla Dam and 0.11 MAF at Chashma. The critical question being debated among water experts is whether the dams' levels could have been lowered through the controlled releases to better accommodate the water peaks later and lessen the intensity of national disaster. The opinion, however, is sharply divided. In the presence of just couple of dams, if the stored water would have been released and the meteorological forecasts would not have turned out there would have been a serious problem of other type.

Unfortunately, we as a nation are still under varying degrees of strives. On one hand, without building new dams for storing excessive supplies of the Indus River System, we have no good future for our water based economy; and on the other hand, without securing a wider consensus for building new dams, we fear to run into the other risks. We should now decide or else we may end up too far.

### Frame – 3: Comparing Satellite Images

*Satellite images show how the Pakistan flood waters have swollen the lower Indus River, completely filling the river valley, when compared with images of the same area one year before.*

*The flow through the Sukker Barrage has reached levels of 1.4m cubic feet per second (cusecs). The barrage is only designed to withstand a maximum of 0.9m cusecs.*



### F. A CRUX TO CONCLUDE

After having been put in place a mechanism for the implementation of relief and rehabilitation plans, we ought to do our homework to meet the challenges which are in store for us in the coming decades. This requires a systematic and scientific projection of the future shape of things. The work on this project should start now as there is no time to lose. To this effect, the authorities and the international agencies may consider the following recommendations:

- (i) A study of the short-term and long-term effects of climate change in each of the 10 climate zones of Pakistan.
- (ii) Appointment of an independent commission that may, after public hearing and consultation with experts, formulate an effective and practical national policy on the management of water resources, including the construction of large and small dams.
- (iii) A study of all public funded entities which are wholly or partially involved in disaster management with a view conserve and to consolidate human and material resource.

In the end it would be appropriate to conclude that we should now prepare for the future challenges with a defiant courage despite being humbled by the overwhelming disaster of 2010 so as to assert our faith in a better future.

## **G. THE WAY FORWARD**

A way forward would be to acknowledge the floods as a resource and harness the numerous benefits that are associated with the regular flooding. The real success of river water supply management would thus depend significantly on the conditions we create in Pakistan. In this regard the flood mitigation measures also need to be so developed so as to ensure the best possible outcome, both in terms of socio-economic, as well as the environmental benefits.

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