

A RUDE AWAKENING

It is a river that tells many tales¹

REPORT

of the

Judicial Flood Inquiry Tribunal²

**on the causes of major breaches³ in River Indus
during the “exceptionally high floods” of 2010**

¹ *Shane Mountjoy, Rivers in World History, The Indus River, Chelsea House Publishers, Philadelphia (2005)*

² For the Province of Punjab only.

³ See TORs in Chapter-2

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ABBREVIATIONS

| | |
|------------------|--|
| C.E. | Chief Engineer |
| C.E. (D&F) | Chief Engineer (Drainage & Flood) |
| Cfs | Cubic feet per second |
| Cft | Cubic feet |
| D/S | Downstream |
| FFC | Federal Flood Commission |
| FFD | Flood Forecasting Division |
| FWC | Flood Warning Center |
| HFL | Highest Flood Level |
| I & P Department | Irrigation and Power Department |
| IRI | Irrigation Research Institute |
| MAF | Million Acre Feet |
| NDMA | National Disaster Management Authority |
| PCIW | Pakistan Commissioner for Indus Water |
| PIDA | Provincial Irrigation and Drainage Authority |
| PMD | Pakistan Meteorological Department |
| PMF | Probable Maximum Flood |
| PMO | Project Management Office |
| PMP | Probable Maximum Precipitation |
| RC | Relief Commissioner |
| RL | Reduced Level |
| S.D.O. | Sub Divisional Officer |
| S.ENG. | Superintending Engineer |
| U/S | Upstream |
| X.E.N. | Executive Engineer |

GLOSSARY

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| <i>Abkalani Sindhi</i> | The inundation or flood season in Sind from 1st May to 15th October. |
| Acre foot | A unit of volume used in irrigation practice. It means the volume of water required to cover an area of one acre, to a depth of one foot. It amounts to 43,560 cubic feet. It will be noticed that a cusec day is equal to 1.98 acre feet ordinarily taken=2). |
| Active Flood Plains or Flood plains. | an area of low-lying ground adjacent to a river, formed mainly of river sediments and subject to flooding. |
| Apron | A floor or lining of concrete stone, etc., to protect a surface from erosion, such as the pavement below weirs, falls or at the toe of a bund. |
| Arid | A term applied to lands or climates that lack sufficient water for agriculture without irrigation. |
| Back water curve | A form of the surface curve of a stream of water caused by an obstruction in the channel such as a weir. |
| Banjar Jadid or new fallow and banjar qadim or old fallow. | If for four successive harvests land which once was cultivated has not been sown it is classed as banjar jaded. If it continues to be uncultivated for the next four harvests it is classed as banjar qadim. |
| Banjar qadim | Includes all culturable waste whether it has ever been under the plough or not. |
| Barrage | A structure of moderate height built across a river or a stream to control the river levels and to divert waters for irrigation, navigation, power or other purposes. |
| Bela | River forest |
| Beldar (Sindhi) | A labourer or workman. |
| Below-Out | An underground leak occurring through a sand stratum under the |

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| | base or seat of a bund breaking out through the ground surface on the rear of the bund in the form of a bubbling spring, carrying with it a volume of sand. Also called a sand-boil. |
| Berm | (1) The space left between the upper edge of a cut and the toe of an embankment. (2) a horizontal strip or shelf built into an embankment to break the continuity of an otherwise long slope. |
| Breach | The pit excavated for obtaining the earth required for making up the section of the bund. |
| Breaching Section | Designated Section of an embankment that has to be operated (removed or blown away) in case the pond level touches the critical level. This is when the Barrage is threatened. |
| Bund | An earthen embankment, built more or less parallel to the river banks and at a sufficient distance away, on either side of the river course, to protect the country from inundation by the river spill, when the river is in flood. In America called a "levee". |
| Canal | An artificial channel constructed to convey appreciable quantities of water |
| Canal Irrigation | A canal constructed primarily for conveying water from the source of supply to areas in which it can be used for irrigation |
| Channel Irrigation | (Commonly known as watercourse). A small channel taking its supply from a Government channel but owned and maintained by the cultivators. |
| Channel Perennial | A channel which is designed to irrigate all the year round |
| Coffer dam | A barrier built in water so as to form an enclosure from which water is pumped to permit free access to the area within. A cofferdam is a (usually temporary) barrier constructed to exclude water from an area that is normally submerged. Made commonly of wood, concrete or steel sheet piling, cofferdams are used to allow construction on the foundation of permanent dams, bridges, and similar structures. When the project is completed, the cofferdam may be demolished or removed. |

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| Crest | (1) The top of a dam, dike, spillway or weir, frequently restricted to the overflow portion (2) the summit of a wave, peak of a flood. |
| Cusec (cs or cfs) | The unit of discharge used in irrigation practice and means a rate of flow of one cubic foot per second. |
| Cusec day | A unit of volume used in irrigation practice and means the volume of water resulting from a charge of one cusecs for one (24 hours). It amounts to 86,400 cubic feet of water and is equal to nearly two acre feet. |
| Dam | a barrier, typically of concrete, constructed to hold back water and raise its level, the resulting reservoir being used in the generation of electricity or as a water supply |
| Discharge | The rate of flow at a stated site, i.e., the quantity of water passing in unit time. |
| Drainage | The natural lines of depression in an area, through which storm water escapes to the river. |
| Embankment | a wall or bank of earth or stone built to prevent a river flooding an area – also called a levee, dyke or bund. |
| Flash Flood | A flood that rises rapidly. With little or no advance warning is called flash flood. |
| Flood Plain | The entire area subject to overflow by the river course in flood. Much, if not all, of the flood plain may have been formed by the gradual deposition of sediments on lands, which were originally delta lands, causing the delta to advance further and further into the sea. |
| Free-board | (1) The distance between the designed full supply level and the top of the sides of an open channel or masonry work left to allow for wave action, floating debris, or any other condition or emergency without over-topping the banks of the channel sides of the structure. (2) When applied to a dam, it is the distance from the top of the dam to the water surface in the reservoir during maximum flood conditions. |

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| | The vertical distance between the flood level (actual or designed, as stated in the context) and the top of the embankment, or other specified structure. |
| Glacis | The sloping floor below and in continuation of the raised crest of a weir |
| Groyne | A spur constructed with more permanent materials. An obstruction of stone, timber, or brushwood constructed from the embankment of a river, for diverting or holding the flow. A stone groyne is called a spur. When the groyne is constructed parallel to the river flow, for the purpose of protection against wavewash, it is called a “longitudinal groyne,” or “muhari” |
| Guide bank | The embankments forming the upstream and downstream approaches of a weir. The nose of a guide bank is heavily armorial to withstand river action. A protecting and training bank constructed to guide the river through the waterway provided. A river bund may in effect, be a guide bank when it is at the edge of the river course, there being little or no foreshore between the river course and the toe of the bund, e.g., the Jamshoro Bund. |
| Head | (1) The height of water above any point or plane of reference. Used also in various compounds, such as energy head, entrance head, friction head, static head, pressure head, lost head, etc. |
| Head race | A channel leading water to a waterwheel, a fore-bay |
| Headworks | The works constructed at the off-take of a main canal. It includes the weir on a river, the dam at storage site, etc. |
| High Flood Level | The highest recorded flood level a river has ever attained in any previous year (since 1914), at a given point. The bund is, however to be designed for, or maintained to, “the Designed High Flood Level, (D.H.F.L.) which is the assumed H.F.L.” or the “extrapolated H.F.L.”, whichever, is higher. |
| Histogram | A graph showing in rectangular areas, standing on each grouping interval, the frequency of observations in that interval. |

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| Hydraulic gradient | The slope of hydraulic grade line. The slope of the surface of water flowing in an open conduit. |
| Hydraulic Gradient Line | In a bund, it is the same as the saturation line |
| Hydraulic jump | The sudden and usually turbulent passage of water from low stage below critical depth to high stage above critical depth during which the velocity passes from hyper critical to sub-critical. It represents the limiting condition of the surface curve wherein it tends to become perpendicular to the stream bed. |
| Hydraulics | the branch of science and technology concerned with the conveyance of liquids through pipes and channels, esp. as a source of mechanical force or control. |
| Hydrograph | (1) The curve resulting from the plotting of discharges against each day of the year. (2) A graph showing the gauge (or discharge) with respect to time |
| Embankment | a wall or bank of earth or stone built to prevent a river flooding an area – also called a levee, dyke or bund. |
| Hydrology | the branch of science concerned with the properties of the earth's water, esp. its movement in relation to land |
| Inundation Canal | A canal dependent upon the surface level of the water in the river for its supplies. It follows that inundation canals only run when the supply in the river rises to a level which permits of feeding the canals. |
| Irrigation | The artificial application of water to arid land for the purpose of growing crops. |
| <i>Khadir</i> | River valley, low alluvial lands. |
| <i>Khal</i> | A water course |
| <i>Kharif</i> | Summer crop |

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| Loop Bund | When there are two lines of defence, the subsequently constructed bund line on the rear or land side generally, is called the Loop Bund and the first line is called the Front Bund. If the first line of defence is eroded or abandoned the Loop Bund may become the Front Bund; vice versa, if another line of defence is constructed on the river side, the Front Bund becomes the Loop Bund |
| Million Acre Feet | Volume of water of one feet depth over an area of one |
| (MAP) | million acres. |
| Marginal bund | An embankment constructed along the river at a short distance from the margin with the object of preventing inundation of the area behind the embankment. |
| Outlet | The term used to designate the work which passes water from a Government channel to a watercourse. |
| Overtopping | River water running over the top and washing out a portion or whole of the bund. |
| Piping | The flow of water under or round a structure built on permeable foundations, which if not prevented or stopped will remove material from beneath the structure and cause it to fail. The erosion of sub-soil by high velocities of flow of water through it, when such velocities exceed a certain limit, is also referred to as 'piping'. See also Creep. |
| Pitching | Stone, brick, brushwood, or mattress (i.e., composite brushwood and earth), or other similar materials, placed on earth surfaces for their protection against the action of flowing water. Also known as "Riprap". |
| Precipitation | The total measurable supply of water received directly from clouds, as rain, snow and hail, usually expressed as depth in inches in a day, month or year, and designated as daily, monthly or annual precipitation. |
| Rabi | Winter crop |
| Reach | A comparatively short length of a stream or channel. |

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| Regulation | Is the process of distribution of supplies available in a river between different canals taking off it or between channels on a canal. |
| Regulator | A structure through which the discharge can be varied at will, also applied to a structure provided with means of varying the water surface level about it. |
| Retrogression | The lowering of the specific levels, i.e. of the level of bed of the channel for a given discharge. |
| Revetment | A pitching protection of stone, or brick or sand bags containing a certain proportion of cement or similar materials. |
| Riparian | of, relating to, or situated on the banks of a river |
| <i>Rod Kohi</i> | Hill torrents |
| Run-off | That part of precipitation that appears as flow in streams. |
| <i>Sailab</i> | Flood inundation |
| Sand | According to the American standard, it is taken as particles of soil 0.05 mm to 1 mm. Diameter. The standard adopted by the International Society of Soil Science is, however, 0.02 to 2 mm diameter. |
| Saturation Gradient | The slope of the top-most seepage line, or the surface of the percolating water, through the cross-section of the embankment. See also Hydraulic Gradient line. |
| Seepage | The percolation of water through the embankment or soil. |
| <i>Selabi</i> | Area irrigated by the river as opposed to the canal. |
| Side slopes | The slopes of the side of a bund embankment. The horizontal distance is named first, according to custom, for example 3 to 1 (or, frequently, 3:1) means a horizontal distance of three feet to one foot vertical. |
| Silt | (1) Water-borne sediment. The term is generally confined to fine earth, sand, or mud, but is sometimes broadened to include all material carried, including both suspended and bed load; |

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| | <p>(2) deposits of water-borne material as in a reservoir, on a delta or on overflowed lands.</p> <p>According to the International Society of Soil Science, all particles of soil from 0.002 mm. to 0.02 mm. in diameter are classified as silt. Silty soils contain upto about 20 per cent. Clay, 0.002 mm. diameter and less; 45 per cent. Silt, 0.002 mm. diameter; and 35 per cent. Sand, 0.02 mm. diameter and above.</p> |
| Slope gauges | Gauges fixed above and below a discharge section line for the purpose or determining the water surface slope through that discharge section line. |
| Sluice | A water channel that is controlled at its head by a gate. (also- A conduit for carrying water at high velocity; an opening in a structure for passing debris; to cause water to flow at high velocities for wastage for purposes of excavation, ejecting debris, etc.) |
| Soil | Finely divided material composed of disintegrated rock mixed with organic mater; the loose surface material in which plants grow. |
| Spur | In irrigation practice, a projection into a stream, provided with an armoured head; the head may be of various shapes. |
| Storage Dead | Is the capacity of a reservoir below dead storage level. |
| Storage-Live | Is the capacity of the reservoir above Dead Storage Level. |
| Tail | This term is usually applied to the work constructed at the end of a channel for the distribution of the water e.g., tail cluster or tail regulator, etc. |
| Tail race | The channel that leads water away from a turbine or water wheel |
| Time lag | Is the allowance that has to be made for time required for the effect of change in indent at one site reaching another indenting site. The time elapsing between the occurrence of any alternation of discharge or level at one point on the river and its occurrence at another point. Time lag is generally measured by timing the passage of a peak or trough between two points varies inversely with the magnitude of the discharge and, for even the same order of discharge, it is different on the falling stage from its value on the rising stage on account of the difference in the slopes of the river. |

| | |
|--------------------|---|
| Toe-wall | A shallow wall constructed below the foundation level to provide a footing for the pitching of the face of an embankment. When the Sub-soil water level is high the toe-wall takes the form of a series of shallow walls. |
| Under-sluices | Under shot gates- in irrigation practice generally confined to the openings in the weir, adjacent to the canal head regulator. |
| Velocity | The rate at which movement occurs and usually expressed in feet per |
| Wall-Toe | See Toe-wall |
| Water course | The term applied to an irrigators channel taking its supply from a Government channel, from which fields are irrigated directly. |
| Waterlogged | A condition of land where the ground water stands at a level that is detrimental to plants. It may result from over-irrigation, or seepage with inadequate drainage. |
| Watershed | (1) The area drained by a stream or stream system (2) The divide between drainage basins. |
| Wave-wash | The damage done to bunds when, on account of a strong wind velocity, the flood water forms waves which mount and strike and splash on their upstream face unless counteracted by jungle or other artificial device. |
| Weir | A fall extending across a river or canal, usually provided with a raised crest and glacis. |
| Wetting Channel. | A device used for soaking or preparing a bund in advance of the main rise of the river, for its task of holding back the river. It refers to both (a) a gravity channel from the river lip to the bund and (b) the channel between the trench bund and the main bund through which water is pumped to soak the main bund. |
| <i>Zaid Kharif</i> | Late summer crop |
| <i>Zaid Rabi</i> | Late winter crop |



CHAPTER 1

....But for the most part, both in time and space, the Indus is cruel and as ruthless and cunning as any lion¹.

OVERVIEW

1. RIVER INDUS AND THE FLOODS IN THE PAST

1.1. “The Indus begins in Tibet, issuing from a small spring called 'the mouth of the Lion.' From its source, gathering water from innumerable glacier-fed streams and from several rivers as large as itself, the Indus rushes down a gutter running more or less directly north-west between the greatest mountain ranges in the world, the Karakoram and the Himalayas. Leaving Tibet in tears down to India. . . . from here on it is a Pakistan's river. Twisting and doubling through fearful gorges it finally breaks out of Himalayas. Then, for nearly a thousand miles, it winds and wanders across the flat plains of Pakistan to the Arabian sea.²”

1.2. River Indus (Sanskrit Sindu = River, Greek Sinthos, Latin Sindus, Arabic Sindi) known as Abbasin (“Father River”) to the Pushtoons of the North, Sind Sagar (“Ocean River”) to the people of Punjab and as Mehran or Sher Darya (“Lion River”) to the Sindhis in the south – flows through one of the most ancient stretches of the human globe, where fabled cities flourished more than sixty centuries ago³.

1.3. Indus is about 1,800 miles long with a drainage area estimated at 372,000 square miles. For the purpose of comparison, Mississippi river, USA in comparison is also 1800 miles long but has a drainage area of 1.25 million sq miles⁴.

1.4. “Floods in Indus basin are of common occurrence . . . The more common floods, which have a greater total effect on agriculture, are due to monsoon rains and can generally be reduced in intensity by bunds and storage reservoirs. The inadequacy of engineering works and inadequate inspection are man-made causes of floods⁵.”

1.5. Bunds are patrolled during the rising stages of the river. At all danger points materials to deal with leaks or breaches are stored for emergencies. Particular attention is paid to the distance between the river edge and the embankment, where ever there is active erosion

¹A prince once counted the variety of tulips near its banks, an emperor discussed God while he waited to cross it, a British general lunched on partridges on a bridge of boats and laughed to see his elephants enjoying their bathe. But for the most part, both in time and space, the Indus is cruel and as ruthless and cunning as any lion. The Lion River by Jean Fairly, 1975 (First Pakistani edition, 1979)

²Jean fairly in The Lion River.

³Samina Qureshi, Legends of the Indus.

⁴A.K.Snelgrove, Geohydrology of the Indus River West Pakistan, Sind University Press, 1967

⁵ibid.

and the river approaches dangerously close to the embankment line, or within 1,500 feet of the toe of the embankment, a “retired embankment” (a supplementary or secondary bund) is planned at the end of the monsoon and the work is completed soon enough to ensure thorough wetting before the front bund is eroded.

1.6. “In general flood control problems are to be met by construction of reservoirs, embankments, diversion of flood waters into natural lakes (e.g. Manchar), swamps, or depressions to store and detain flood flow, and by soil conservation measures⁶”.

1.7. Statistically, every five years a flood of exceptionally high level occurs in the Chenab, which is the flashiest channel out of all the five major rivers. Every ten years a major flood or exceptionally high level passes through all the five rivers. Every 15 years a super flood of 1988 or 1992 type occurs⁷.

1.8. Design discharges⁸ of the reservoirs and barrages are as follows:

| River Indus (at Tarbela) | | |
|--------------------------|------------------|------------------|
| Sr. # | Design Discharge | 2010 |
| 01. | 1,800,000 Cusecs | 835,000 Cusecs |
| River Indus (at Jinnah) | | |
| 02. | 950,000 Cusecs | 898,700 Cusecs |
| River Indus (at Chashma) | | |
| 03. | 950,000 Cusecs | 1,038,900 Cusecs |
| River Indus (at Taunsa) | | |
| 04. | 1,100,000 Cusecs | 934,100 Cusecs |
| River Indus (at Guddu) | | |
| 05. | 1,200,000 Cusecs | 1,148,738 Cusecs |

1.9. Loss of life and property associated with flood has been colossal. In the year 1973 more than 3 million homes were destroyed and 160 persons lost their lives. The 1976 flood demolished over 10 million house while 425 lives were lost with losses amounting to Rs 6 billion. In 1988 an unprecedented flood occurred towards the end of September inflicting Rs 17 billion worth of damage to the country. The super flood of 1992 surpassed all previous records with the damage estimated at Rs 50 billion⁹.

⁶ ibid.

⁷ SOP regarding Hydro Meteorological Forecasting - FFD, PMD (Ex I.W. 3/2)

⁸ Mark 29 (Flood Report, 2010 Guddu Barrage)

⁹ SOP regarding Hydro Meteorological Forecasting - FFD, PMD (Ex I.W. 3/2)

2. THE DELUGE¹⁰ - FLOODS 2010

2.1. Exceptional and continuous rainfall¹¹ in the upper catchment of Indus River¹² resulted in exceptionally high floods into Punjab¹³ at Khairabad (Attock) on 29th July, 2010. This aqueous onslaught caught the provincial flood managers unprepared and ill equipped. Surprise turned into tragedy when the watery offensive started eroding the Left Guide Bund (LGB) of Jinnah Barrage¹⁴. As this critical training arm of the Barrage began to fall, Left Marginal Bund (LMB) stood threatened. Beyond this earthen embankment (LMB) lay a large human settlement of Districts Mianwali, Bhakkar and Layyah almost unaware of the devastation underway within the protected confines of the Barrage.

2.2. Flustered, inexperienced and ill equipped flood managers fought a losing battle till a local cement company¹⁵ came to their rescue and supplied them the basic tool required for flood fighting – boulders and stones. This fundamental flood fighting material was astonishingly missing in the arsenal of the flood managers at the Barrage and amounts to a criminal omission.

2.3. By the time the erosion was arrested, Left Guide Bund had been eaten up by the rapacious flood waves and nothing remained of it. For the first time in the history of the Barrage, Breaching Section located in the Right Marginal Bund (RMB) was blasted open under the stewardship of the Pakistan Army but it could not save the LGB.

2.4. Roaring River Kurram flows into Indus as it leaves Jinnah Barrage (Kalabagh) for Chasma Barrage, adding to its ferocity. As a result, exceptionally high flood of 10,38,000 Cfs, far above the design capacity¹⁶ of Chasma Barrage successfully passed through under the able supervision of its flood managers (i.e., WAPDA). Chasma's performance must have temporarily allayed the fears of the nervous flood managers downstream at Taunsa. But the nightmare was yet to begin and the worst was still to come.

2.5. Indus charged downstream towards Taunsa Barrage¹⁷. Once again, it was received by the same breed of unprepared and ill equipped flood managers of the I & P Department. Before reaching the weir gates, the flood breached Left Marginal Bund (LMB), a partially pitched earthen embankment (bund), a rampart to protect District Muzzafargarh and its people, if ever Indus swell in anger. The breach in LMB took place at RD 32+000 (more popularly known as Abbaswala) unleashing 1,25,000 Cfs of roaring flood towards human settlement of District Muzzafragarh.

¹⁰ a severe flood - (the Deluge) the biblical Flood (recorded in Genesis 6-8)

¹¹ starting on 28th July, 2010.

¹² in KPK

¹³ Not to mention its devastating effects on KPK but as the Report pertains to Punjab, the starting point and focus has been portion of River Indus within the Province of Punjab.

¹⁴ District Mianwali – See Chapter-3

¹⁵ Maple Leaf Cement Company Limited, Mianwali.

¹⁶ i.e., 9,50,000 Cfs

¹⁷ District Muzzafargarh- see Chapter 4

2.6. The unkempt and poorly watched embankment (LMB), which sat on an old creek fell due to foundational failure, giving thundering Indus an opening to surge ahead. The unmaintained, abused and neglected Sunawan bund - the second line of defense, could hardly resist the angry Indus, which went marching down into District Muzzafargarh, breaching the retention walls of Taunsa Punjnad (TP) Link Canal, Muzzfargarh Canal and ruthlessly damaging structures that came in its way. The tragedy had begun.

2.7. As the mighty Indus got derailed, it dictated its own course through human habitation brutally displacing people and their livestock besides damaging crops and buildings. The remaining discharge passed through Taunsa Barrage without causing any damage. Shuddered out their slumber, the flood managers stated to have worked tirelessly to tame the heady waters. Before the breach of LMB, the team of flood managers at Taunsa put up a fight on the right side of the Barrage in defending Spur no. 5, while the relatively less attended LMB on the left side of the Barrage, gave in.

2.8. At the LMB, the inexperienced flood managers saw the boils come out in the bed of Tibba Minor – a channel flowing along side LMB in that reach (RD 32 to 44) but failed to read and assess the piping action that had been set in motion from right under the foundation of the bund. Instead of covering the entire reach of Tibba Minor that flowed alongside LMB, they simply attended to the earlier boils at RD 35-36. As a result, the boils at RD 32 could not be contained and the LMB gave way. Even the dream team sent by the Secretary I & P, a night before, could not read the connection between the boils, the Tibba minor and the LMB. Surely, a competent, experienced and a well prepared flood manager, who had read the Sind Bund Manual on boils coming out of the bed of an adjacent water course would have easily sensed that fatal piping action had begun right under the LMB and unless the entire reach of Tibba Minor was covered with sand and stones to shut down the exist gradient, LMB would fall.

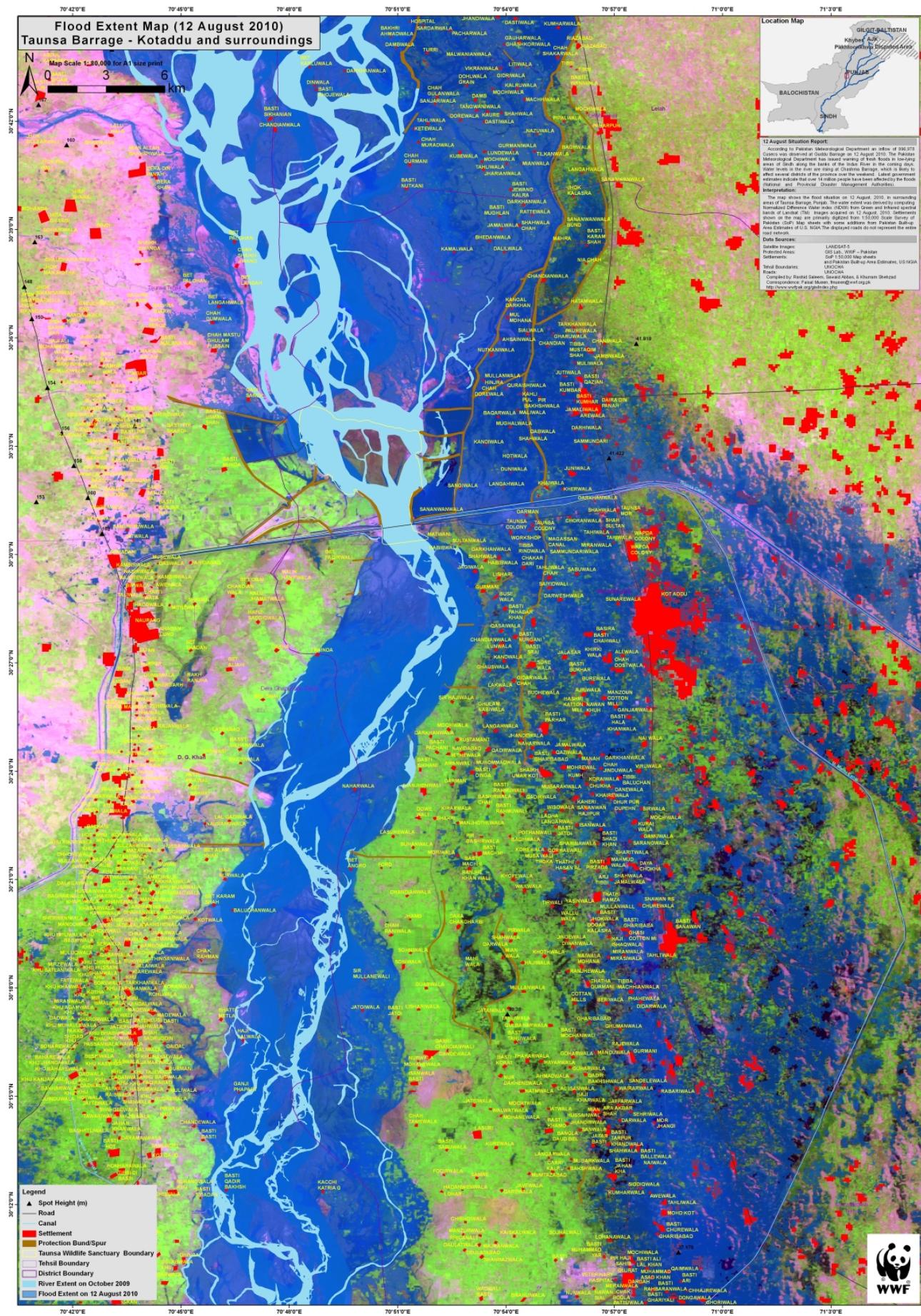
2.9. Never has Indus met Chenab before the confluence at Punjnad, but flood created history, as Indus met Chenab at Shehar Sultan much before Punjnad.

2.10. Downstream Taunsa the flood breached Jampur Flood Bund¹⁸ in District Rajanpur and overtopped Fakhar Flood Bund, leaving Mithankot unguarded. Once again the flood fighting team at these Bunds were of no consequence. [Their presence was as good as their absence.](#)

2.11. On the whole the flood managers of I & P Department saw the glorious Indus pass by, knowing little what to do. Even though they took pains to show us how zealously they had fought the flood – but to us it was no more than a bunch of inexperienced, incompetent, ignorant and nervous flood managers¹⁹, pirouetting and gyrating in meaningless frenzy - without any preparedness, plan, equipment or strategy. It appeared to us that the flood managers of the I & P Department had laid down their arms and given up on floods, thinking of them as a tale of the past. The failure in the recent floods and inability of the team of

¹⁸ See Chapter 5

¹⁹ Dealt in detail in the Main Report.



Source: WWI

flood managers reminds us of a nursery rhyme called “Humpty Dumpty” which we read in our childhood:

“Humpty Dumpty had a great fall.
All the king's horses and all the king's men
Couldn't put Humpty together again.”²⁰

2.12. The ferocious flood left Punjab to play more havoc downstream.

3. THE FLOOD TRIBUNAL

3.1. To investigate the causes that turned this blessing (flood) into a tragedy, the Provincial Government constituted a Court of Inquiry referred to as the **Judicial Flood Inquiry Tribunal** in this Report. The investigation, analysis, findings and recommendations of the Tribunal are in the Main Report. This overview is just a flavour of what is to follow.

3.2. Flood Inquiry Tribunal was constituted on 1-9-2010 by the Government of the Punjab to inquire into the causes of breach of the major embankments namely: LGB at Jinnah Barrage, LMB at the Taunsa Barrage, Jampur Bund and the Fakhar Flood Bund and to fix responsibility on the delinquents besides giving other recommendations.

3.3. The Tribunal commenced proceedings on 15th of September, 2010 and concluded its Report after hearing the flood affectees, public complainants, the key departments, international experts and after carrying out field visits, detailed deliberations and inhouse research.

4. SCOPE OF THE TRIBUNAL

4.1. The Tribunal closely studied the construct of the “flood control” system in existence and its application in combating the recent floods besides evaluating the ability and capacity of the flood managers in coping with flood emergencies. The Tribunal stood removed from the popular departmental view that the recent exceptionally high floods were unprecedented, implying thereby, that breaches were a fait accompli and largely beyond human control.

4.2. The Report first zooms in to probe the immediate causes of breach and then zooms out to study the systemic flaws that have played a role in the recent chaos and failure. The Report concludes with policy recommendations for the way ahead in combating floods in future.

5. INQUIRY & FINDINGS

²⁰The Oxford Dictionary of Nursery Rhymes (Oxford: Oxford University Press, 1951, 2nd edn., 1997)

5.1. The immediate causes of breach have been a result of poor governance and mismanagement of the Barrages and Embankments by the I & P Department. At Jinnah Barrage the weir gates (right side) remained closed during medium flood generating pressure on the LGB. Absence of reserve stones made the flood fighting plan totally ineffective, till miraculously stones were provided by a local cement company and the erosion was arrested before reaching the LMB. At Taunsa Barrage, the confusing management structure under the PMO, violation of regulations and poor flood fighting resulted in collapse of LMB at RD 32-33 and then subsequently at RD 34-40. Jampur Bund breached at many places, once again due to poor maintenance, weak vigilance and shoddy pre flood preparedness. Fakhar Flood Bund breached due to over topping for similar reasons.

5.2. The popular notion that the breach of LMB at Taunsa Barrage was under political duress in order to save valuable land on the right side of the Barrage was not substantiated by evidence before us. Pond area on both sides, however, is encroached by influential locals²¹ of the area seemingly in collusion with the I & P Department.

5.3. Floods cannot be contained by artificial structures. Floods are to be considered as a natural bounty that brings agricultural fecundity and economic prosperity. They recharge the aquifers and enrich the soil. Flood Control is therefore a misnomer. Flood resilience, flood mitigation, flood risk assessment and management are the terms of the day - leading to an Integrated and holistic Flood Management Plan – which is the way ahead.

5.4. To our dismay, we found out that since independence, I & P Department, Federal Flood Commission (FFC) or the Planning Commission have not developed an Integrated Flood Management Plan for the country. FFC's National Flood Protection Plans I, II and III give a robust prefatory start but no more. These Plans are a huge misnomer- they are actually a compendium of flood schemes which are the brain child of the zonal irrigation chiefs and the local politicians. FFC has not injected any vision or drawn up a Plan of its own for the country – this is against its grain and the legal mandate it enjoys. FFC has, therefore, been a disappointment.

5.5 The closest the flood sector institutions got was to develop a [DRAFT National Water Policy](#)²² which simply carries a segment on flood management. Even the said Policy hangs in the air without legs of approval since 2005. Shameful neglect indeed.

5.6. The compendium of existing regulations²³ dealing with flood management, in some cases remained unread and in others, recklessly disregarded by the flood managers.

5.7. The flood managers besides being reckless and complacent, did not possess the requisite professional education or experience to merit posting on a barrage or an

²¹ One family is in possession on the basis of a stay order from the Hon'ble Lahore High Court (Multan Bench).

²² Mark 142

²³ Barrage Regulations, Flood Fighting Plans, MIP, Sind Bund Manual and FFC Manual.

embankment which demands best of the best. This questions the stewardship of the Department and its accountability mechanism by the Provincial Government. What germinates all this - mal governance, bureaucratic sluggishness, corruption, poor human resource, absence of research, lack of training, poor leadership, lack of political will - to mention a few.

5.8. While the official literature boasts our irrigation system to be world's best contiguous irrigation network – the main institution in existence for its management and supervision i.e., I & P Department, lacks the vibrance and the dynamism to lead the irrigation sector, in general, and the flood sector in particular. The reality gets more gruesome when we realize that the same department is incharge of managing, conserving and ensuring the sustainability of the world's most expensive resource – WATER, for us and our future generations.

5.9. I & P Department being the lead provincial department dealing with fresh water has little to show in the area of research and development (in the context of floods atleast)- We were surprised to note that the I & P Department had not factored in climate change or climate variability in the flood fighting strategy or in their future water management strategy. Similarly, PMD and FFD being the principal weather and flood forecasters displayed blunted alertness and rusted alacrity in reading the weather. At a deeper level PMD and FFD have no cutting edge research on monsoons or climate change and seem to make little of the changing weather patterns in the country. We found our flood guardians off guard.

5.10. In this new world of climate change and global warming, of extreme weathers and innovative irrigation techniques, Pakistan seems not to have made an appreciable advance. We have failed over the last 63 years to develop our irrigation system to meet the requirements of the 21st century, to develop our most important economic resource i.e., agriculture. Our hill torrents- a valuable fresh water resource, which if wisely harvested is a cornucopia- but the hill torrents remain untamed and cause havoc almost every flood season.

5.11. If the Governments²⁴ fail to develop integrated flood management plan in the coming years, monsoon rains coupled with glacial melt i.e., abundance of freshwater, will go to waste down the Arabian Sea- not to mention the ghastly havoc it will play when it flows downstream through the country. We need to store water for our sustainable development, for combating droughts and for the security of our future generations. This intergenerational equity is a scared trust. It is time to wake up and soon.

²⁴ Federal and Provincial Governments

6. RECOMMENDATIONS

6.1. The report provides three sets of recommendations preceded by detailed findings. First set recommends penalties for the flood managers in the shape of departmental proceedings under relevant service rules and initiation of criminal proceedings [under sections 166, 167, 283, 322, 427 and 431](#) of the Pakistan Penal Code (PPC) alongwith immediate suspension of all the concerned flood managers and replacement of Secretary from the I & P Department. Second set of recommendations deal with systemic deficiencies like absence of flood plain and hill torrents management, weak structure of the I & P Department, ineffectiveness of FFC and lack of coordination between other key departments in facing floods. The third set provides recommendations for developing an integrated flood management plan adapting to the vulnerabilities of climate change.

6.2. [The summary of the recommendations has not been provided, intentionally. We would like that the Provincial Government and especially the I & P Department to read this Report in full.](#) During the proceedings we noted that Government Departments think and plan on the basis of generic POWER POINT PRESENTATIONS and pay little attention to detail, depth and analysis. It is axiomatic that “devil is in the detail.” The Departments will have to change-good planning requires far more detail, deliberation and thought. [Government Departments and I & P Department in particular will have to move from generic to specific. Let this Report be a start!](#)

6.3. We hope that this labour of love is taken as the second awakening. We could have conveniently concluded our Report after addressing the technical causes of breach, but then, we sensed the gravity and seriousness of the issue at hand (flood resilience) and the corresponding fragility and feebleness of the flood sector department and authorities. We, therefore, decided to go the extra mile to find the right construct, which can provide a permanent fix. We think this Report points in that direction. It is now for the provincial and national leadership, the policy makers and the flood managers to take up the challenge and up the ante.

7. PUBLIC ACCESS

7.1. We do not expect that this Report will be wrapped in secrecy and shelved in some dark confidential record room of the Provincial Government. What we wish and hope is that this Report will be widely circulated and boldly put out in the press and uploaded on government websites so that the flood affectees and public at large, who so eagerly participated in the flood inquiry get to know of the outcome of the JUDICIAL FLOOD INQUIRY TRIBUNAL. This Report might not heal their wounds but might provide some succour and relief.

7.2. It needs to be underlined that FREEDOM OF INFORMATION is now a fundamental right under article 19-A of the Constitution of the Islamic Republic of Pakistan, 1973. Therefore, this Report cannot be denied public access.

7.3. A copy of the Report shall be retained at the Judges' Library at the Lahore High Court, Lahore along with attached documents which spread over 91 appendices. After the Report is duly released to public by the Provincial Government, any person desirous of getting a copy of the Report or attached documents can apply to the Lahore High Court for a copy in accordance with law.

7.4. This Report is officially handed over to the Secretary, Home Department, Government of the Punjab by the Registrar of the Tribunal today in an open assembly at the Judges' Library at the Lahore High Court, Lahore.

7.5. Before parting, we would like the flood managers to remember that:

افراد کے ہاتھوں میں ہے اقوام کی تقدیر
ہر فرد ہے ملت کے مقدر کا ستارا
(اقبال)

(Justice Syed Mansoor Ali Shah)
Chairman

(Abdul Sattar Shakir)
Member

(Shafqat Masood)
Member

Dated: _____



CHAPTER 2

Without the Indus....the country's history might read as a dull narrative of a people living and dying in a harsh climate surrounded by rugged mountains and unforgiving arid lands¹.

CONSTITUTION OF THE TRIBUNAL & ITS TERMS OF REFERENCE (TORs)

1. CONSTITUTION OF THE JUDICIAL FLOOD INQUIRY TRIBUNAL

1.1. Tribunal of Inquiry was constituted vide notification² dated 1-9-2010 issued by the Home Department, Government of the Punjab [under the West Pakistan Tribunals of Inquiries Ordinance, 1969](#) (II of 1969)³ ("Ordinance") with the following [Terms of Reference](#):

- i) To inquire into the causes of breaches at main Bunds including Jinnah Barrage, Taunsa Barrage, Jampur and Mithan Kot and to ascertain whether prescribed procedure was followed by I & P Department with regard to the induced breaches.
- ii) To inquire into the causes of consequent breaches in Canal Network, Roads, Bunds and Drains and to furnish detailed report with regard to cases of malfeasance⁴, if any, on part of I & P Department, others agencies or locals.
- iii) To fix responsibility on the delinquent(s) in cases of malfeasance.
- iv) Any other recommendations that the Tribunal of the Inquiry may deem appropriate to make in the facts and circumstances of the cases.

1.2. The Tribunal of Inquiry (initially) comprised the following:

- i. [Mr. Justice Syed Mansoor Ali Shah](#), Hon'ble Judge, Lahore High Court, Lahore.
- ii. [Mr. Mansoob Ali Zaidi](#), (Retd) Secretary, I&P Department.
- iii. [Mr. Abdul Sattar Shakir](#), Dean (Civil Engineering), UET, Lahore.

¹ Shane Mountjoy, *The Indus River – Rivers in World History*. Chelsea House Publishers, Philadelphia 2005.

² Schedule -1

³ Schedule-2

⁴ the performance by a public official of an act that is legally unjustified, harmful, or contrary to law; wrongdoing (used esp. of an act in violation of a public trust)- see: Dictionary.com

The Tribunal met for the first time on 4-9-2010 and commenced formal proceedings on 14.09.2010 under Section 8 of the Ordinance.

2. RE-CONSTITUTION OF THE TRIBUNAL.

2.1. On 21.09.2010, Mr. Mansoob Ali Zaidi (Member) stepped down from the Tribunal on the pretext of pressing prior commitments⁵. As a replacement, Mr. Shafqat Masood, Ex-Chief Engineer, I&P Department and ex-Chairman and ex-Member, Indus River System Authority (IRSA), was appointed as the new Member of the Tribunal, vide notification dated 25-9-2010⁶,

3. PROCEDURE OF THE TRIBUNAL

3.1. The Tribunal of Inquiry (during the hearings and) for this Report shall be referred to as the JUDICIAL FLOOD INQUIRY TRIBUNAL, 2010 ("Tribunal").

3.2. The Tribunal decided to keep the hearings private (as opposed to open hearings) in order to encourage and provide confidence to the flood affectees and other concerned persons to come forward and boldly depose before the Tribunal, without the risk and fear of being exposed or influenced by stronger elements of the society. Private hearing was also more suitable for carrying out cross examination of the witnesses.

3.3. Quorum of the Tribunal was fixed as two members inclusive of the Chairman. This was only when the third member was unable to attend due to any disability including resignation from the Tribunal. It is for this reason that the Tribunal continued as a Two Members Tribunal when Mr. Mansoob Ali Zaidi stepped down on 21.09.2010 till Mr. Shafqat Masood (the new member) joined the Tribunal on 03.10.2010. On 24-11-2010 the Tribunal completed its scheduled hearings and authorized the Chairman to call additional witnesses or seek clarification on the evidence already on the record without the constitution of the Tribunal, hence redefining the quorum to be the Chairman for the above limited purpose. The Members were duly informed of all the hearings held after 24-11-2010.

4. SCOPE OF THE TERMS OF REFERENCE OF THE TRIBUNAL

4.1. Inquiry unfolded that the "causes" of breach were at several involving failure of public responsibility at multiple levels by different public officers in different public institutions. It transpired that this overt failure was merely symptomatic of a chronic dysfunctional institutional structure. Inquiry of the "Causes" of breaches could not be complete if restricted to merely regulatory and technical reasons that circulated around the event but required a "thinking behind floods" approach, a deeper probe to discern if there

⁵ Schedule- 3

⁶ Schedule-4

was more than met the eye. Without probing into the architecture of flood governance this inquiry would have been half-baked, inchoate and cosmetic.

4.2. The TORs were further qualified by the Tribunal to setup a meaningful roadmap for its investigation into the causes of the breaches. They are;

4.2.1. **“Area under Inquiry”** (AUI) to mean: Portion of River Indus within the Province of Punjab i.e., starting from Jinnah Barrage down to upstream Guddu Barrage.

4.2.2. Breaches to mean breach of LGB at Jinnah Barrage, LMB at Taunsa Barrage, Jampur Bund and Fakhar Flood Bund in District Rajanpur. Breaches in Canal Network, Roads, Bunds and Drains were a direct consequence of the breach of LMB at Taunsa Barrage and hence are not discussed separately.

4.2.3. To fully investigate whether there are technical, administrative and institutional causes of breach and to also discern if there is any political intervention or pressure that might have triggered administrative or institutional failure.

4.2.4. To fix responsibility on the delinquent(s) in cases of malfeasance. Malfeasance shall mean wrong doing of a public official or breach of trust by a public official.

4.2.5. Under **“any other recommendations,”** the Tribunal has formulated fundamental recommendations for the future of flood resilience and flood risk management in the Province.

5. PROCEEDINGS OF THE TRIBUNAL.

5.1. Tribunal ensured to provide best possible public access to the flood affectees, so that they could conveniently reach out to the Tribunal and make their submissions.

5.2. In order to hear the grievances of the flood affectees/public complainants⁷, the Tribunal decided to hold hearings in the affected Districts of Area Under Inquiry. For this purpose public notices⁸ were issued in the national dailies and local newspapers of the respective districts giving a detailed programme of the Tribunal and its visit to the said districts with the additional facility of registering or submitting their grievances with the local learned Civil Judges.

5.3. Concerned District and Sessions Judges were directed to nominate learned civil judge from every district (namely: Mianwali, Bakkar, Layyah, Muzzafrgarh, DG Khan and Rajanpur) to receive complaints on behalf of the Tribunal from the general public. The list of learned civil judges and the complainants are as under;

⁷ Schedule-5

⁸ Schedule-6

| Sr. # | Names of Judicial Officer with Designation | District |
|-------|--|----------------|
| 01. | Mr. Fayyaz Ahmad Zaheer Senior Civil Judge, D.G. Khan | D.G. Khan |
| 02. | Mr. Ghulam Mujataba Civil Judge, 1st Class Taunsa Sharif | D.G. Khan |
| 03. | Mr. Asad Ullah Siraj Civil Judge, 1st Class Jalalpur Pirwala | Multan |
| 04. | Mr. Rafaqat Ali Gondal Sr. Civil Judge, Muzaffargarh | Muzaffargarh |
| 05. | Mr. Muhammad Zubair Chughtai Civil Judge, 1st Class, Kot Addu | Muzaffargarh |
| 06. | Mr. Aasim Mansoor Civil Judge, 1st Class Ali Pur | Muzaffargarh |
| 07. | Syed Farrukh Hussain Shamsi Civil Judge, 1st Class Jatoi | Muzaffargarh |
| 08. | Rana Nasir Javed Civil Judge, 1st Class, Rajanpur | Rajanpur |
| 09. | Mr. Hassan Iqbal Civil Judge-cum-judicial Magistrate Jampur | Rajanpur |
| 10. | Malik Safdar Ali Jasra Senior Civil Judge, Bhakkar | Bhakkar |
| 11. | Ch. Javed Iqbal Saif Addl. District & Session Judge, Kallurkot | Bhakkar |
| 12. | Mr. Muhammad Tariq Jasra Civil Judge, 1st Class Darya Khan | Bhakkar |
| 13. | Mr. Javed Iqbal Ranjha Magistrate Section-30 Mankera | Bhakkar |
| 14. | Mr. Zahid Hussain Bakhtiar Civil Judge-cum-Judicial Magistrate Rahim Yar Khan | Rahim Yar Khan |
| 15. | Mr. Iftikhar Ahmad Civil Judge, Sadiqabad | Rahim Yar Khan |

| Sr. # | Names of Judicial Officer with Designation | District |
|-------|---|----------------|
| 16. | Mr. Fayyaz Hussain Civil Judge, Khanpur | Rahim Yar Khan |
| 17. | Mr. Muhammad Jehangir Ashraf Civil Judge, Liaqat Pur | Rahim Yar Khan |
| 18. | Mr. Khadim Hussain Superintendent o/o District & Session Judge Mianwali | Mianwali |
| 19. | Mr. Muhammad Ismail Jasra Civil Judge, Piplan | Mianwali |
| 20. | Mr. Khalid Yaqoob Civil Judge Isa Khel | Mianwali |
| 21. | Mr. Imran Muhammad Khan Civil Judge, Layyah | Layyah |

| Sr.No. | Names of public complainants. |
|--------|---|
| 1. | Ch. Muhammad Yousuf, Advocate, Kot Adu (IW-24). |
| 2. | Mr. Muhammad Younus Chandia s/o Ghulam Rasool, r/o Mauza Bhabar Ghair Mustaqil, Kot Adu (IW-25). |
| 3. | Mr. Asghar Ali Khan Pachar, Advocate, r/o Village Chaudhry, Tehsil Kot Adu (IW-26) |
| 4. | Syed Allah Bukhsh Shah r/o Tasneem Chah Basti Wazir Gadiwala, Mauza Tibba Mustaqil Sharqi, Kot Adu. (IW-27) |
| 5. | Malik Munir Ahmad, Advocate, Kot Adu. (IW-28) |
| 6. | Mr. Muhammad Ashraf Khan Rind s/o Manzoor Hussain Rind, former Nazim Union Council Bate Wala r/o Taunsa Barrage Colony, Tehsil Kot Adu. (IW-29) |
| 7. | Mr. Ghulam Abbas s/o Muhammad Bukhsh, r/o Ward No.14-C, Mohallah Khokhar Abad, Kot Adu (IW-31) |
| 8. | Mr. Rafique Ahmad Khan s/o Sardar Khan r/o Ward No.14-C, Kakkay Wala, Kot Adu. (IW-32) |

| | |
|-----|---|
| 9. | Mr. Khalid Hussain Khan s/o Lal Muhammad Khan r/o Mauza Bate Qaim Wala, Tehsil Kot Adu. (IW-33) |
| 10. | Mr. Ghulam Abbas s/o Dost Muhammad r/o Chah Abbas Wala Mauza Hanjrai Ghair Mustaqil, Sharqi, Kot Adu. (IW-34) |
| 11. | Mr. Qadir Bukhsh s/o Hamid Khan, r/o Basti Nutkani, Mauza Hanjrai Ghair Mustaqil, Daira Deen Panah near LMB Abbas Wala, Kot Adu (IW-35) |
| 12. | Mr. Wahid Bukhsh s/o Ghulam Haider r/o Chah Abbas Wala, Mauza Hanjrai Ghair Mustaqil Sharqi, Kot Adu. (IW-36) |
| 13. | Mr. Muhammad Mahiwal s/o Fateh Muhammad r/o Ward No.14-A, Mohallah Mandi Mawashian, Kot Adu (IW-37) |
| 14. | Mr. Muhammad Bukhsh s/o Qadir Bukhsh r/o Chak Abbas Wala, Hanjrai Ghair Mustaqil Sharqi, Kot Addu. (IW-38) |
| 15. | Malik Muhammad Ibrahim Hanjra s/o Muhammad Ismail, Ex-Nazim, Union Council Hanjra and News Reporter Nawa-e-Waqt, r/o Daira Deen Panah, Kot Adu. (IW-39) |
| 16. | Mr. Sabir Hussain s/o Ghulam Sarwar r/o Mauza Tapal, Tehsil Kot Adu (IW-40). |
| 17. | Mr. Ejaz Hussain s/o Ghulam Hassan r/o Chah Kandhi Wala, Mauza Kacha Patal, Tehsil Kot Adu. (IW-41) |
| 18. | Malik Muhammad Zaman s/o Peer Bukhsh r/o Daira Deen Panah, Tehsil Kot Adu. (IW-42) |
| 19. | Mr. Sabir Hussain s/o Manzoor Hussain r/o Mauza Janoon, Tehsil Kot Adu. (IW-43) |
| 20. | Mr. Muhammad Rafique s/o Azeem Bukhsh r/o Chah Bukhi Wala, Mauza Patal Ghair Mustaqil, Kot Adu. (IW-44) |
| 21. | Mr. Riaz Ahmad s/o Rahim Bukhsh r/o Daira Deen Panah, Tehsil Kot Adu. (IW-45) |
| 22. | Mr. Ghulam Mustafa s/o Ghulam Hussain r/o Daira Deen Panah, Kot Adu. (IW-46) |
| 23. | Syed Nadeem Hussain Shah s/o Syed Zamir Hussain Shah r/o Ward No.3, Daira Deen Panah, Kot Adu. (IW-47) |
| 24. | Mr. Ghulam Farid s/o Wahid Bukhsh r/o Daira Deen Panah, Kot Adu. (IW-48) |

| | |
|-----|---|
| 24. | Mr. Ghulam Farid s/o Wahid Bukhsh r/o Daira Deen Panah, Kot Adu. (IW-48) |
| 25. | Mr. Kamran Yasin s/o Ghulam Yasin r/o Tibba Mustaqil Gharbi, Daira Deen Panah, Kot Adu. (IW-49) |
| 26. | Mr. Ghulam Shabbir s/o Muhammad Kaloo r/o Daira Deen Panah, Kot Adu. (IW-50) |
| 27. | Mr. Ghulam Shabbir s/o Jawar Khan r/o Mauza Khai Doim Ghair Mustaqil, Tehsil Kot Adu. (IW-51) |
| 28. | Mr. Ghulam Abbas s/o Qadir Bukhsh r/o Mauza Khai Chak Awal, Chah Ghumni Wala, Tehsil Kot Adu. (IW-52) |
| 29. | Mr. Abdul Wahid Khan s/o Abdul Karim Khan r/o Railway Road, Daira Deen Panah, Kot Adu. (IW-53) |
| 30. | Mr. Muhammad Hanif s/o Khadim Hussain r/o Basti Samundri, Daira Deen Panah, Kot Adu. (IW-54) |
| 31. | Mr. Ahmad Khan s/o Muhammad Khan r/o Ward No.14-C, Kot Adu. (IW-55) |

| | |
|-----|--|
| 32. | Mr. Muhammad Akram s/o Qadir Bukhsh r/o Mauza Chaudhry Kot Adu. (IW-56) |
| 33. | Mr. Zafar Iqbal s/o Malik Mitha Thathal r/o Mauza Chaudhry, Kot Adu.(IW-57) |
| 34. | Mr. Muhammad Ayyub Khan s/o Mirza Abdullah Khan r/o Daira Deen Panah, Kot Adu.(IW-58) |
| 35. | Mr. Zia Javed Khan s/o Muhammad Bukhsh, r/o Mauza Faqir Wali, Tehsil Kot Adu. (IW-59) |
| 36. | Mr. Muhammad Imran Hassan s/o Riaz Hussain r/o Qureshi Town, Ward No.10 near Tehsil Headquarter Hospital, Kot Adu. (IW-61) |
| 37. | Malik Shahid Hussain Barar s/o Malik Allah Dewaya Barar, r/o Ward No.2, Faisal Colony, Kot Adu. (IW-62) |
| 38. | Mr. Shahid Hussain, Advocate, r/o City Tehsil Kot Adu. (IW-63) |
| 39. | Mr. Manzoor Hussain s/o Khuda Bukhsh r/o Ward No.4 Basti Ara, Daira Deen Panah, Kot Adu. (IW-64) |
| 40. | Mr. Muhammad Ishaq s/o Ghulam Haider r/o Basti Janoo, Daira Deen Panah, Kot Adu. (IW-65) |
| 41. | Mr. Muhammad Yousuf s/o Ghulam Hassan, r/o Mauza Bate Qaim Wala, Tehsil Kot Adu. (IW-66) |
| 42. | Mr. Nazir Ahmad s/o Karam Hussain r/o Mauza Wan Patta, Muzaffargarh. (IW-68) |
| 43. | Malik Kausar Abbas, Advocate, District Courts, Muzaffargarh.(IW-69) |
| 44. | Ch. Abdul Qayyum Kamboh, Advocate, Muzaffargarh. (IW-70) |
| 45. | Mr. Muhammad Iftikhar Qureshi, Advocate, District Courts, Muzaffargarh (IW-71). |
| 46. | Sh. Iftikhar ul Hassan, Advocate, District Courts, Muzaffargarh.(IW-72) |
| 47. | Mr. Sanaullah Khan s/o Shair Ali Khan r/o Pai Khel, Tehsil & District Mianwali. (IW-113) |
| 48. | Mr. Habib Ullah Khan Niazi, Advocate, Muslim Colony, Mianwali.(IW-114) |
| 49. | Mr. Taj Muhammad Jora s/o Ali Muhammad, Caste Jora, age 44 years, Reporter, r/o Mianwali. (IW-115) |

| Sr. # | Names of Voluntary Witnesses |
|-------|---|
| 1. | Dr. Zulifqar Ali, Professor, Hydraulic / Hydropower Engineering, Civil Engineering Department, UET, Lahore (IW-1) |
| 2. | Mr. Sultan Barq, s/o Mian Muhammad Ibrahim Barq, r/o Ali Pur, Muzaffargarh (IW-2) |
| 3. | Mr. Aurangzeb Shaafi Burki, s/o Abdul Shaafi Khan Burki, r/o 215-GG, D.H.A. Lahore (IW-83) |

5.5. The Tribunal held hearings in following places:

| District | Location |
|---------------------------|--|
| i. District Mianwali | Irrigation Rest House & Wapda Rest House in Chasma |
| ii. District Muzzafargarh | Taunsa Barrage, District and Sessions Court & Court of Senior Civil Judge, Kot Addu. |
| iii. District D.G. Khan | Circuit House |
| iv. District Rajanpur | Court of Senior Civil Judge. |

The Tribunal was always open to receive walk in complaints while visiting the affected districts.

5.6. The Tribunal traveled through Districts Mianwali, Bakkhar, Layyah, Muzzafargarh, D G Khan and Rajanpur inspecting the Bunds, examining departmental representatives and granting hearings to the complainants. Pictorial travelogue of the Tribunal has been documented and made a part of this Report⁹.

5.7. Thereafter, notices were issued to a number of departments, authorities and officers¹⁰ to submit written position papers and to personally appear before the Tribunal. Departments were mostly heard at the, Lahore High Court¹¹, Lahore, which formed the permanent seat of hearing of the Tribunal. At Lahore the hearing commenced at 9:30am and continued till late afternoon everyday (except holidays or outstation travel days).

5.8. Tribunal has placed reliance on evidence tendered by the witnesses including their oral depositions, written positions papers, power point presentations, maps, drawings and photographs¹². Tribunal also relied on the expert opinion given by two international experts, local experts¹³/voluntary witnesses¹⁴ including technical inputs from PRO, Irrigation Research

⁹ Chapter-10 of the Report.

¹⁰ Schedule-8

¹¹ The New Library

¹² List of Exhibits and Marks is at Schedule 9 & 10

¹³ namely: Mr. John Briscoe (Harvard University) and Mr Adil Najam (Boston University)- see Schedule-11

¹⁴ Schedule-12

Institute, I & P Department, reports of three local Commissions¹⁵ constituted by the Tribunal

5.9. Tribunal has also placed reliance on Books¹⁶ and international research articles¹⁷. Assistance in this regard by research clerks¹⁸ (student volunteers), especially Syed Azeem Ali Shah¹⁹ (a Phd student) from the Lahore University of Management Sciences (LUMS) under the tutelage of Mr Rafay Alam, Advocate and materials from WWF and LEAD, Islamabad are also acknowledged with thanks. The efficient management of the affairs of the Tribunal by Mr. Irfan Saeed (Additional District and Sessions Judge), Registrar of the Tribunal, laborious proof reading of the Report by Mr. Shahid Shafi, Staff Officer (Reader at the Lahore High Court) of the Tribunal, the indefatigable typing skills of Syed Zahid H. Shah, Iqbal Hanif and Muhammad Tahir and the valuable assistance rendered by each and every member of the Secretariat of the Tribunal is acknowledged with thanks.

5.10. Tribunal constituted three Local Commissions; (i) to assess the status of pond area/ belas at Taunsa Barrage, (ii) for technical evaluation of the breach of LMB at Taunsa Barrage and (iii) for a factual report on the status of the control room at Taunsa Barrage.

5.11. Irrigation Research Institute, I & P Department was directed to run a physical model of Jinnah Barrage at their Nandipur Research Station to get a qualitative analysis on the breach of LGB²⁰. The report of the IRI is on the record and discussed in this Report.

5.12. The travel, lodging and secretarial expenses of the Tribunal incurred during the inquiry were settled by the I & P Department. Summary of the total expenditure incurred has been placed on the record²¹.

5.13. Complete Order Sheet of the Tribunal, Statements of Witnesses and the documents (exhibits or marks) filed before or collected by the Tribunal are placed on the record in 91 APPENDICES to this Report duly stamped. Copy of this Report alongwith the Appendices will be placed in the Judges' Library at the Lahore High Court. Any person desirous of obtaining a copy can apply to the copy branch in accordance with law after the Report has been released to the public by the Government of the Punjab.

¹⁵ Marks 78, Ex I.W. 77/1 & Ex I.W./110/1 - (see also Appendices 3, 4 & 5)

¹⁶ Schedule-13

¹⁷ Schedule-14

¹⁸ Schedule-16

¹⁹ He traveled with the Tribunal and assisted in compiling and indexing the soft copies of the evidence submitted before the Tribunal.

²⁰ Opinion was also sought on the breach of LMB at Taunsa Barrage.

²¹ Schedule-17



CHAPTER 3

The Indus River has served as a border, a vital source of agricultural irrigation, and the stage on which a diverse group of peoples, languages, and religions have gathered for more than 4,000 years.¹

JINNAH BARRAGE



¹ Shane Mountjoy, *Rivers in World History, The Indus River*, Chelsea House Publishers, Philadelphia (2005)



1. INTRODUCTION

1.1. Jinnah Barrage (also referred to as the “Kalabagh Headworks”) is situated on River Indus about three miles downstream of Kalabagh town, District Mianwali. It is managed, regulated and maintained by Kalabagh Headworks Division of the Sargodha Zone of I & P Department. The Barrage was completed in 1943 and commissioned in 1947. Thal Canal (capacity 10,000 Cfs) off takes from the left flank of the Jinnah Barrage and for irrigation purposes is split into Main Line Upper (MLU) and Main Line Lower (MLL). Thal Canal has a length of 57.73 miles and irrigates **21 lac² acres** of land in Mianwali, Khushab, Bhakhar, Layyah and Muzaffargarh districts³.

1.2. Normal pond level at the Barrage is maintained at **R.L. 692.50** by manually operating regulation gates. The Barrage is designed to pass normal flood discharge of **9.50 lac Cfs** and an ultimate capacity to pass a flood discharge of **11 lac Cfs**. The last maximum flood at the Barrage was in 1976, when **8.62 lac Cfs** of flood passed without causing damage to any component of the Barrage. This year a total discharge of **9,36,453 Cfs** passed through the barrage and alleged **1,51,392 Cfs** through the designated breaching section operated during

² One Lac= 100,000

³ Flood Fighting Plan, 2010 (Ex I.W.6/1)

the floods. Breaching section at the Barrage was operated for the first time ever during the recent floods (2010)⁴. We were informed that Jinnah Barrage has been declared as a sick barrage and is now up for rehabilitation by the PMO.

1.3. According to the histogram of highest flood at Jinnah Barrage⁵, exceptional high flood passed the Barrage on 02.08.1976 with a downstream discharge of 8,61,965 Cfs and then after 16 years with a downstream discharge of 8,46,040 Cfs on 10-9-1992. Since 1992 the Barrage has faced one **very high flood** and one **high flood**. Extract of the histogram from 1992 to-date is re-produced hereunder.

Histogram of Highest Floods at Jinnah Barrage

| Year | Date | U/S guages | D/S guages | D/S discharge | Remarks |
|------|-----------|---------------|---------------------|---------------------|--------------------|
| 1992 | 10/9/1992 | 692.50 | 688.40 | 846040 | Exceptional High |
| 1993 | 23/7/1993 | 692.50 | 680.60 | 355569 | Low |
| 1994 | 13/7/1994 | 692.50 | 683.40 | 491375 | Medium |
| 1995 | 27/7/1995 | 692.50 | 684.00 | 544663 | High |
| 1996 | 16/8/1996 | 692.50 | 682.00 | 441410 | Medium |
| 1997 | 28/8/1997 | 692.50 | 684.90 | 654179 | Very High |
| 1998 | 14/7/1998 | 692.50 | 682.10 | 473221 | Medium |
| 1999 | 10/8/1999 | 692.50 | 682.10 | 456146 | Medium |
| 2000 | 02/8/2000 | 692.50 | 678.30 | 261141 | Low |
| 2001 | 24/7/2001 | 693.00 | 681.70 | 412238 | Medium |
| 2002 | 14/8/2002 | 693.00 | 681.30 | 395589 | Medium |
| 2003 | 3/8/2003 | 692.50 | 683.00 | 399352 | Medium |
| 2004 | 11/7/2004 | 693.00 | 679.70 | 245067 | Low |
| 2005 | 2/7/2005 | 693.00 | 685.80 | 515073 | High |
| 2006 | 6/8/2006 | 692.00 | 684.50 | 489606 | Medium |
| 2007 | 16/8/2007 | 693.00 | 682.10 | 359912 | Low |
| 2008 | 5/8/2008 | 693.00 | 681.00 | 336530 | Low |
| 2009 | 17/8/2009 | 693.50 | 681.20 | 348320 | Low |
| 2010 | 30/7/2010 | 692.50 | 689.90 ⁶ | 936453 ⁷ | Exceptionally High |
| 2010 | 1/8/2010 | 693 | 689.55 | 870000 | Exceptionally High |

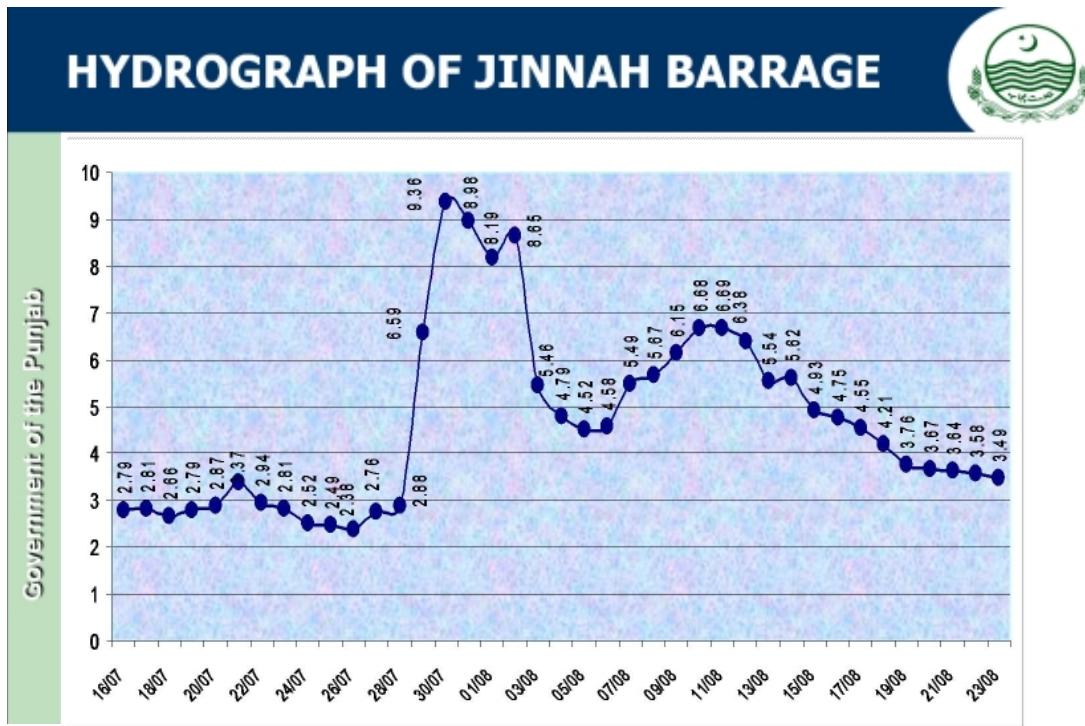
Table : Source: Flood Fighting Plan , 2010 & Presentation of C.E. Sargodha Zone (Ex I.W 119/1).

⁴ Flood Fighting Plan 2010, Sargodha Irrigation zone, Sargodha (Ex I.W. 6./1) and statement of I.W. 6.

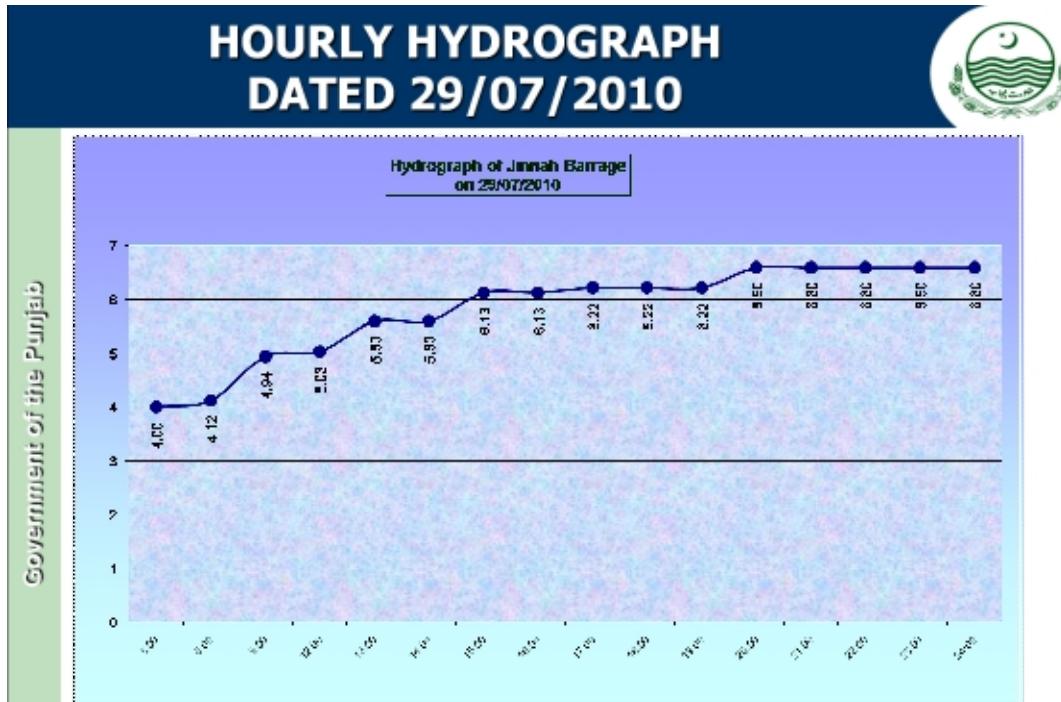
⁵ Annexure B of Flood Fighting Plan, 2010

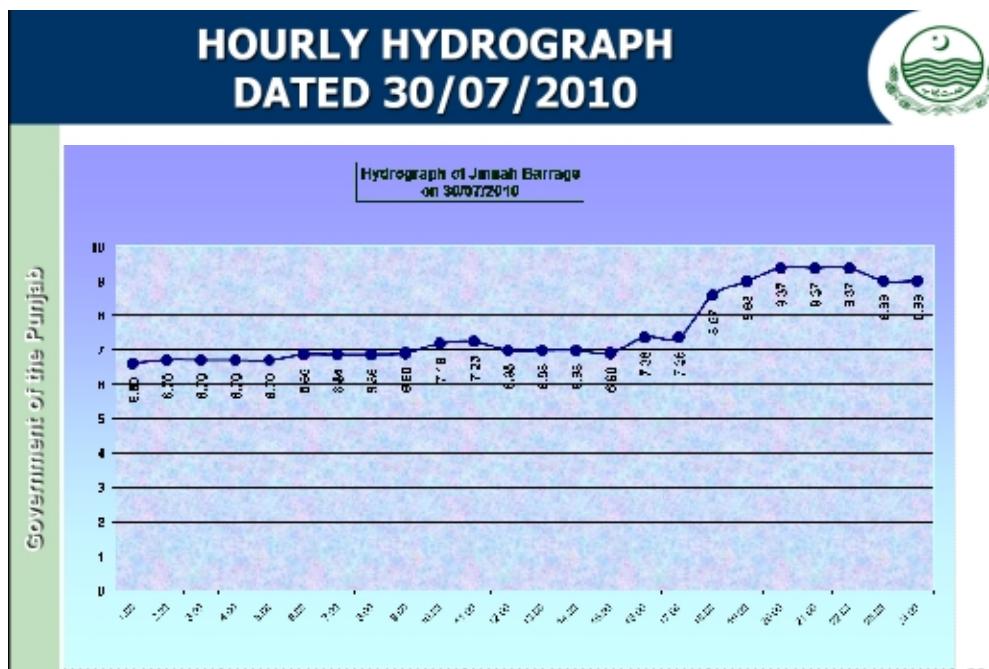
⁶ Ex I.W. 5/3

⁷ Ex I.W. 5/3



Hydrograph at Jinnah Barrage - source I & P Department





1.4. It is the first barrage after Tarbela Dam on Indus River. The time lag of water flow from Tarbela down to Taunsa is as follows:

| RIVER INDUS TIME LAG OR TRAVEL TIME (normal flow i.e., below low flood level) ⁸ | |
|--|---|
| <u>Tarbela to Attock (Khairabad)</u> | |
| 32 Km | 2.0 Hours ⁹ |
| <u>Attock to Kalabagh (Jinnah Barrage)</u> | |
| 168 Km | 14 Hours ¹⁰ 26 Hours ¹¹ |
| <u>Kalabagh (Jinnah Barrage) to Chashma</u> | |
| 59 Km | 4 Hours ¹² (or 12 Hours ¹³) |
| <u>Chashma to Taunsa Barrage</u> | |
| 256 Km | 16.5 Hours ¹⁴ (72 hours ¹⁵) |
| <u>Taunsa to Mithankot</u> | |
| | 48 Hours ¹⁶ |

Table : Source: C.E. Sargohra Zone, I & P Department and PMD

⁸ Ex I.W. 119/1

⁹ I & P Department

¹⁰ I & P Department

¹¹ SOP of FFD, PMD

¹² I & P Department

¹³ SOP of FFD, PMD

¹⁴ I & P Department

¹⁵ ibid

¹⁶ ibid

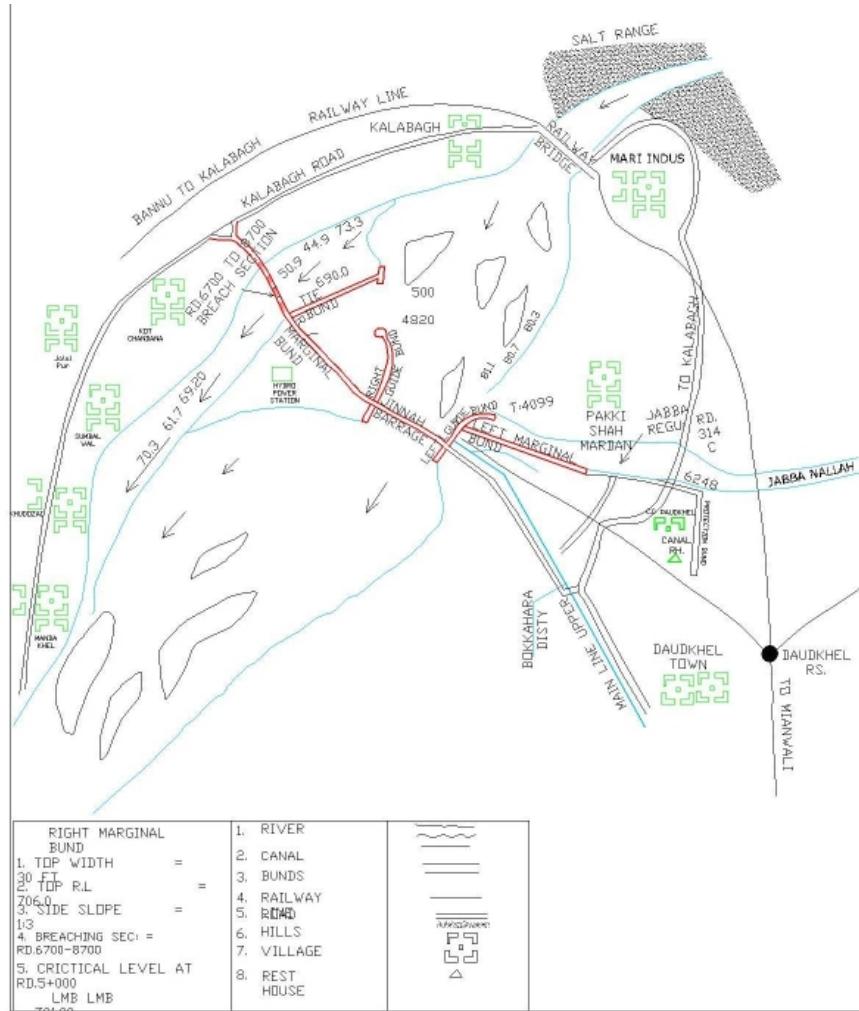
Time Lag of Flood 2010 in River Indus¹⁷

| Reach | Distance (KM) | Normal Time (in hours) | Flood 2010 Time (in hours) |
|---------------------|---------------|------------------------|----------------------------|
| Tarbela to Kalabagh | 209 | 33 | 27 |
| Kalabagh to Chasma | 68 | 12 | 10 |
| Chasma to Taunsa | 237 | 60 | 50 |
| Taunsa to Guddu | 270 | 84 | 74 |

Table 3: source- I & P Department (Jan, 2010)

1.5. The categories of floods have been described as follows;

INDEX PLAN OF KALABAGH HEADWORKS



¹⁷ Mark 148

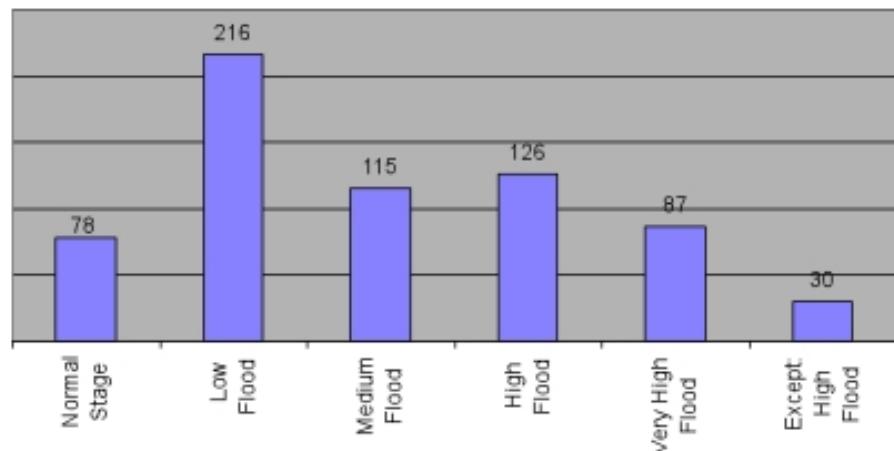
| <u>RIVER INDUS D/S KALABAGH</u> | |
|---------------------------------|------------------------------|
| LOW FLOOD | 2.50 Lac Cfs to 3.75 Lac Cfs |
| MEDIUM FLOOD | 3.75 Lac Cfs to 5.00 Lac Cfs |
| HIGH FLOOD | 5.00 Lac Cfs to 6.50 Lac Cfs |
| VERY HIGH FLOOD | 6.50 Lac Cfs to 8.00 Lac Cfs |
| EXCEPTIONALLY HIGH FLOOD | Above 8.00 Lac Cfs |

Source: Flood Fighting Plan, 2010 Sargodha Irrigation Zone¹⁸.

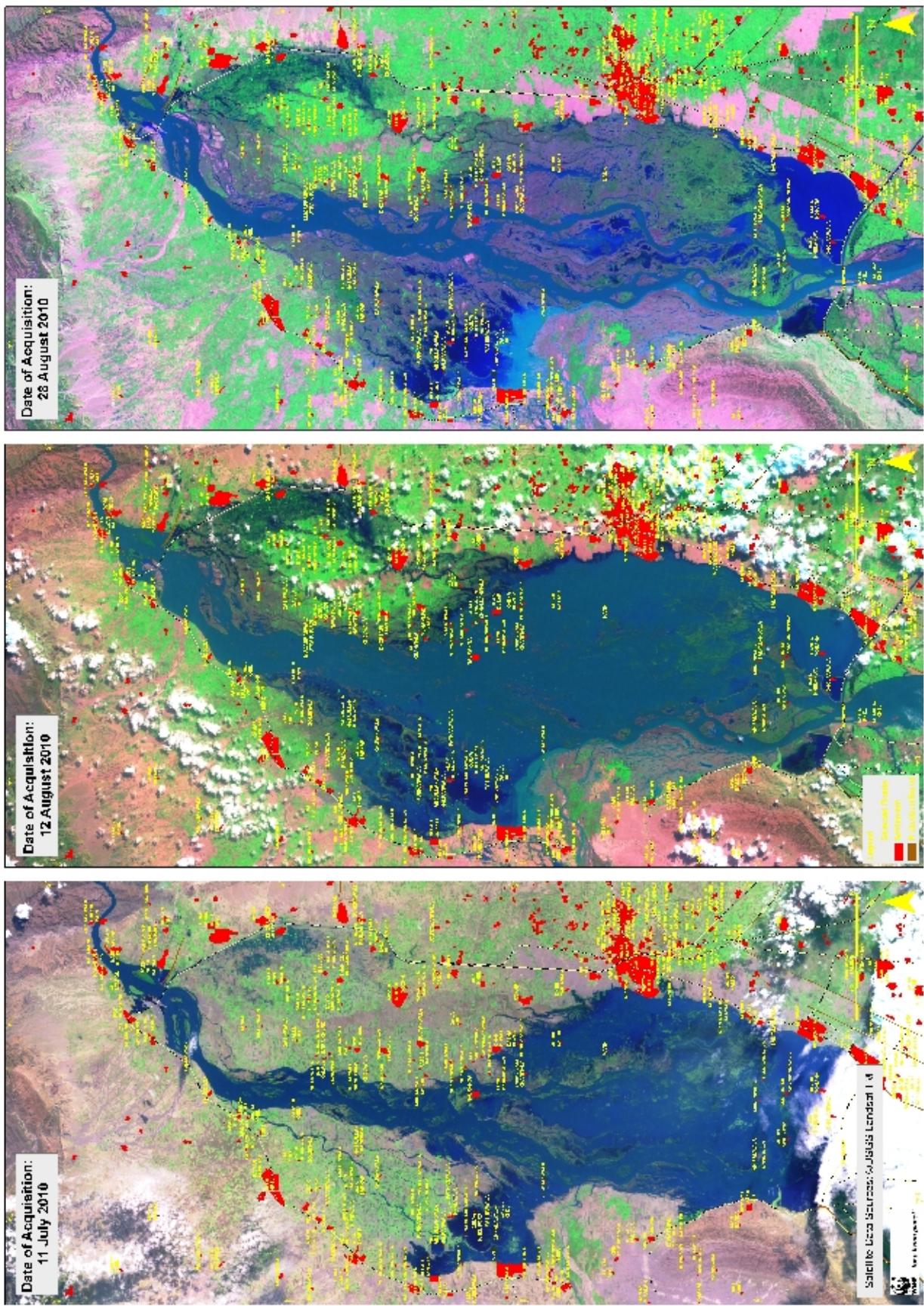
FLOOD DURATION (HRS) AT JINNAH BARRAGE FROM 16.07.10 TO 12.08.10



Government of the Punjab

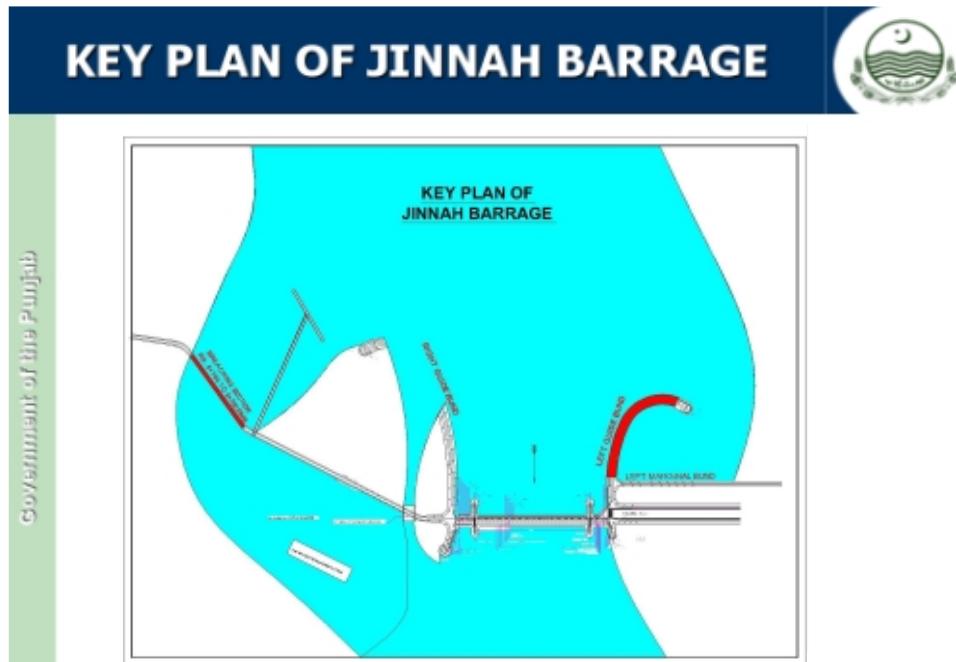


¹⁸ Ex I.W.6/1



source: WWF - Pakistan

1.6. *Left Marginal Bund [“LMB”] and Left Guide Bund [“LGB”]) (Protection and Training Works)*



1.7. Left Marginal Bund is 7410-feet long with a design top of RL 706. The top width is 30 feet and designed side slopes are 1:3 to 1:5 on the right side and 1:3 to 1:8 on countrysides. Left Guide Bund (U/S) is 4099 ft long with a design top of RL 706 with top width between of 30 to 60 feet and design side slopes of 1:3 on both sides. Highest flood level recorded in the year 1992 was RL 693 and the design pond level for 10,000 Cfs in Thal Canal is 694 RL¹⁹.

2. NATURE OF BREACHES

2.1. According to the I & P Department, breach in LGB was spotted at 7pm on 29-7-2010 at RD 3-4 by the Sub Engineer (Headworks). This breach finally resulted in the total erosion of the LGB. It was only in the evening of 2-8-2010 that the breach was contained at the junction of LGB and LMB. LGB having almost totally disappeared except the nose at the extreme front end. The breaching section was also operated in the evening of 30-7-2010 on the orders of the C.E. Sargodha Zone²⁰. Four different sections of the designated breaching section were operated upon i.e., blasted with explosives. Details of the breaches according to the I & P Department are as under:

¹⁹ Flood Fighting Plan 2010, Sargodha Irrigation Zone, Sargodha.

²⁰ As opposed to the order of the Breaching Operation Committee.

List of breaches at Jinnah Barrage.

| Sr. No | Location | Date | Time | Nature | Duty Officer | Officers of other Deptt. Present at Site | Cause of Breach | Area inundated |
|--------|--|-----------|--------------------------|------------------|--|--|---|----------------|
| JB-1 | Breaching Section on R.M.B. Jinnah Barrage (RD.6700-8700). 4 No. Cuts were made through Pak Army with explosive & machinery. | 30-7-2010 | 07:15 P.M. 10:15 P.M. | Self made breach | CE Irrigation Sargodha SE Thal Canal Circle XEN Kalabagh SDO H/Works Sub Engr: H/works | Commissioner Sargodha RPO Sargodha DCO Mianwali DPO Mianwali Capt: Mujtaba | As per SOP (Aproved Flood Fighting Plan) when the critical gauge at RD. 5000 LMB reached at 701 reading, RMB. Breaching Section (RD. 6700-8700) was operated to save the barrage and LMB. | 150 Acres. |
| JB-B1 | Breach in L.G.B. Jinnah Barrage. | 29-7-2010 | 07.00 P.M. | Breach | XEN Kalabagh SDO H/works Sub Engr: H/works | NIL | Mis-regulation | Nil |

Table 5: Source- I & P Department

2.2. No breach occurred in Thal Canal since it was reduced to 1000 Cfs on 30.7.2010 and later on totally closed for safety measures up to 11.08.2010.

3. COMPLAINTS OF THE LOCAL RESIDENTS/ FLOOD AFFECTEES.

3.1. **Mr. Taj Muhammad Jora**²¹ submitted²² that Officials of Irrigation Department, **have raised a bogus claim of one contractor amounting to Rs.83,00,000/- (eighty three lacs).** It was due to the **negligence of these Irrigation officers** that 4500 ft of Guide Bund has been washed away which has an approximate costs of Rs 50 crores. Mianwali was saved by the cement company on the behest of the Chief Minister.

3.2. **Habib Ullah Khan Niazi**²³, Advocate, submitted²⁴ that Chief Engineer Irrigation

²¹ IW.115

²² His application is addressed to Chief Justice of Pakistan, Islamabad and Chief Minister, Punjab and was filed by Muhammad Asim Mecan, and Taj Muhammad Jora, however, one of the Petitioners, namely, Taj Muhammad Jora appeared as IW.115.

²³ I.W.114

²⁴ His application is addressed to Mian Muhammad Shahbaz Sharif, Chief Minister, Punjab

Sargodha Zone in his statement published in Daily Nawa-i-Waqat, Lahore on 26-8-2010 stated that in Sargodha Zone no bund has been breached, except minor damage caused to Channel of Kalia Division. He further stated that due to timely control over LMB, they have saved Mianwali and Khushab. He submitted that the **Chief Engineer is telling lies through newspapers and deceiving the rulers.** Apparently the damage caused to the Barrage is approximately Rs.80 to 90 Crore. 4000 ft **LGB has been completely washed away** and 2000 to 2500 ft of **RGB has also been washed away**, the damage to tie bund and cut to Isa Khel – Bannu metal road are not included. He further submitted that when the water subsides **damage caused to Down Stream Apron due to mis-regulation** will also surface. He further submitted that on 28/29.07.2010 when erosion of LGB started the Chief Engineer remained present for about two days, **but did not take any step to stop the erosion.** The whole irreparable loss / damage caused to the structure of Jinnah Barrage is due to negligence and inefficiency of the Officers.

3.3. Mr. Sana Ullah Khan²⁵ submitted²⁶ that during High/Medium Flood, all gates of the barrage are opened and repair work (upstream or downstream) is stopped so that the water may pass through the barrage without causing any damage to the structure of the barrage. During recent floods, it has been observed that **20 gates of right side remained closed for about one month for stone dumping towards down stream, which continued for one year and four months.** In the 3rd week of July Medium flood arrived in the river, however, neither the gates were opened nor stone dumping work was stopped. On 27.07.2010, high flood was observed. On 29.07.2010 till noon the water discharge was noted as 6,25,000 Cfs. When the information was received from Tarbela Dam that 2,00,000 Cfs was heading to the Barrage the Officers opened the barrage gates, but due to high pressure of water, the gates were opened with difficulty. Consequently, LMB was completely washed away which caused damage of 80 to 90 crores to the national exchequer. C.M. Punjab arranged heavy machinery from the Cement Factories of Districts Khushab, Chakwal and Minawali and stone from the nearest hills to control the erosion of river. It is astonishing that incompetent and corrupt officers due to their personal greed caused loss to the Barrage Structure and LMB (4500 ft), out of which only 50 ft remained intact and the remaining portion of the LMB completely washed away. Had the remaining portion of LMB been washed away the flood flow would have endangered villages Daud Khel, Thathi, Dhair Umeed Ali Shah, Pai Khel, Duliwali, Rokhari and even Mianwali City. He continued to submit that the emergent work should have been completed before (June 2009) flood season, however, the estimates were revised. On this project a loss of about Rs.1.5 crore (i.e., Rs 15 million) has been caused to the national exchequer, but work has not yet been completed.

3.4. **SUMMARY OF ALLEGATIONS** raised by the complainants:

- i. Negligence of the irrigation officers.
- ii. Closures of gates during flood.

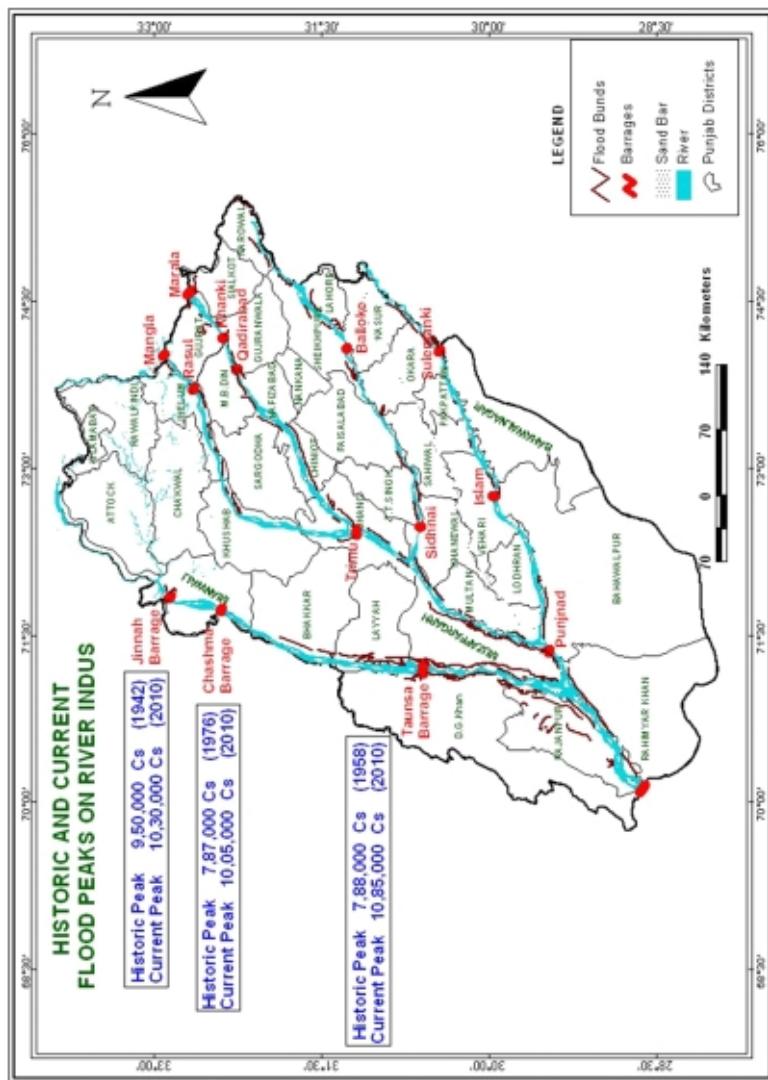
²⁵ I.W.113

²⁶ The application was addressed to Chief Minister, Punjab and was filed by Sana Ullah Khan and Haji Habib Ullah Khan, Advocate District Courts Mianwali, however, one of the Petitioners, namely, Sana Ullah Khan appeared as IW.113

- iii. Continuance of emergent work on downstream loose apron during flood.
- iv. Heavy loss to the exchequer due to erosion of LGB and breach of RMB (breaching sections) and the possibility of damage to the downstream work on the loose apron.
- v. No effort by the Irrigation Department except the timely help by the cement company.

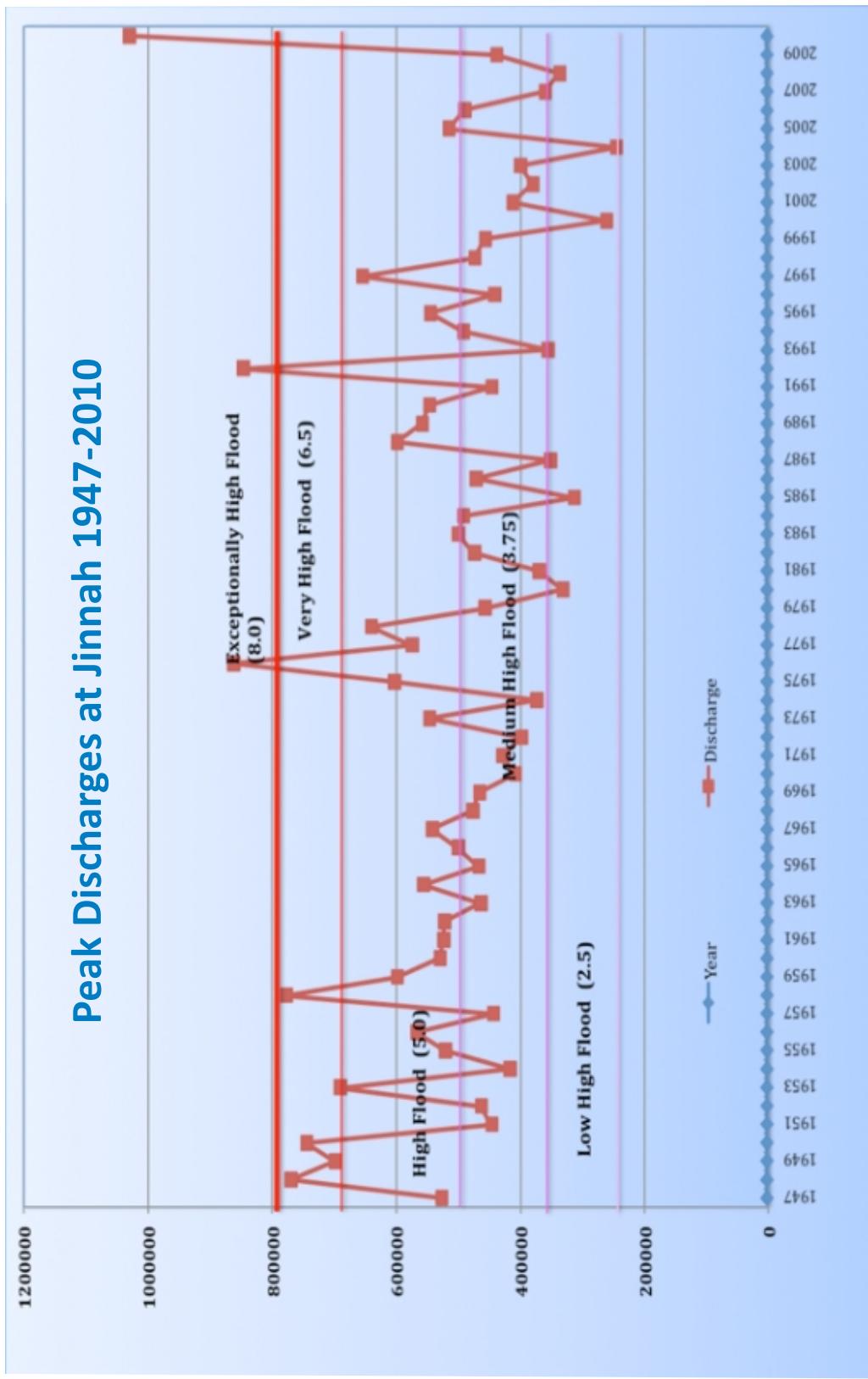
4. GENERAL POSITION OF THE DEPARTMENT REGARDING BREACHES²⁷

4.1. *Recent floods were unprecedented and extraordinary in the known history of the river Indus.* The flood peaks were far in excess of the recorded historical floods. It has been estimated that the flood 2010 was 1 in 1000 years flood event, which highlights that this flood was an extraordinary event. It is relevant to mention that the irrigation structures are designed for 1 in 100 year flood.



NOTE: Current Peak at Jinnah and Taunsa Barrages are incorrectly given by Secretary I & P Department. Above the correct figures according to the Hydrograph are: 9,36,453 Cfs at Jinnah Barrage and 9,59,177 Cfs at Taunsa Barrage. Source: I & P Department.

²⁷ Position Paper of Secretary I & P. Ex I.W.6/1

²⁸ Ex I.W.6/1

4.2. ***Duration:*** The duration of flood peaks is generally short, ranging from 12 to 24 hours. In the recent floods the duration of peaks was extraordinarily long, as Exceptionally High and Very High flood persisted for 115 hours at Jinnah Barrage. .

4.3. ***Two peaks over a two week period:*** Another important feature of the 2010 flood was that two peaks were received in river Indus over two weeks period, which exerted a lot of pressure on the infrastructure, supervisory staff and the watching establishment.

4.4. ***Continuous Rainfall and Hill Torrents Flooding:*** The flood situation was further exacerbated due to continuous rainfall in the areas, which hampered the flood fighting activities due to over slippery embankments. The hill torrent flooding in Mianwali added to the complexity of the situation.

4.5. ***Very Long Dry Spell:*** The floods in River Indus were received after a very long dry spell with the result that the embankments and the flood infrastructure had not been tested. Due to this long dry spell, the settlements had also increased within the river Khadir and the river channels also had the siltation trend. As a consequence, very high flood levels had been recorded on the embankments, which were beyond their design parameters and endangered the safety of the embankments and also caused breaches.

5. CAUSES OF BREACH

5.1. The discussion on the causes of breach, hereunder, is in the following format:

- i. PRE FLOOD PREPAREDNESS.
- ii. FLOOD FORECASTING
- iii. FLOOD FIGHTING
- iv. TECHNICAL CAUSES OF BREACH (closure of weir gates)
- v. OPERATION OF BREACHING SECTION.

6. PRE-FLOOD PREPAREDNESS

6.1. Secretary, Irrigation & Power Department submitted²⁹ that the Guidelines for pre-flood preparedness, as well as, guidelines for flood fighting have been laid down in ***Guidelines for Flood Preparedness / Works during Flood Season 2000*** dated 10.03.2000³⁰ (also popularly known as “Suleman Ghani Guidelines” within the Department) and the same has become the guideline for all the subsequent flood fighting plans. According to the said guidelines the following flood preparedness activities have to be strictly followed:-

²⁹ IW-6

³⁰ Ex I.W. 6/3

| Activities | Target Date |
|--|--|
| I) Preparation of flood fighting plans <ul style="list-style-type: none"> <li>a) <u>Submission of Draft Divisional Plans by Zonal Chief to Chief Engineer Drainage and Flood (after scrutiny by SE/CE)</u> <li>b) <u>Review by Chief Engineer D&F</u> <li>c) Final Submission of Divisional Plans | 15-04-2000 30-04-2000 15-05-2000 |
| II. Inspection of flood works <ul style="list-style-type: none"> <li>a) By XENs <li>b) <u>Checking / inspections by SEs/CEs</u> <li>c) <u>First Inspection by Joint Civil Admn. and Army Teams</u> | 15-04-2000 30-04-2000 15-05-2000 |
| III. <u>Identification of encroachments to the Civil Administration</u> | 30.04.2000 |
| IV. Painting Gauges, RD Marks, Data Boards and Repairs to Flood Bunds, etc. | 30-04-2000 |
| V. <u>Co-ordination Meetings with District Administration / Army to finalize Flood Fighting Plans / Arrangements.</u> | 15.05.2000 |
| VI. Reserve Stone Replenishment / Flood Fighting Materials <ul style="list-style-type: none"> <li>a) Identification of needs <li>b) Funding/Procurement Arrangements <li>c) Procurement, Stacking, Prescribed Field Checks | 28-02-2000 15-03-2000 15-06-2000 |
| VII. Implementation Completion Inescapable of Flood works | 15-05-2000 |
| VIII. Installation of Wireless Sets | 01-06-2000 |
| IX. Opening of Zonal Flood Cells <ul style="list-style-type: none"> <li>a) Duty Rosters <li>b) Operative | 01-06-2000 15-06-2000 |

Source: Flood Preparedness Activities (Annex A to Guidelines for Flood Preparedness / Works During Flood Season, 2000).

The Guidelines provide³¹:

SUBJECT: GUIDELINES FOR FLOOD PREPAREDNESS / WORKS DURING FLOOD SEASON 2000

The Following guidelines for flood preparedness/works during flood season 2000 are reiterated for strict compliance by all concerned departmental officers/officials.

- i. The field officers will strictly follow the schedule of implementation of inescapable flood works and other flood preparedness activities as detailed above.
- ii. **The Chief Engineers / Superintending Engineers should hold exclusive briefing sessions with the concerned Army Coordination / Monitoring Units to brief them about the flood preparedness activities and the flood restoration works.**
- iii. **The field officers would take immediate steps for procurement of the rationalized / agreed quantities of reserve stock of stone. The Chief Engineers would closely monitor the progress in this behalf in order to ensure implementation of the codal rules/latest Government instructions, which are summarized below:**
 - The field officers will prepare a site plan showing the existing stacks of stone, as well as, quantity in each stack of all works. The Stock Registers would also be properly maintained in keeping with the instructions on the subject.
 - The existing stacks would be properly demarcated so as to be clearly identifiable.
 - The Executive Engineers & Superintending Engineers would check the existing stacks 100% and 25% respectively and record their certificate on the site plans as well as in Stock Registers. **These site plans would be furnished to be respective Chief Engineers / Chief Engineer, Drainage & Flood at the earliest. A copy of these plans should also be provided to the Civil Administration / concerned Army Monitoring Teams.**
 - When the supply of additional reserve stock of stone is received, it should be properly stacked in manner to be clearly identifiable as new arrivals.
 - After the stacking of the newly procured reserve stock of stone at site, the concerned Executive Engineers / Superintending Engineers would check the stacks and stone quantities by 100% and 25% respectively, show them on

³¹ Letter no. US (Flood) Misc-96(I)97 dated 10-3-2000 (Ex I.W.6/3)

Site Plans / Registers and **immediately inform the respective Chief Engineers / Chief Engineer D&F / Secretary, I&P.** After this, the · Checking Teams should be informed in order that they can plan 10% random check of the reserve stone.

- **The Inspection Teams would check the reserve stone and inform about the out-come of their checking to the respective Chief Engineers / Chief Engineer D&F / Secretary I&P.**
- **The reserve stone to be procured would also be checked by the respective Deputy Commissioners and Army Monitoring Units. For this purpose, the Executive Engineers would also furnish to the respective Deputy Commissioners and Army Units, details regarding quantity of reserve stone being procured, sites where this reserve stock is to be kept and the expected schedule of supply of the stone at site.**
- **Weekly Progress Reports regarding procurement / checking of reserve stone would be submitted by Zonal Chief Engineer Drainage and Flood / Secretary I&P.**

iv. Comprehensive division-wise flood fighting plans should be prepared in accordance with the instructions on the subject (refer Annex-B). **The flood fighting plans should be finalized after discussions / coordination with the Civil / Army authorities and these should also be carefully reviewed by the field SEs / CEs.** The plans should be well documented and forwarded to the concerned quarters according to the notified schedule

v. **The Chief Engineers should ensure strict observance of the financial discipline, particularly on the flood works. They should exercise extra vigilance on emergency flood works to be implemented under para 2.89.** In this context, the instructions / procedure identified in the minutes of meeting dated 18-6-1997 conveyed vide I&P Department letters No.US(Floods)Misc-96(I)97 dated 11-7-1997, No. US(Floods)Misc-96(I)97 dated 26-7-1997 and subsequent instructions should be strictly followed. The main points of the instructions are repeated below:

- a. The emergency clause should be implemented judiciously and cautiously and **Chief Engineers should ensure their full satisfaction in all such cases.**
- b. All the codal / departmental formalities should be fulfilled before invoking emergency provisions under para 2.89 and cogent reasons should be recorded.

- c. All the damages / emergent works under para 2.89 should be got independently checked from a team of one Superintending Engineer and Executive Engineer, who should be from outside the circle / division where the work is being undertaken.
- d. **Chief Engineer should visit and personally inspect all the works under para 2.89, as soon as possible.**
- e. Intimation regarding all such emergency works should also be communicated to the Deputy Commissioners / Army Monitoring Units.
- f. The Chief Engineers should exercise proper professional skill and adopt most economical and technically sound interventions in each case.
- g. Intimation regarding 2.89 emergency works should also be given to the respective Consultants and the works must be got implemented under resident supervision of the Consultants.
- vi. The Chief Engineers should ensure compliance of all the codal / departmental instructions regarding open and transparent tendering / bid awards.
- vii. The field officers should exercise strict caution in case scheme revision is warranted. The Government instructions in this behalf should be adhered to in letter and spirit. **The Chief Engineers should ensure that revised scope is not implemented without approval of the competent authority.** In exceptionally compelling / emergent cases, at least approval in principle should be obtained from the competent authority.

2. **It is advised that the implementation of the above instructions / guidelines may kindly be ensured and the Chief Engineers should closely monitor the progress of implementation.**
(Emphasis supplied)

6.2. Vide notification dated 24.3.2010 issued by the Director Flood/Secretary, Punjab Flood Commission, Irrigation & Power Department, all the Chief Engineers, as well as, the Head PMO Punjab Barrages, were directed to send their comprehensive flood fighting plans to the Punjab Flood Commission/Director Flood by 15.4.2010. The flood fighting plan as per notification was to provide the following:^{31-A}

^{31-A} Mark-93

1. Salient features of the concerned Division (A brief of two pages).
2. Details of flood protection and river training works alongwith the design parameters and location maps.
3. Brief History of past flood events.
4. Designed data. Historic peak flood data and previous five years flood data of H/Works/Barrages and or other control points
5. **Flood Fighting strategy at different flood limits (A brief of one page)³²**
6. **Flood Damages Restoration Works carried out and other repair works.**
7. **Flood Fighting/Watching arrangements Labour required site location and quantities of engineering stores etc.**
8. **Details of encroachments on flood works.**
9. Duty Roster/ battle stations of key personnel during high flood flow.
10. Emergency Telephone Numbers.
11. Any other flood related information

6.3. The respective Chief Engineers and Head PMO were further directed through the above notification to complete the flood fighting plans after discussion with Civil/Army Authorities and also to ensure its careful review by the field Superintending Engineers/Chief Engineers.

6.4. Secretary I & P Department³³ deposed that Flood Fighting Plan is prepared by the Division e.g., Flood Fighting Plan for Kalabagh headwork's Division is prepared by the XEN and counter signed by SE and C.E. Flood Fighting plan is vetted by the C.E. (D & F) and if there is any disagreement regarding the contents of the same, it is taken up with the Department, but not otherwise."

6.5. According to the Position Paper submitted by the Secretary, I & P Department, the pre-flood preparation was satisfactorily achieved. Summary³⁴ of the "completed" events as given by the Secretary I & P are:

| Sr. No. | Activities | Target | Status |
|---------|---|-------------------|----------------------------|
| 1. | Preparation of flood fighting plans | 30.04.2010 | Completed |
| 2. | Inspection of flood works by Department, Civil Administration and Pakistan Army Teams | 30.04.2010 | Completed |
| 3. | Reserve Stone replenishment/flood fighting materials | 30.04.2010 | Partially completed |
| 4. | Preparation of breaching section | 15.06.2010 | Completed |
| 5. | Provision of wireless sets on all barrages | 15.06.2010 | Completed |

³²emphasis supplied

³³I.W.6

³⁴Exhibit I.W.6/1

6.6. Vide order dated 04.03.2010 Secretary, I&P Department, Government of the Punjab, Lahore constituted inspection team³⁵ to inspect the flood fighting work of Sargodha Zone. In their report submitted in April, 2010 the Committee reported;

“LEFT MARGINAL BUND

Overall condition of the bund satisfactory except minor deficiencies like jungle growth on the slope, rain cuts and gharas on slope and top in some reaches. Some ramps were found built by cutting body of the bund which can jeopardize safety of the bund. **Reserve stock existing on the bund was also told to be short.**

U/S LEFT GUIDE BUND

The bund was found in intact [sic] and in satisfactory condition. However, some jungle growth was existing on the slope in some reaches. **Reserve stock of pitching stone was short.”**
(emphasis supplied).

6.7. The Flood Fighting Plan prepared in the same month (i.e., April, 2010) mentions under the heading **Stores: “sufficient quantity of stone is available on all river training works”.**

6.8. Thereafter, meeting of the Provincial Coordination Committee to review pre-flood season 2010 was held on 21-6-2010 under the Chairmanship of Sardar Zulfiqar Ali Khan Khosa, Senior Advisor to Chief Minister Punjab. In the said meeting Chief Engineer, Sargodha Zone vide his letter dated **11.06.2010** certified that necessary repair to flood protection bunds has been carried out, requisite quantity of the explosive of breaching section is available and has been kept in safe custody which can successfully be used in case of breaching section needs to be operated during high flood. It was also certified that payment for purchase of new explosive material has been made through cheque amounting to **Rs 10 million.**

6.9. XEN Kalabagh Headworks Division vide letter dated 4.6.2010³⁶ reported to Superintending Engineer, Thal Canal Mianwali in the following manner:

| | | |
|----|--|--|
| 4. | Procurement arrangements for replenishment of reserve stock of stone and flood fighting material | <u>Sufficient quantity of reserve stock of stone is available to met [sic] with any emergency. Stock of stone used on emergent work of Jinnah Barrage the procurement of stone stack is in progress.</u> |
|----|--|--|

³⁵comprising Khurshid-uz-Zaman S.E. and Hakim Ali XEN (Ex I.W. 6/1)

³⁶ (Ex.I.W.122/2)

6.10. S.E., Thal Canal, Mianwali relying on the above information (Letter dated 4-6-2010 of the XEN) prepared **FOLLOW UP ACTION ON THE FLOOD PREPAREDNESS ACTIVITIES FOR THE YEAR 2010³⁷** dated 13-7-2010. **STATEMENT SHOWING PROGRESS ACHIEVED UPTO 30-6-2010.** Under the head “Reserve Stone”, S.E. reported to the Chief Engineer, Sargodha in the following manner: “**sufficient quantity of stone is available to meet with any emergency**”.

6.11. The Chief Engineer, as well as, Secretary, Irrigation & Power Department have deposed that on the basis of the above statement they stood assured that reserve stone was in place on the training works at Jinnah Barrage. The Chief Engineer, Irrigation³⁸, Sargodha Zone, submitted that

“Before the start of the flood season i.e., 15-6-2010 onwards I was under constant impression that the said stone had been recouped as per the above mentioned report of the XEN/S.E. I was shocked to notice on 30-7-2010 when I reached Jinnah Barrage to see that there was no reserve stock of stone. When I inquired from the Executive Engineer regarding the status of Reserve Stock Stone, he had no clear answer and this automatically makes the letter dated 13.07.2009 submitted by the S.E to be totally incorrect and a false statement.”

6.12. While Secretary I & P submitted that after the report of the departmental inspection team dated 16-4-2010:

“I & P Department wrote to the C.E. (D & F) to follow up on the subject. As a result of the said follow up, S.E wrote to the C.E. Sargodha Zone, who forwarded the same to the C.E. (D & F) confirming that “Sufficient quantity of stone is available to meet with any emergency” through Report no. 709/105-R dated 13-7-2010.”

6.13. INQUIRY & FINDINGS

6.14. **Information given by the Secretary I & P Department** (above) regarding highest peaks reached during the Floods 2010 at Jinnah and Taunsa Barrage are incorrect. The highest peaks at Jinnah and Taunsa Barrages were as under and were within the design capacity of the barrages. The total duration of exceptionally high flood (of both the peaks over different dates) is 30 hours³⁹. The twin peaks or the duration or the long dry spell cannot be considered to be technically acceptable reasons for the breach of LGB. Such factors can develop any time and cannot be projected as an excuse for the poor performance of the department. Irrigation department is equipped (or should be equipped) to deal with floods in different climatic conditions. Therefore the generic submissions of the Secretary have no merit.

6.15. According to PMD, every ten years a major flood or exceptionally high level passes

³⁷ (Ex.I.W.6/4)

³⁸ I.W.5

³⁹ According to C.E, Sargodha Zone.

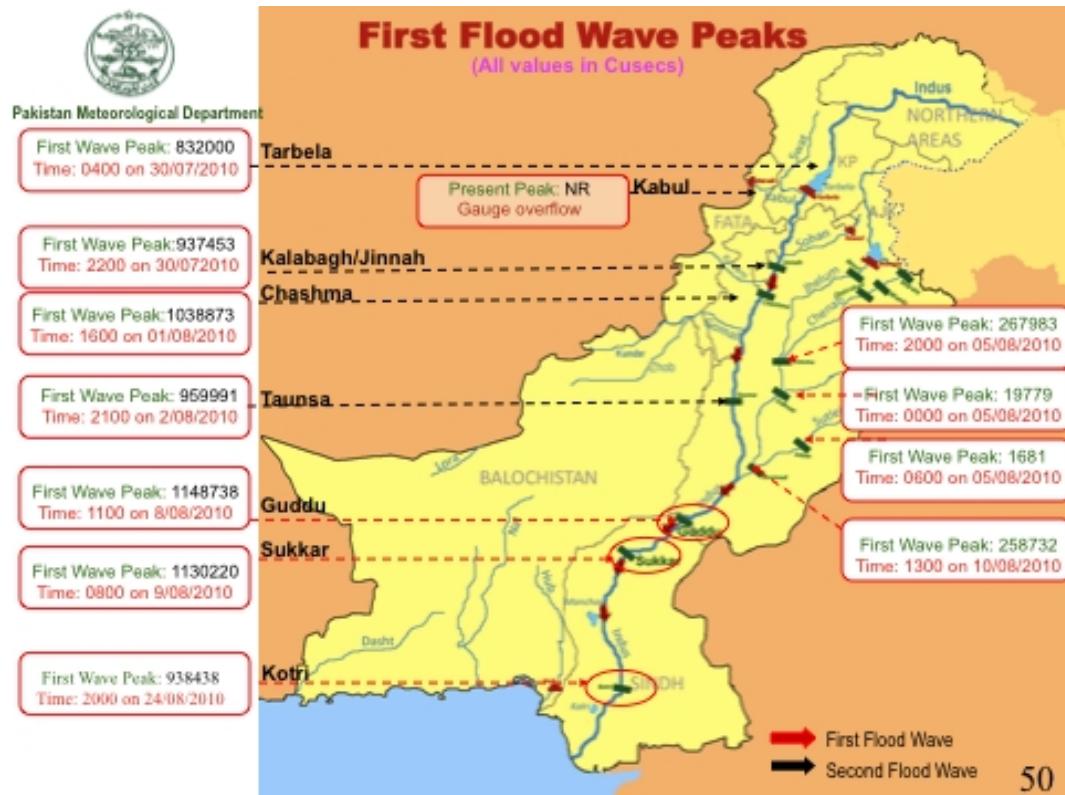
through all the five rivers. Every 15 years a super flood of 1988 or 1992 type occurs⁴⁰. Irrigation department seems to have failed to consult their own histogram or SOP of the PMD while planning and strategizing for the flood season. Long dry spell, therefore, cannot be put out as ground for departmental failure or weakness to face floods. Department should have been in a state of preparedness by having provided for wetting the embankments. This was not done and people were made to live in a false sense of security. Department as the prime flood manager enjoys the role of a trustee for the people of the Province, especially those who live within the flood prone areas. Absence of any flood preparedness or strategy for wetting the embankments amounts to serious breach of this trust. The department should have shared these risks with the local residents so that they could have perceived the threat and not lay cocooned behind the unkempt and unmaintained embankments with a sense of security which in reality never existed.

6.16. Details of the discharges from the Barrages and the breaches are as follows:

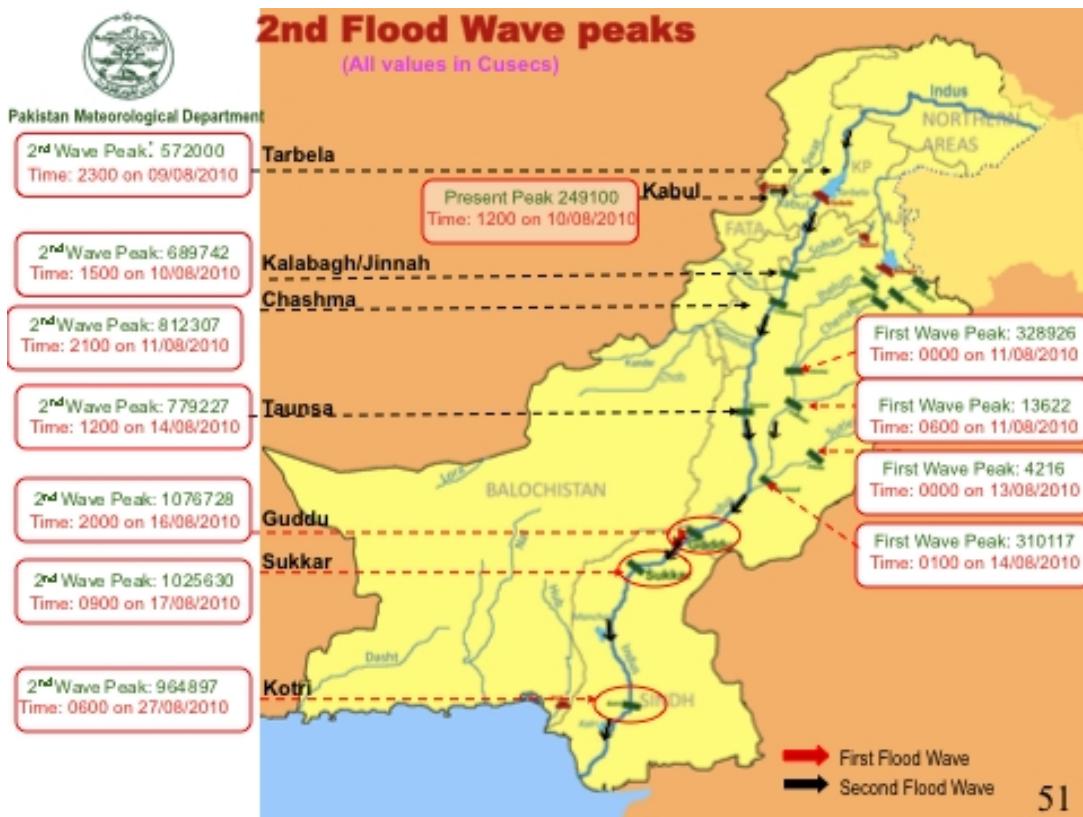
| Location | 1 st Highest Peak (date) | 2 nd Highest Peak (date) | Alleged Discharge through Breach | Design Discharge |
|----------------|--|--|--|---------------------|
| Tarbela | 837000 (30/7/2010) | 572000 (8/8/2010) | | |
| Jinnah Barrage | 937453 (30-7-2010) | 689742 (10-8-2010) | 151392 (total discharge 10,88,845 Cfs) | 9,50,000 |
| Chasma Barrage | 1038873 (1-8-2010) | 812307 (8-8-2010) | NIL | 9,50,000 |
| Taunsa Barrage | 959991 (2/8/2010) | 779227 (14-8-2010) | 1,25,000 (total discharge 1,084,991 Cfs) | 11,00,000 |

Info on Highest Peaks during Floods 2010 - source PMD (Design Discharge and Discharge through breaching figures by I & P Department)

⁴⁰ SOP regarding Hydro Meteorological Forecasting - FFD, PMD (Ex I.W. 3/2)



Source PMD



Source PMD

6.17. **Pre flood preparedness and the Flood Fighting Plan:** From the evidence it is abundantly clear that pre flood preparedness is a perfunctory ritual which is done with little pain and interest every year. Infact it is not even done in the manner prescribed. Mechanical and thoughtless Pre Flood Meetings (several of them at different levels) fail to gauge the pre-flood preparedness or the strengths or weaknesses of the various flood managers. The data presented in these meetings is mostly incorrect or intentionally incomplete, there is no flood mitigation or management strategy evolved, it is not inclusive and there is no participation of the local residents. Finally there is hardly any follow up on the suggestions made. In the present case (recent floods at Jinnah Barrage) no mention was made by the C.E. regarding the absence of reserve stones, the continuance of emergent work on the downstream loose apron and the closure of gates since May, 2010 in the Provincial Coordination Committee. The meeting and the Certificate of the C.E were therefore hardly of any use as a pre flood preparation exercise. In another pre flood meeting under the auspices of NDMA in Islamabad, the submissions of DG, PMD failed to highlight that the QPM radar in Attock was not working or that there was not QPM Radar to cover the upper catchment area of River Indus and the Hill Torrents (see discussion under Flood Forecasting later in this chapter)

6.18. Under the **Guidelines for Flood Preparedness** mentioned above, the Flood Fighting Plans after scrutiny by the S.E. and C.E. have to be reviewed by the C.E (D&F) before they are finalized. This year there was no scrutiny by the S.E. or C.E or review by the C.E.(D & F) while preparing the flood fighting plan. It appears that preparation of Flood Fighting Plan every year is a thoughtless perfunctory, cut and paste exercise, paying little heed to the Guidelines mentioned above. Important elements of the Flood Fighting Plan and the Guidelines are pre flood inspection, flood fighting material, the arrangement of workforce, location and installation of camps, observance of the barrage regulations (pertaining to floods), firming up arrangements for machinery required and ensuring the presence of reserve stone for flood fighting as per M.I.P. Record shows that the above requirements were not met. It is no surprise that there was an incorrect assurance recorded in the Flood Fighting Plan, 2010 to the effect that **the reserve stock of stone at Jinnah Barrage was in order**. Failure to follow the regulation by the flood managers came close to a tragic nightmare for the credulous residents of Mianwali and other contiguous districts.

6.19. The flood fighting materials carry items which are no more in use today, like lanterns, etc. There is no proposed mapping of the locations where stones have to be stacked or camps have to be set up. List of machinery required or the proposed list of available contractors, who could supply manpower at the last minute is missing. I & P Department appears to have been frozen in time with nothing but obdurate inertia to show for itself.

6.20. **Importance of Pre Flood Inspection:** Under the Guidelines checking and inspection of the Flood Works has to be done by the S.E. and C.E by the target date of 30-4-2010. No inspection report exists that records that such an inspection took place. More importantly the emergent work carried out on the downstream loose apron had to be closely monitored and inspected by the C.E. Any such work should have been stopped by the C.E. due to the

flood season. The C.E. not only failed to stop the said emergent work he deliberately avoided to mention a word on this in his position paper or his statement before the Tribunal. No mention was made by the C.E. regarding the shortage of reserve stone, closure of the gates during medium to high floods or the emergent work in progress on flexible loose stone apron down stream Jinnah Barrage before the Provincial Coordination Committee or the Certificate issued by the C.E.

6.21. It is important to refer to Letter dated 13-2-2010⁴¹ of the C.E written to the S.E. Thal Canal Circle, Mianwali regarding Emergent Repair / Replenishment of loose stone apron down stream Jinnah Barrage under para 2.89 of PWD Code. The C.E pointed out: “**Keeping in view the above situation you are directed to pay your personal attention to this very important matter so that it could be completed well before the onset of the coming flood season, 2010.**” The C.E. soon forgot about this “important matter” and the deadline of its completion. On the other hand he was scheduled to inspect the said emergent works on 8-7-2010 in the midst of the flood season.

6.22. **No pre-flood inspection** as per Guidelines was carried out jointly with the Civil Administration and the Army Teams. No pre-flood coordination meetings took place with the Civil Administration by the C.E. It is disturbing to note that after the news of the breach reached the C.E, the entire system was shaken out of slumber and put to immediate work. C.E rushed in from Sargodha and allegedly held tireless meetings with the Civil Administration and the Army teams. This untiring zeal had to be exhibited during the pre flood preparation. In the absence of pre-flood preparedness, post breach exercise does not merit any appreciation. I & P Department forgot that “Prevention is better than cure.”

6.23. We noticed that reference of letter⁴² dated 29.07.2010 Commissioner Sargodha in the letter dated 30-7-2010⁴³ of the Home Department, Government of the Punjab requested for Army force for protection of LMB, Jinnah Barrage. The request was made by the Commissioner for service of 01 Company of Army alongwith three dozers, three hydraulic excavators and other necessary machinery. The Army had not been requisitioned when the breach had taken place on Jinnah Barrage. The Flood Fighting Plan & Guidelines clearly stipulate pre flood coordination with Pakistan Army and the civil administration. Regulations were, therefore, blatantly flouted.

6.24. **Reserve Stone:** According to the Guidelines, funding and procurement arrangement of reserve stones had to be done by 15-3-2010, while procurement, stacking and field checks had to be completed by 15-6-2010⁴⁴. None of the above was done. The entire field formation including the C.E. appears to have slept through the flood season, exhibiting no duty of care, gross violation of the regulations- all this painfully without any remorse or guilt as we observed during the inquiry. It is very disturbing to note that the sufficiency of reserve

⁴¹ Ex I.W. 5/3

⁴² Ex.I.W.11/1

⁴³ Ex I.W.11/1

⁴⁴ Ex I.W.6/1

stone reported to the C.E. in July, 2010 did not raise any alarm with the C.E. (considering that the reserve stones have been missing much before 2009). The sudden procurement in July, 2010 was noted with nonchalance and raised no alarm or concern. This raises serious doubt about the professional capacity and expertise of the C.E. who (in this case) is qualified as a mechanical engineer rather than a civil engineer.

6.25. Under the Guidelines, weekly progress reports regarding procurement / checking of reserve stone have to be submitted by Zonal Chief Engineer (D & F) and Secretary I & P. No such reports were generated and none were seen by the C.E. (D & F) or the Secretary. However, the worrying part is that this did not cause any alarm, then or even now. It is appalling that even today the Secretary or the C.E. (D & F) are not aware of this Regulation, because not a word appears regarding this in the position papers submitted before the Tribunal or in their statements recorded before us.

6.26. Reserve Stock was missing through out the flood season of 2009 as the Stock Register shows a nil balance in June, 2009 when **1,47,012 cft** reserve stone was used for the emergent work on the loose stone apron downstream. The Departmental Inspection Committee reported the shortage of Reserve Stone. The amount of stone to be recouped and replenished from the demolished part of RGB is not certain and clear. With all these warnings and uncertainties, the C.E. casually accepted the report of the S.E. dated 13-7-2010 stating that the reserve stone was in place and further communicated the same to the C.E. (D & F). The C.E, as well as, C.E (D&F) should have verified the quantity procured and the site plans showing the stacking done by the field staff of the alleged procured stone.

6.27. The following highlighted Guidelines were totally ignored:

- i. **The Chief Engineers / Superintending Engineers should hold exclusive briefing sessions with the concerned Army Coordination / Monitoring Units to brief them about the flood preparedness activities and the flood restoration works.**
- ii. **The field officers would take immediate steps for procurement of the rationalized / agreed quantities of reserve stock of stone. The Chief Engineers would closely monitor the progress in this behalf in order to ensure implementation of the codal rules/latest Government instructions, which are summarized below:**
 - The Executive Engineers & Superintending Engineers would check the existing stacks 100% and 25% respectively and record their certificate on the site plans as well as in Stock Registers. **These site plans would be furnished to be respective Chief Engineers / Chief Engineer, Drainage & Flood at the earliest. A copy of these plans should also be provided to the Civil Administration / concerned Army Monitoring Teams.**
 - After the stacking of the newly procured reserve stock of stone at site, the concerned Executive Engineers / Superintending Engineers would check the stacks and stone quantities by 100% and 25% respectively, show them on Site Plans / Registers and **immediately inform the respective Chief Engineers / Chief Engineer D&F / Secretary, I&P.** After this, the Checking Teams should be informed in order that they can plan 10% random check of the reserve stone.
 - **The Inspection Teams would check the reserve stone and inform about the out-come of their checking to the respective Chief Engineers / Chief Engineer D&F / Secretary I&P.**
 - **The reserve stone to be procured would also be checked by the respective Deputy Commissioners and Army Monitoring Units. For this purpose, the Executive Engineers would also furnish to the respective Deputy Commissioners and Army Units, details regarding quantity of reserve stone being procured, sites where this reserve stock is to be kept and the expected schedule of supply of the stone at site.**
 - **Weekly Progress Reports regarding procurement / checking of reserve stone would be submitted by Zonal Chief Engineer Drainage and Flood / Secretary I&P.**
- iii. Comprehensive division-wise flood fighting plans should be prepared in accordance with the instructions on the subject (refer Annex-B). **The flood**

fighting plans should be finalized after discussions / coordination with the Civil / Army authorities and these should also be carefully reviewed by the field SEs / CEs. The plans should be well documented and forwarded to the concerned quarters according to the notified schedule

iv. **The Chief Engineers should ensure strict observance of the financial discipline, particularly on the flood works. They should exercise extra vigilance on emergency flood works to be implemented under para 2.89.** In this context, the instructions / procedure identified in the minutes of meeting dated 18-6-1997 conveyed vide I & P Department letters No. US (Floods) Misc-96(I)97 dated 11-7-1997, No. US (Floods) Misc-96(I)97 dated 26-7-1997 and subsequent instructions should be strictly followed. The main points of the instructions are repeated below:

- a. The emergency clause should be implemented judiciously and cautiously and **Chief Engineers should ensure their full satisfaction in all such cases.**
- b. **Chief Engineer should visit the personally inspect all the works under para 2.89, as soon as possible.**

v. The field officers should exercise strict caution in case scheme revision is warranted. The Government instructions in this behalf should be adhered to in letter and spirit. **The Chief Engineers should ensure that revised scope is not implemented without approval of the competent authority.** In exceptionally compelling / emergent cases, at least approval in principle should be obtained from the competent authority.

2. **It is advised that the implementation of the above instructions / guidelines may kindly be ensured and the Chief Engineers should closely monitor the progress of implementation.**

6.28. The Chief Engineer was under a duty as per the above Guidelines to regularly monitor the emergent works under para 2.89 of PWD Code, especially so when the procurement of the reserve stone had to be recouped from the demolished portion of the RGB.

6.29. As per **paragraph 6.39 of Manual of Irrigation Practice**⁴⁵ (MIP) the stone required for the right and left embankment as well as upstream and downstream, right and left guide bund was **10 lac Cft** as stated by an earlier Chief Engineer, Irrigation Sargodha in his letter

⁴⁵ 1 6.39. Reserve stone is usually sanctioned for guide banks at the rate of 2 ½ lacs cubic feet for each of the upstream and downstream banks and between 1 to 1 ½ lacs for spurs depending upon circumstances. This stone is heaped on the top of spurs and guide banks in stacks not more than 4' high and with gaps at every 100'. (Ex 1.W 121/3)

dated 6.3.1997 (3521/Accounts/97/213/75)⁴⁶. According to the Stock Register the reserve stone in the above quantity has not been stacked at the barrage since 2006 (Stock Registers prior 2006 have not been inspected). During our investigation we noticed that no one including the Secretary, C.E., S.E., XEN and SDO knew the total quantitative requirement of reserve stone to be stacked on the RGB and LGB at Jinnah Barrage for flood fighting. The XEN referred to **7,50,000 cft** to be the requirement of reserve stone however no direction or letter specifying this amount was placed before us. C.E. also referred to the said quantity in his statement unsupported by any evidence. Secretary also failed to refer to any document in this regard in his statement. XEN, however, didn't even know of para 6.39 of the M.I.P.

6.30. The quantity of stone to be replenished / recouped from the RGB has not been stated by the Chief Engineer or recorded in any statement, however, according to the present Executive Engineer⁴⁶, Kalabagh headworks (Mr. Masud Anwar Chughtai) at Jinnah Barrage, the stone recouped from RGB in **April, 2009** has been recorded in the Stock Register to be **1,47,012 cft**, which was utilized on the emergent replenishing work on the down stream loose apron. Was there more stone to be recouped from the RGB? There is no answer forthcoming from any quarter. C.E.'s statement that he was under the constant impression after the start of the flood season in June, 2010 that the stone will be recouped is also unfounded and baseless as the said stone was recouped in April, 2009. This shows weak vigilance, feeble control and poor understanding of the Barrage affairs.

6.31. According to the Canal Wire No.140 dated 23.11.2010^{46-A} issued by Superintending Engineer, Thal Circle to Chief Engineer, Irrigation, Sargodha Zone no payment for the explosives has been made to the Army Authority regarding breaching section at Jinnah Barrage. This contradicts the Certificate of the C.E. dated 11-6-2010 submitted before Provincial Coordination Committee stating that a cheque in the sum of Rs 10 million has been handed over to the Army.

6.32. Reserve stone had to be reflected in the Stock Register of the Barrage and site plans were to be developed by the field officers showing stacking of stones. The Stock Register and the site plans had to be inspected by the XEN and SE. The site plans were to be furnished to the respective C.E. and the C.E (D & F). Such is the importance of reserve stone under the regulations of the irrigation department. Nothing was done and nothing was asked for.

6.33. The performance of C.E. (D & F) and the utility of the said post can be gauged from the quality of the answers^{46-B} given by C.E (D & F) in response to the questions posed by the Tribunal in November, 2010 are reproduced hereunder:

6.33.1. Q.No.(ii): "What is the quantity of stone used for the aforesaid emergent work since its inception in March, 2009"?

⁴⁶ I.W.121

^{46-A} Mark-32

^{46-B} Mark-111

6.33.2. Answer: This information can be provided by the Chief Engineer, Sargodha and his field staff under whose jurisdiction and supervision the work is being carried out.

6.33.3. Q. No.(iii): *“What is the quantity of stone replenished after part removal of RGB at Jinnah Barrage and was the said stone used for the emergent work at the stone loose apron downstream”?*

6.33.4. Answer: The quantity of stone replenished after part removal of Guide Bund is not in the knowledge of this Zone as no information in this regard has been provided by the concerned Chief Engineer Irrigation Sargodha. However, this information must be available with the Chief Engineer, Sargodha.

6.33.5. Q. No.(iv): *“Why emergent work on stone loose apron downstream Jinnah Barrage was allowed to continue during flood season i.e., after 15.06.2010”?*

6.33.6. Answer: Chief Engineer, Drainage & Flood neither allowed continuation of the emergent work on loose stone apron downstream Jinnah Barrage during flood season nor does this fall in the purview / responsibility of Drainage & Flood Zone. Under the direction of Administration Department, the concerned Chief Engineer was required to exercise professional skill in this regard. The circumstances under which permission to continue the work under question was allowed (if allowed) by the concerned Chief Engineer Irrigation Sargodha is best known to him.

6.33.7. Q. No.(v): *“Was the emergent work completed on 21.07.2010?*

6.33.8. Answer: The completion of the work has not so far been intimated by the concerned Chief Engineer Sargodha to Drainage & Flood Zone, hence the current status of the work is best known to the concerned Zonal Chief Engineer / Incharge field team.

6.33.9. Q. No.(vi): *“Did the said work suffer loss during the recent floods, if so, give estimate amount”?*

6.33.10. Answer: Drainage & Flood Zone has not so far been informed by the concerned Chief Engineer, Irrigation Sargodha Zone about any loss suffered by the said work during the recent floods. The Chief Engineer, Sargodha is in the position to intimate any loss and the estimated amount.

6.33.11. Q. No.(viii): *“Reserve Stock Stone for the training and protection works at Jinnah Barrage is 10 lac cft as per para 6.39 of the M.I.P. The said stone was missing during the flood season 2009 as well as 2010. What steps were taken by the Chief Engineer D&F to ensure the supply of the said Reserve Stock Stone? What is the obligation of Chief Engineer, D&F regarding the said omission”?*

6.33.11. Answer: Procurement of Reserve Stock of stone at barrages or other critical sites is an important item for preparation before floods. Accordingly, all the zonal Chief Engineers were requested to make necessary preparation before commencement of flood season. In response to above, the Chief Engineer, Sargodha vide his letter No.15299/W-II/6-54/2010, dated 27.07.2010 intimated that "**sufficient quantity of stone is available to meet with any eventuality at Kalabagh Headworks**". Similarly, Chief Engineer, Irrigation Sargodha Zone vide his letter No.8478/Works-II/6-54/2009, dated 15.5.2009 i.e., before flood 2009 intimated that Reserve Stock of Stone is "**available**" at Kalabagh. In view of satisfactory report received from Chief Engineer Sargodha, there was no need to take any further steps.

6.34. Jinnah Barrage, which was declared as sick barrage required extra care this flood season. The poor performance of C.E, C.E (D & F), S.E. and X.E.N reflects otherwise. The Secretary I & P department, who under the Rules of Business of the Provincial Government is the official head of the department and responsible for its efficient administration, discipline and proper conduct of business has not fully discharged his responsibility. His vigilance during the flood season appears to be loose and weak. His systems and control should have been good enough to detect that reserve stone was missing, the alleged procurement was without his approval, the total quantity of reserve stone required at the barrage, the unlawful continuance of emergent work downstream Jinnah Barrage during flood season and the closure of gates much before the start of the flood season. He should have taken extra care considering the Jinnah barrage was one of the sick barrages in his fleet of barrages. The Secretary, as the departmental head, did not fulfill his responsibility. C.E. (D & F) on the other hand was asked questions on 29-11-2010 but he still failed to provide the Tribunal with the information required. The competence and relevance of the post of C.E. (D & F) has become seriously suspect. We were made to understand that the overall head of the flood policy after the Secretary is the C.E. (D & F) but this has been proven wrong by his statements. Is C.E. (D & F) required ?

6.35. The submission of the Secretary that the country was passing through a long dry spell or that the intensity of the floods was unprecedented this year does not at all justify the failure to carry out a responsible pre flood preparation. The omissions have been fatal, resulting in a huge loss. As estimated, restoration cost of LGB is Rs.350 million and of the breach site at RMB and tie bund is Rs. 20 million⁴⁷.

6.36. Para 2.89 PWD Code. Another aspect of the matter is that S.E. or XEN could not have single handedly procured the reserve stone during the Flood Season and therefore had to invoke para 2.89 of the PWD Code, as the procurement would fall under emergent work. Chief Engineer, C.E. (D & F) as well as the Secretary failed to bother how the XEN procured the reserve stone⁴⁸ without their knowledge and without the approval of the Secretary while invoking para 2.89.

⁴⁷ Reference head-wise loss of damages restoration works 2010 Sargodha Irrigation Zone, Sargodha (Ex.I.W.5/3).

⁴⁸ 10 lac cft as per para 6.19 of the M.I.P

6.37. Para 2.89 (1 & 2) of the PWD CODE states :

“(1) It is a fundamental rule that no work shall be commenced unless a properly detailed design and estimate have been sanctioned, allotment of funds made, and orders for its commencement issued by competent authority. Permission granted by Government in orders on a Budget estimate for the retention of an entry of proposed expenditure during the year on a work, conveys no authority for the commencement of outlay. Such permission is granted on the implied understanding that, before any expenditure is incurred, the above conditions will have been fulfilled. Excepting in regard to petty works, as defined in paragraph 2.18, repairs of the nature contemplated in paragraphs 2.20 and 2.59 and in cases of real emergency which must be immediately reported and explained to the authorities competent to accord administrative approval and technical sanction, this injunction may not be infringed. On the other hand, the sanction of a design and estimate by Government or any other authority conveys no permission for the commencement of expenditure on the work, unless such expenditure has been provided for in the budget estimate of the year, or provisions has been made for the outlay within the official year either by re-appropriation or out of some lump sum grant allotted for the head of classification under which the service falls. Similarly no liability may be incurred in connection with any work until an assurance has been received from the authority competent to provide funds that such funds will be allotted before the liability matures.

(2) If in any case, whether on grounds of urgency or otherwise, a Divisional Officer is required to carry out a work for which no estimates have been sanctioned or for which no financial provision exists (whether estimates have been sanctioned or not) the orders of the officer authorizing the work should be conveyed in writing. On receipt of such written orders the officer who is directed to carry out the work should immediately intimate to the audit officer concerned that he is incurring a liability or which there is no provision or inadequate provision of funds and should, at the same time, state approximately the amount of the liability which it is likely he will incur by compliance with the written orders which he has received. The audit officer will then be responsible for bringing the facts instantly to the notice of higher financial authority, with a view to necessary steps being taken either to stop the progress of the work or to regularize its execution. There should be no hesitation in enforcing disciplinary action against any officer administrative or executive, who may fail or delay to comply with these orders.”

6.38. Subsequently, the departmental instructions were further added to the said paragraph. Reference is made to the (a) [Guidelines for Flood Preparedness/works during Flood Season 2000 \(U.S.\(Floods\) Misc-96\(1\)97 dated 10.3.2000](#), (b) [Works to be Implemented Under Para 2.89 of PWD Code In Case of Extreme Emergency \[No.P.A. \(AST\)/8/2001 dated 11.08.2001\]](#), (c) [Execution of Emergent Works Under Para 2.89 of PWD](#)

Code (No.A.S. (Budget) I&P/1-3/2010 dated 30.06.2010)⁴⁹

6.39. Last letter on the subject dated 30.06.2010 is reproduced hereunder for ready reference:-

NO.A.S.(budget) I&P/1-3/2010
GOVERNMENT OF THE PUNJAB
 IRRIGATION AND POWER DEPARTMENT
 Dated Lahore, the 30th June, 2010

To
 The Chief Engineers, Irrigation:-
 1- Lahore Zone, Lahore
 2- Faisalabad Zone, Faisalabad.
 3- Sargodha Zone, Sargodha
 4- Multan Zone, Multan
 5- D.G. Khan Zone, D.G. Khan
 6- Bahawalpur Zone, Bahawalpur
 7- Development Zone, Lahore
 8- Head, PMO (Taunsa Barage)
 9- Project Director, LBDCIP Sahiwal.

Subject: **EXECUTION OF EMERGENT WORKS UNDER PARA 2.89 OF PWD CODE.**

In partial modification of the previous departmental instructions regarding execution of emergent works under Para 2.89 of PWD **Code, Secretary, Irrigation & Power Department will allow implementation of emergent works.** Chief Engineers will recommend and monitor all such cases subject to strict observance of all the codal, legal procedural and financial rules / instructions issued by the Government from time to time. The following instructions are reiterated:

- A) Chief Engineer should ensure their full satisfaction before recommending such cases to Secretary, Irrigation & Power Department
- B) All the codal / procedural formalities should be fulfilled before taking up such works.
- C) All the damaged / emergent works under para 2.89 of PWD Code should be independently checked by a team comprising concerned Chief Engineer, one Superintending Engineer, and Executive Engineer who should be from outside the Circle / division where the work is required to be undertaken.
- D) Chief Engineers should visit and personally inspect all the works under Para 2.89 as soon as possible.
- E) Use of stone for emergent works should be restricted to consumption out of stacks of

⁴⁹ Ex I.W. 119/2/1

reserve stock duly checked and documented as per already conveyed instructions. Daily consumption of stone and other materials should always be intimated to all concerned alongwith cost impact of the used materials.

F) The consumed reserve stock should be replenished through XEN/SDO and a contractor other than those involved on implementation of emergent works. The replenished reserve stock should always be checked/ documented as per instructions in this regard before allowing use of replenished reserve stock on implementation of emergent works, if so required.

G) Base line data of all the works should be got checked / verified from the monitoring teams before the start of the works. These teams should always be kept involved during execution and on completion of the works

H) Intimation regarding all such emergency works should also be communicated to the concerned District Coordination Officer.

I) Chief Engineers should exercise proper professional skill and adopt most economical and technically sound proposal in each case.

J) Chief Engineer D&F Lahore would be overall coordinator who should always be kept apprised by concerned XEN /SEs /CEs of all the daily activities and liabilities incurred on emergent works. He may exercise adequate checks as and when deemed fit by him to ensure quantitative as well as qualitative control of emergent works.

K) Chief Engineer D&F as well as concerned Chief Engineer shall keep Secretary I&P posted / updated on the progress of implementation of all such emergent works.

L) The applications for arrangement of funds against the emergent works should contain following information

- i) Name of Works
- ii) Approval of Secretary, Irrigation & Power Department (No. & Date)
- iii) Head of Account
- iv) Estimated Cost
- v) Mode of execution (through contractor, Departmental Machinery or through Stock)
- vi) Amount already paid.
- vii) Expenditure incurred through stock and its adjustment
- viii) Balance amount to be Paid / Adjusted
- ix) Additional Funds required.

ADDITIONAL SECRETARY (Budget)

CC.

1. Additional Secretary to Chief Secretary, Punjab, Lahore
2. Chief , Strategic Planning and Reforms Unit (SPRU), I&P Department, Lahore.
3. Additional Secretary (Technical) Irrigation & Power Department, Lahore.
4. Project Manager, Third Party Monitoring of O&M Works.
5. P.S. to Secretary, Irrigation & Power Department, Lahore.

6.40. On the basis of above, para 2.89 of PWD Code, only Secretary, I & P Department can allow the implementation of emergent work whereas Chief Engineer will recommend and monitor all such cases subject to strict observations of all the codal, legal procedural and financial rules / instructions issued by the Government from time to time. It, therefore, means that in the case of Jinnah Barrage any procurement of the reserve stone allegedly made between 29th to 31st July, 2010 was not in compliance with the above instructions/regulations.

6.41. Vide letter dated 21/23 September, 2000⁵⁰ of the Additional Secretary (Technical)⁵¹ addressed to all Chief Engineers including Sargodha Zone it was directed that in future, field divisions shall obtain supply of stones from Sikhanwala Quarry only. Change in source can only be allowed by the I & P Department on a reference from the concerned Divisions through the Zonal office. However, in the current situation XEN in violation of all the regulations has shown to have allegedly procured reserve stone from private quarries in Sargodha. Why ? there is no answer.

6.42. The C.E. (D & F) once again exhibited total ignorance and incompetency towards important flood related matters. Responding to the questions raised by the Tribunal, the C.E. submitted:⁵²

6.42.13. Q. No.(i): "What were the daily checks put in place by Chief Engineer, D&F Lahore regarding emergent work carried out under Para 2.89 of PWD Code on the stone loose apron downstream Jinnah Barrage"?

6.42.14. Answer: The Chief Engineer, Drainage & Flood does not exercise daily checks on any work carried out under Para 2.89 of PWD Code because he acts as "Coordinator" only and as such, exercise the daily check does not fall under purview / responsibility of Drainage & Flood Zone. Therefore, no daily site checks were performed by this Zone on the work of replenishing loose stone apron downstream Jinnah Barrage.

However, under the orders of Administrative Department, the concerned Chief Engineer and the Monitoring Team comprising of Chief Engineer concerned, one Superintending Engineer and one Executive Engineer are required to perform close

⁵⁰ No. S.O. (OP)(I&P) 18-26/98

⁵¹ EX IW-119/2/1

⁵² Mark 111

monitoring for all purposes before, during execution and after completion of the work. (emphasis supplied)

6.42.15. Q. No.(vii): *“Is it also the responsibility of Chief Engineer of the concerned Zone to closely monitor all the emergent works under para 2.89 of PWD Code”?*

6.42.16. Answer: According to the orders / directions of the Administrative Department, the concerned Chief Engineer, Irrigation Sargodha Zone and the Monitoring Teams mentioned earlier are entirely responsible for close monitoring of all the emergent works under Para 2.89 of PWD Code in the Zone before start of work, during execution of after [sic] completion of work. Responsibility of the Chief Engineer, Drainage & Flood is “to coordinate only” between the Zonal Chief Engineers and the Admin Department.

6.42.17. Q. No.(ix): *“According to the SE, XEN and SDO Jinnah Barrage, Reserve Stock Stone was procured on emergent basis on 29th and 30th July 2010. Was Chief Engineer, D&F informed of the said procurement under paragraph 2.89 of the PWD Code? What is the position of the Chief Engineer, D&F regarding the procurement of Reserve Stock Stone from Sikhanwali and Musakhel quarries as per record of the Chief Engineer, D&F and what is the current status of the Reserve Stock Stone at Jinnah Barrage”?*

6.42.18. Answer: According to the record, the Chief Engineer, Drainage & Flood was not informed about the said procurement on emergent basis on 29th and 30th July, 2010 under Para 2.89 of PWD Code. Further, it does not fall in the purview / responsibility of Chief Engineer, Drainage & Flood to allow for carriage of stone from any quarry. It is the authority / responsibility of the concerned Zonal Chief Engineers to allow and sanction such works in accordance with Government rules in this regard. Further, Drainage & Flood Zone was not intimated by the Zonal Chief Engineers about any procurement made for reserve stock stone from Sikhanwali and Musakhel quarries. Current status of the Reserve Stock Stone at Jinnah Barrage has also not been intimated by the Zonal Chief Engineer except previous intimation made vide No.15299/W-II/6-54/2010, dated 27.07.2010 that “sufficient quantity of stone is available to meet with any eventuality at Kalabagh Headworks”. As such, all actions taken in the above regard pertain to the authority / responsibility of the concerned Zonal Chief Engineer Sargodha. However, the current status of the reserve stock of stone at Jinnah Barrage can be provided by the concerned Chief Engineer, Sargodha Zone.

6.43. We find that pre-flood preparation was not done as per Regulation and Guidelines. Reserve Stone stacking is fundamental to pre-flood preparedness. In this case there was no reserve stone at the Barrage since 2006. Infact, no one had any idea as to the exact requirement of reserve stone required for the training works at Jinnah Barrage. Therefore,

the letter of S.E, reassuring the C.E. and the Secretary that the reserve stone is available does not mention the quantity of reserve stone procured. The Secretary or C.E also did not bother to confirm the reserve stone required and therefore could never have known if the reserve stone had been fully procured. We are deeply disturbed at the insouciance and the indifference of the irrigation officers towards one of the most crucial aspect of pre flood preparation i.e., procurement of reserve stone, which undoubtedly forms the bed rock of any successful flood fighting plan.

6.44. Additionally, alleged procurement of reserve stone without invoking Para 2.89 of the PWD Code should have caused a stir and shaken the Secretary, C.E.(D & F) and the C.E out of their slumber as Secretary's permission was not sought for the said procurement but nothing happened and all of them accepted the sudden and rather magical presence of the reserve stones which were missing since long.

6.45. Jinnah Barrage, which was declared as sick barrage which required extra care, especially during the flood season. The poor pre-flood preparation and weak vigilance of C.E, C.E (D & F), S.E. and X.E.N does not reflect this. The Secretary, who under the Rules of Business is the official head of the department and responsible for its efficient administration and discipline and proper conduct of business of the department did not discharge his responsibility well. His vigilance during the flood season appears to be loose and weak. His systems should have been good enough to indicate to him that the reserve stone was missing, the alleged last minute procurement of reserve stone was without his approval, assessment of the total quantity of reserve stone required at Jinnah Barrage, the unlawful continuance of emergent work downstream Jinnah Barrage during flood season, the closure of gates much before the start of the flood season till the day of the breach. He should have taken extra care considering the Jinnah barrage was one of the sick barrages in his fleet of barrages. The Secretary, as the departmental head, did not have the right systems in place and failed to attend to details that were expected of him during the flood season. The argument that the country was passing through a long dry spell or that the intensity of the floods was unprecedented this year does not absolve the department and its officers from carrying out the pre flood preparation responsibilities.

6.46. CONCLUSION

6.47. The poor pre flood preparation i.e., absence of reserve stone, failure to deploy labour for flood fighting, poor stocks of flood fighting material, failure to set up flood fighting camps, failure to hold pre flood inspection as regulated, abuse of Para 2.89 of the PWD Code, continuance of emergent work downstream on the loose apron, closures of the gates during the flood season, contradictory versions regarding unlawful last minute procurement of reserve stones reflect gross incompetence, little regard for regulation, deep rooted corruption in the face of a national tragedy, misinformed and weak administrative vigilance. All these factors cut a sorry picture of a chaotic dysfunctional governance structure at the I & P Department which is certainly not fit or able to handle floods - unless the department is re-engineered.

7. FLOOD FORECASTING

7.1. According to Dr. Qamar uz Zaman Chaudhary's⁵³, DG PMD during the recent Floods: July 23, 2010 was a normal monsoon day when a monsoon low-pressure system developed over the Bay of Bengal and started moving slowly towards Pakistan. As it reached the skies over Pakistan around July 26, 2010 another westerly trough was approaching the northern parts of Pakistan and the two weather systems started interacting over the country's north-western regions.

7.2. He further submitted that the event was aggravated by the presence of a stagnant jet stream (a tunnel of strong winds at high altitude) at an abnormally low latitude in the north, which helped suck a lot of moisture from the ocean into the monsoon system, aggravating the whole event and causing the heaviest rainfall in recorded history over Khyber Pakhtunkhwa, Gilgit-Baltistan and eastern Afghanistan, [especially in the evening of July 28 and the whole day of July 29](#).

7.3. Ex DG, PMD was of the view that the rainfall, which was about five times higher than the usual July rainfall in this area, causing flash flooding in the Swat and Kabul rivers. The heavy rainfall in the Hindu Kush and Karakoram mountain ranges also accelerated snow and glacier melt and their combination caused unprecedented floodwater in the Indus river at Tarbela. The combined effect of the flood peak at Tarbela and the Kabul and Swat rivers, and extremely heavy rainfall in the plains of Nowshera, Risalpur, Mardan and Peshawar generated the first flood wave in the Indus.

7.4. He continued to submit that this was not the end of the weather chaos. On August 3rd, 2010 another monsoon low-pressure system formed over the Bay of Bengal and followed the same track: a frozen jet stream and a westerly trough were lying in wait and caused the second heavy rainfall between August 6th and 9th in Khyber Pakhtunkhwa, Gilgit-Baltistan and Ladakh. This second rainfall event generated the second flood wave. These two flood events caused the longest sustained floods in Pakistan's history. For reference purposes, the sustained flood peak of over one million cusecs at Guddu lasted for eight days and 17 hours. Previous similar historic flood peaks of 1992, 1998 and 1986 at Guddu lasted for 28 hours, six days, 22 hours and five days, 11 hours respectively.

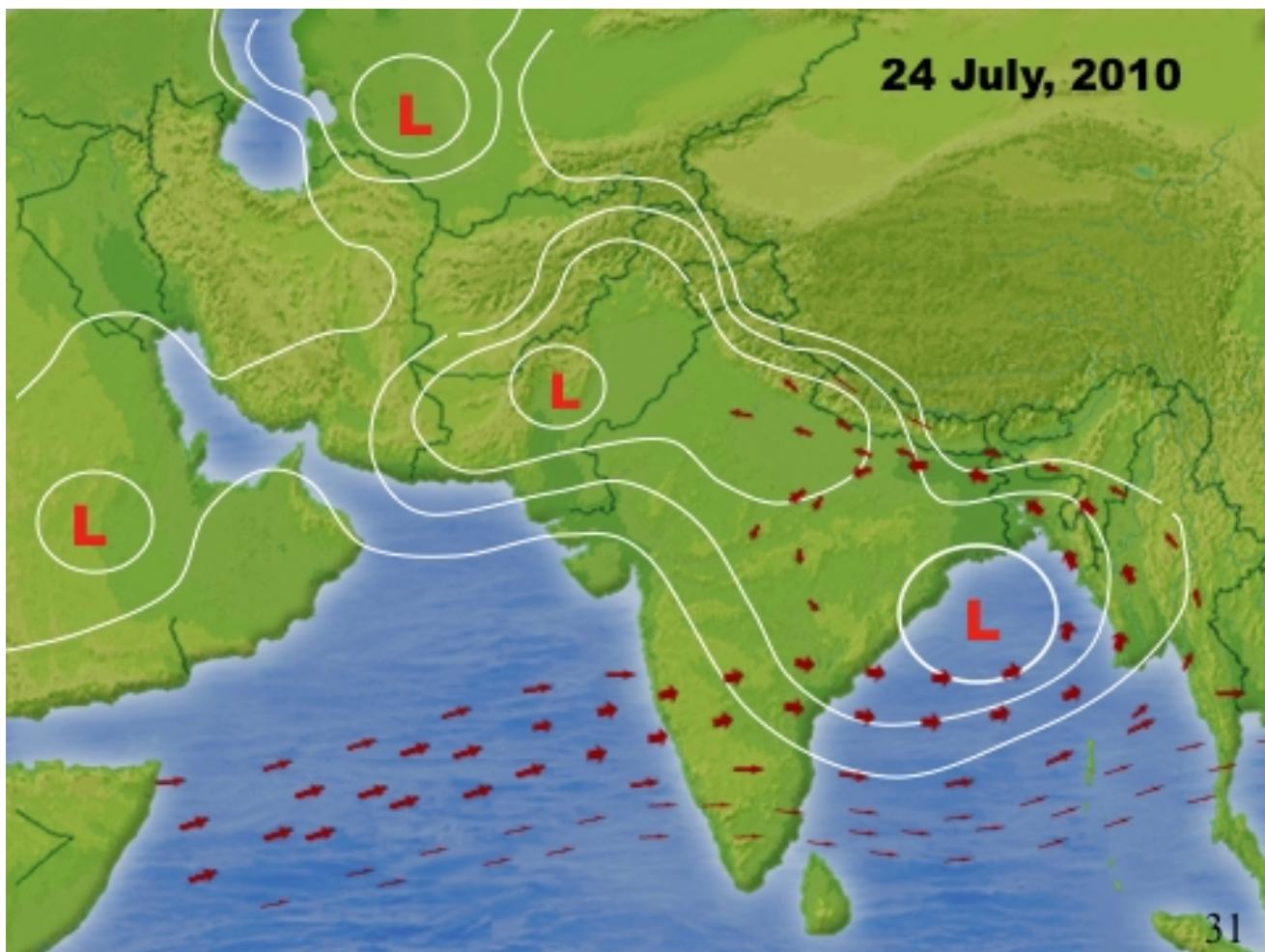
7.5. Dr. Qamar uz Zaman Chaudhary submitted that Pakistan's Task Force on Climate Change in its report very clearly stated that in the country, extreme events would increase in their frequency and intensity while monsoon rains in the country would be more erratic, causing frequent floods and drought. The answer to the question about linking Pakistan's weather chaos to climate change would be easier if we looked at our weather patterns over the last eight months. The year started with drought conditions in the country. March witnessed abnormally high temperatures that affected our wheat production badly because of premature ripening. Then in the first week of June the southern parts of the country were

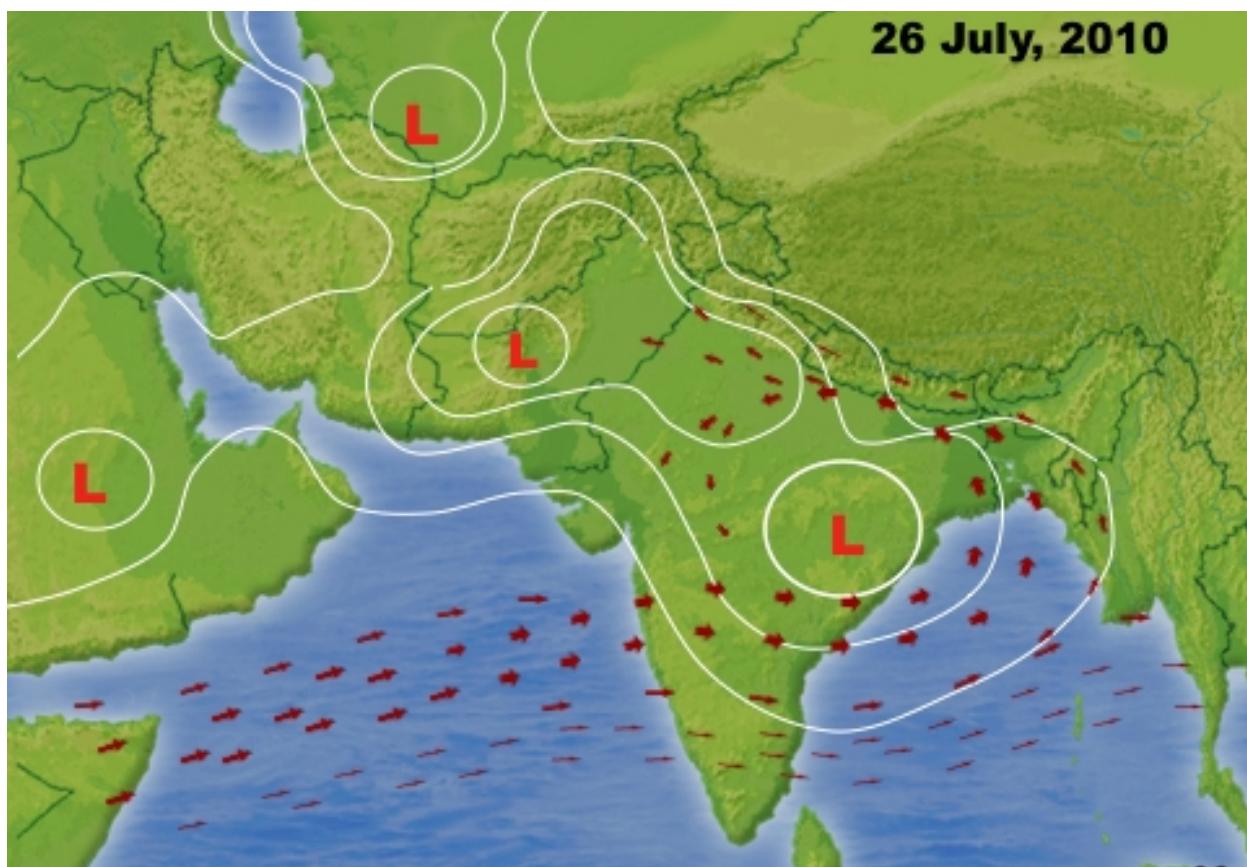
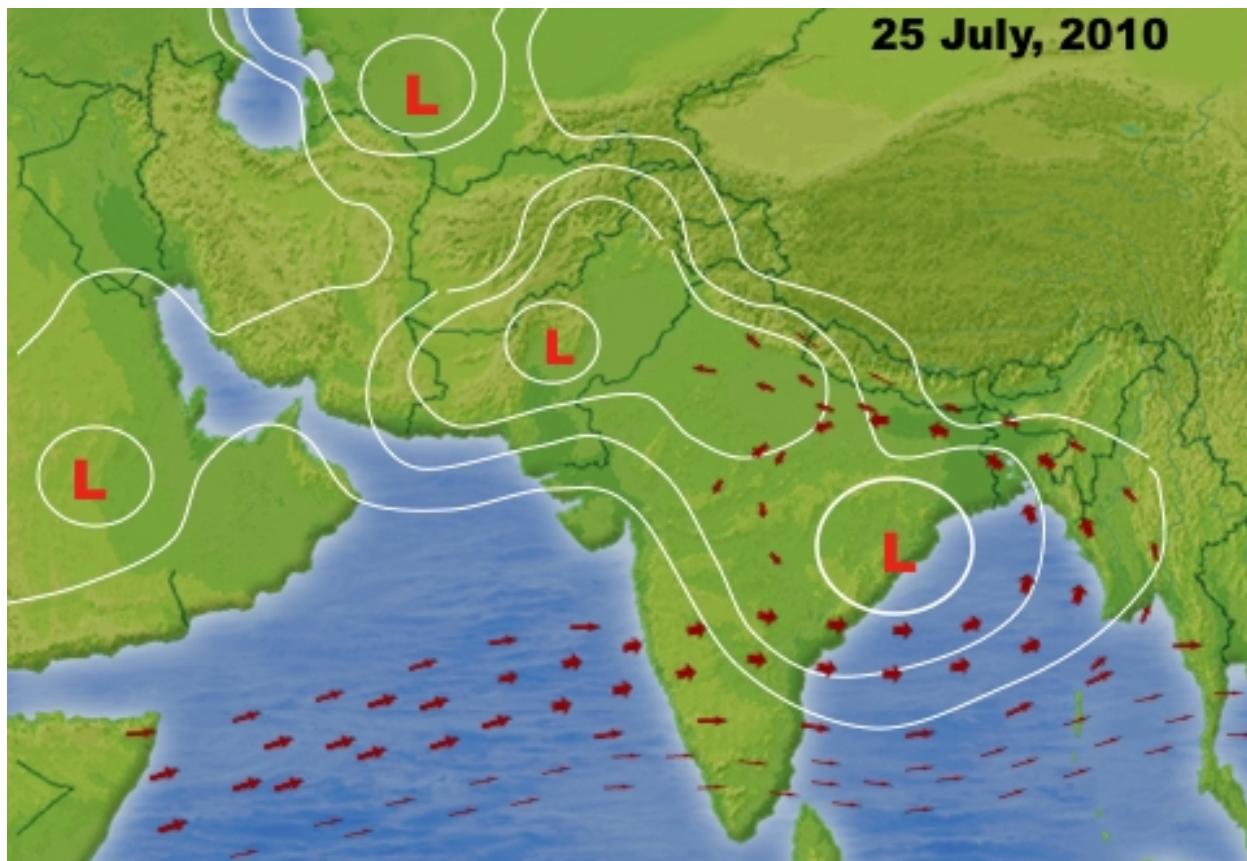
⁵³ Ex.I.W.88/2

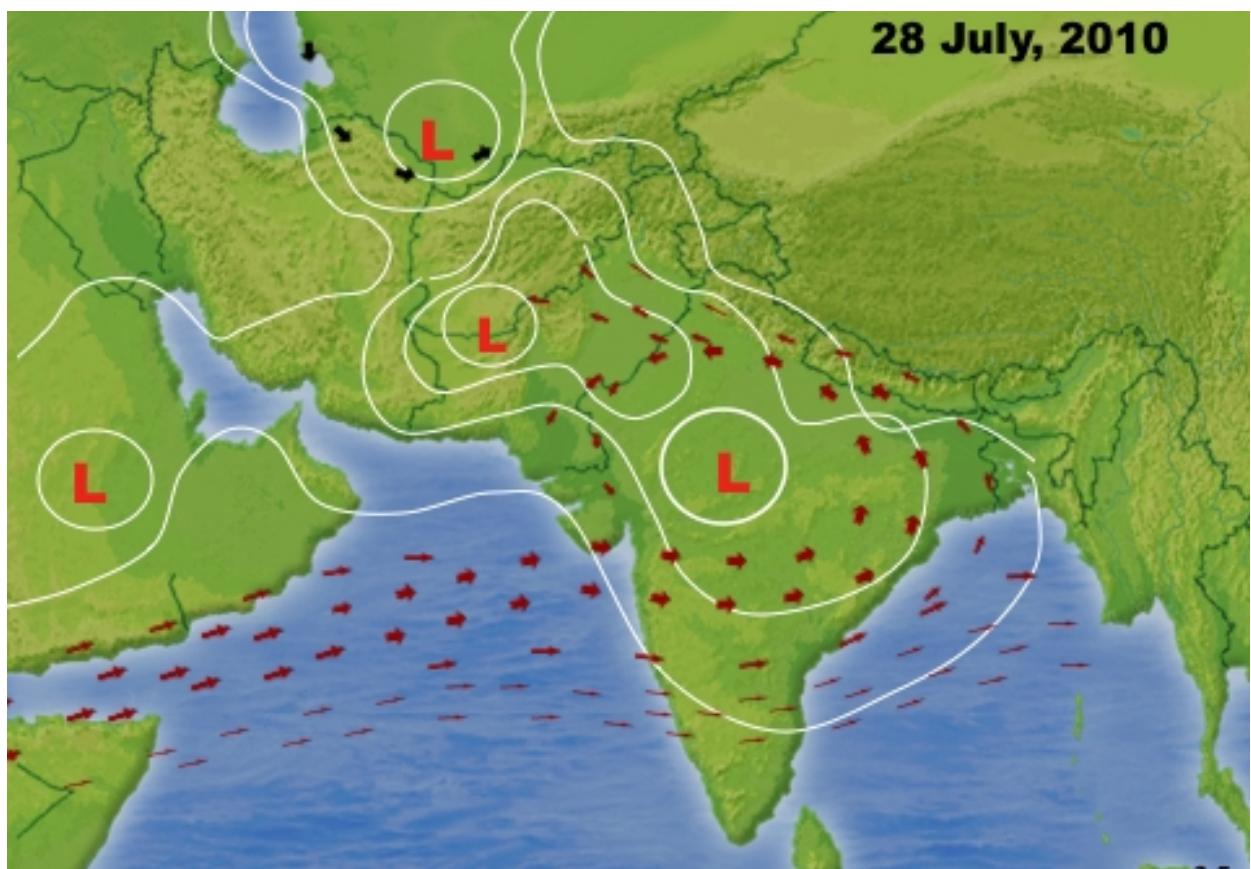
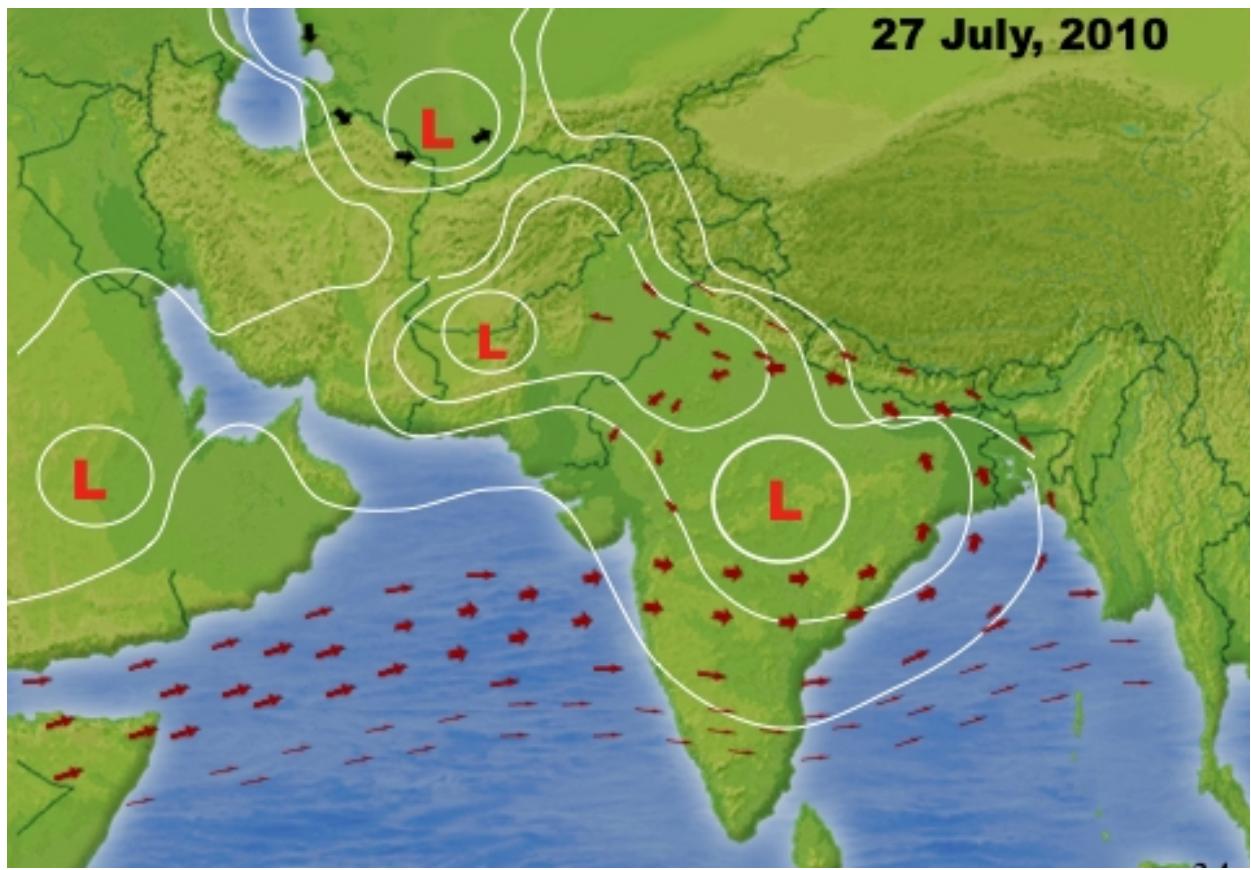
struck by a tropical cyclone, another extreme event. In the remaining part of June the country experienced heat-wave conditions that broke all previous records, while in the last week of July and August the country experienced the worst floods of its history. Can we still afford the luxury to deny that this is not because of climate change? Surely all these extreme events are the visible footprints and signs of climate change in Pakistan.

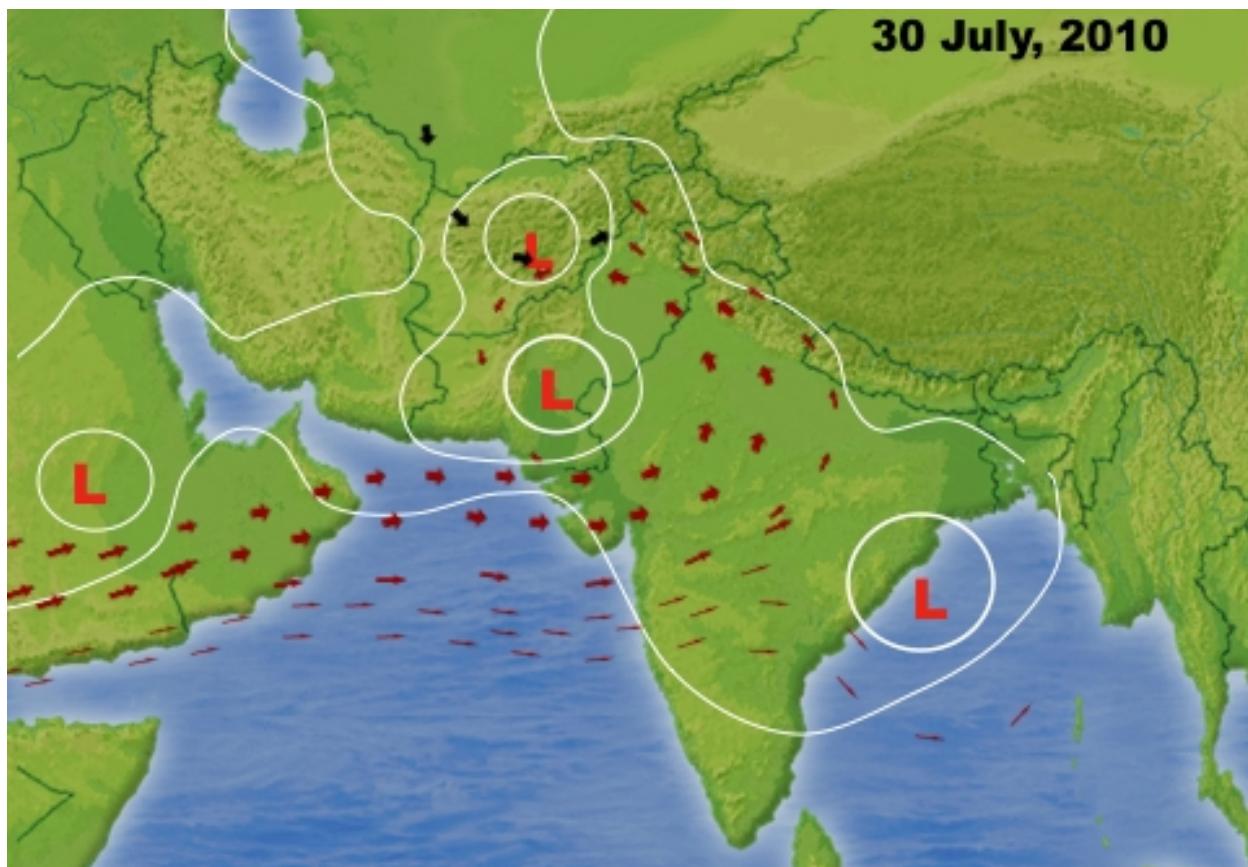
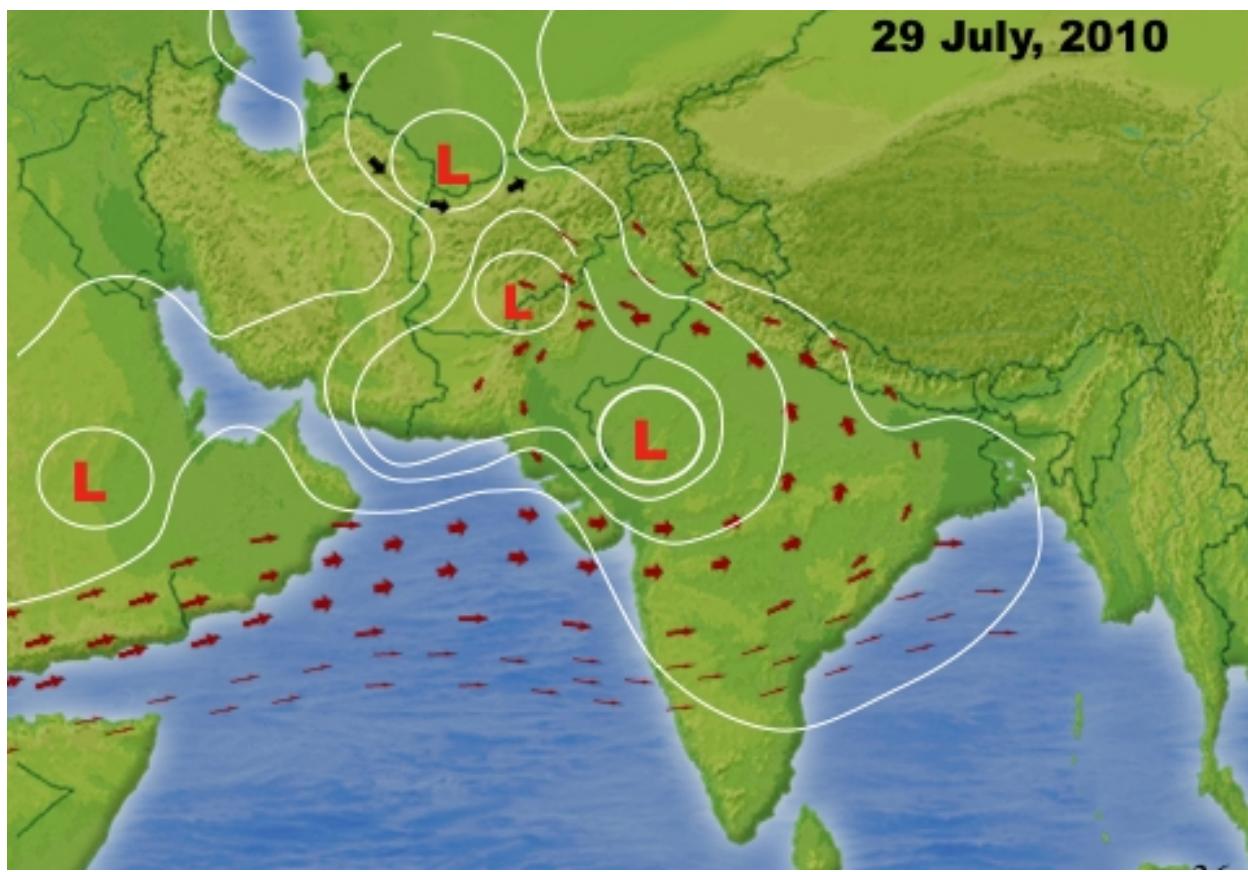
7.6. He recommended development policies should be in line with climate change scenarios, which indicate erratic monsoon rains with frequent and intense floods and droughts in Pakistan. Further, the flood forecast and early warning system in the country should be strengthened. River flood plain laws and regulations should be formulated and strictly implemented, as during the present floods most of the damage was in the flood plain areas. There also needs to be further strengthening of flood- protection bunds wherever possible while the construction of flood-mitigation dams should also be considered.

7.7. The interactions of westerly-easterly waves are shown in the following diagrams:



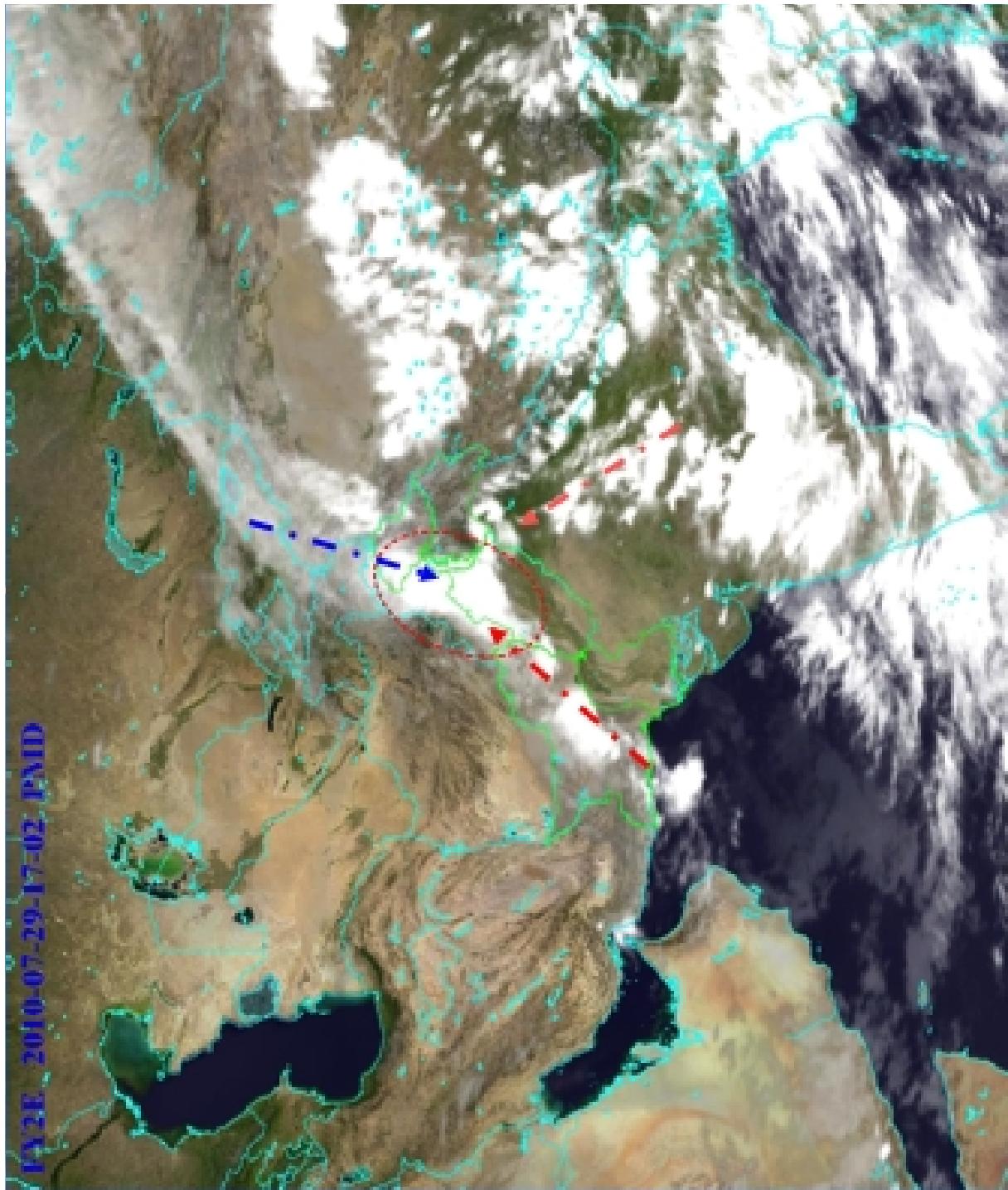








Interaction of 2 Weather Systems: St Image of 29th July



7.8. **Meteorological condition responsible for the flood of July/August 2010**⁵⁴: According to PMD, a well marked low pressure area was located in Bay of Bengal on 25th July 2010 which after traveling over Madhya Pardesh (India) reached the state of Gujrat, India on 27th July 2010. On the same day this low entered Pakistan and merged into the seasonal low at Balochistan and adjoining areas. This condition accentuates the seasonal low and under this situation heavy rainfall was expected over Khyber Pakhtunkhawa (KPK), Punjab and over Kashmir also, due to strong incursion of moist current from Arabian Sea. The presence of westerly waves over KP and adjoining Afghanistan aggravated the situation and record breaking rainfall was recovered over KP, Gilgit Baltistan area.

7.9. After a gap of four days another low pressure, which originated from Bay of Bengal was located over Rajasthan on 5th August 2010, which also merged with seasonal low over Balochistan on 6th August 2010. This was once again accentuated by the presence of westerly wave over Afghanistan & adjoining KP. This interaction of two systems again produced heavy rain in KP, north Punjab, Kashmir and Gilgit Baltistan. The intensity of rains was however less than the first system.

7.10. The record breaking rains in the north of Pakistan, which is a part of catchment of river Indus, generated a historic peak at Tarbela (8,32,000 cusecs at 0400 PST on 30-07-2010). The release of more than 600000 cusecs from Tarbela was joined by a flow of more than 3,50,000 cusecs from river Kabul at Nowshera (the gauge of Kabul river at Nowshera was over topped and it is presumed that the water flow was more than 3,50,000 cusecs). This massive flood wave struck Kalabagh barrage on 31st July 2010. It was a near historic peak (9,37,459 cusecs at 2200 PST on 30-07-2010). After passing Kalabagh barrage, the flood wave reached Chashma on 1st August 2010. The flood wave was more than the capacity of Chashma barrage; however this historic flow (10,38,873 cusecs at 1400 PST on 01-08-2010) managed to pass through the barrage without damaging it. The flood wave reached Taunsa Barrage (9,59,991 cusecs) on 02nd August 2010. At Taunsa, the flood wave was slightly attenuated and the exceptionally high flood level continued for a longer period as expected. From Taunsa this flood wave reached Guddu on 8th August 2010. It was also a historic peak at Guddu measuring 1,148,738 cusecs at 1100 PST on 08-08-2010. The flood wave further traveling down touched Sukkur on 09th August 2010. The volume of water at Sukkur (1,130,220 cusecs) was more than the capacity of the barrage but again the flood wave passed safely without any damage to the barrage. The volume of water can be imagined by the fact that more than 1,130,000 cusecs of water continued for more than 60 hours at Sukkur. Finally, Kotri barrage started to rise slowly and the peak flow of 9,38,438 cusecs was recorded on 24-08-2010 at Kotri.

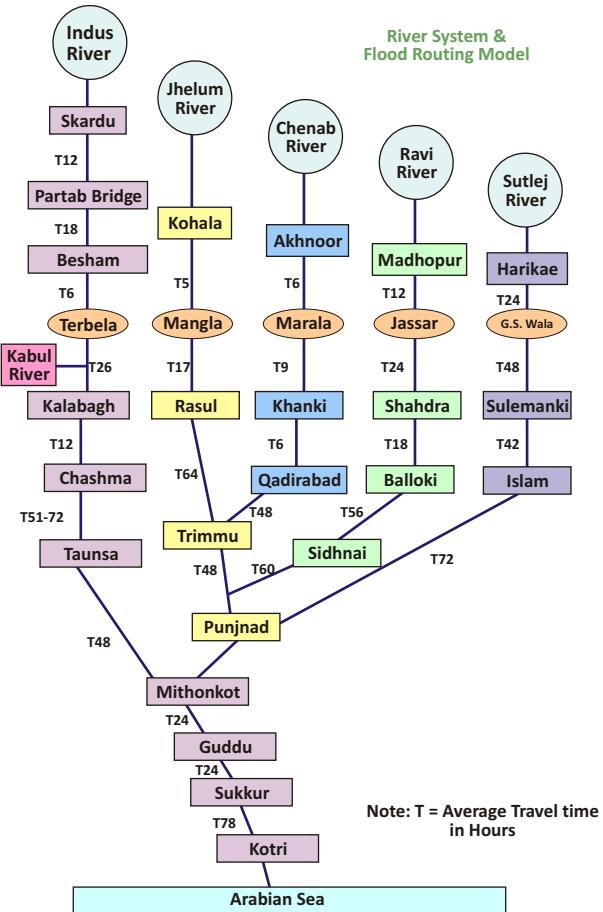
7.11. A second spell of very high flood wave followed the first flood wave due to the second rainy system described above. River Indus at Tarbela again started to rise from 6th August-2010 and a peak discharge of 5,72,000 Cusecs was recorded on 9th August 2010. Consequently the flow at Kalabagh barrage also started to swell from 10th August-2010 and max flow of 6,89,742 Cusecs was recorded there on 10th August-2010. Chashma Barrage

⁵⁴ Ex.I.W.3/2

once again recorded very high flood of 8,12,307 cusecs on 8th August-2010. The second flood wave reached Taunsa barrage on 14th August-2010 when the peak discharge of 7,79,227 cusecs was observed there. After hitting Taunsa the second flood wave reached Guddu where effects of first wave were still present and the water level had not come down. The river at Guddu recorded peak of 1,148,738 cusecs on 8th August-2010 and started to fall but hardly came down below 10,00,000 cusecs when under the influence of second flood wave the water level again started to rise from 14th August-2010 and reached a peak discharge of 1,076,728 cusecs on 16th August-2010. Particularly, the second flood wave merged with the first flood wave after Guddu and the combined effect of the two waves was observed at Sukkur and Kotri.

7.12. Flood Warning (Significant Flood Forecast)- Position of PMD: The mandate of FFD (PMD) is to issue flood forecasts and warnings/advisories relating to the flood situation likely to occur during next 24 hours. The warning is definitely issued and the related agencies who are directly affected are informed as well. These warnings are not only faxed to the related agencies but the confirmation regarding its receipt is also confirmed on phone. Simultaneously the Flood Warning Center (established by the Irrigation Department Punjab under the logistic support of Relief & Crisis Management Punjab) is also immediately informed for necessary action at their end (as provided in the SOP).

7.13. The River System and Flood Routing Model prepared by PMD is as follows:



Source: Flood Forecasting Division, Pakistan Meteorological Department

7.14. During this flood event, the first warning for the river Indus at Tarbela, was issued at 1900 PST on 28.07.2010 (warning No.9). At the time the flood at Tarbela was **4,60,000** Cusecs. Due to the extraordinary heavy rainfall in the upper catchment of Indus River, high to very high flood was expected at Tarbela and Kalabagh. Consequently, a warning of expected high flood at Kalabagh was issued at 2200 hrs PST on 28.07.2010 (warning No.10). At that time the flood at Kalabagh was **2,72,424** Cusecs.

7.15. Due to continued worst weather observed over Khyber Pakhtunkhwa, adjoining Kashmir and Afghanistan, second warning for very high to exceptionally high flood likely to be observed at Kalabagh was issued at 1030 hrs. PST on 30.07.2010 (No.14). The actual peak was observed at Kalabagh at 2200 hrs. on 30.7.2010 i.e, about 12 hours after the warning was issued. Eventually this peak was to reach Chashma and a high to very high flood warning for (No.15) Chashma was issued at 1040 hrs PST on 30.7.2010. At that time Chashma was maintaining a level of nearly 7,00,000 Cusecs while the peak (1038873 cusecs) reached Chashma at 16:00 PST on 01.08.2010, 54 hours after the warning was issued. Due to this exceptionally high flood the river Indus started to rise at Taunsa and warning (No.16) for exceptionally high flood at Taunsa was issued at 1340 PST on 31st July 2010. The actual peak of **9,59,991** Cusecs was observed at Taunsa at 2100 PST on 02.08.2010 about 55 hours after the warning was issued by Flood Forecasting Division, Lahore.

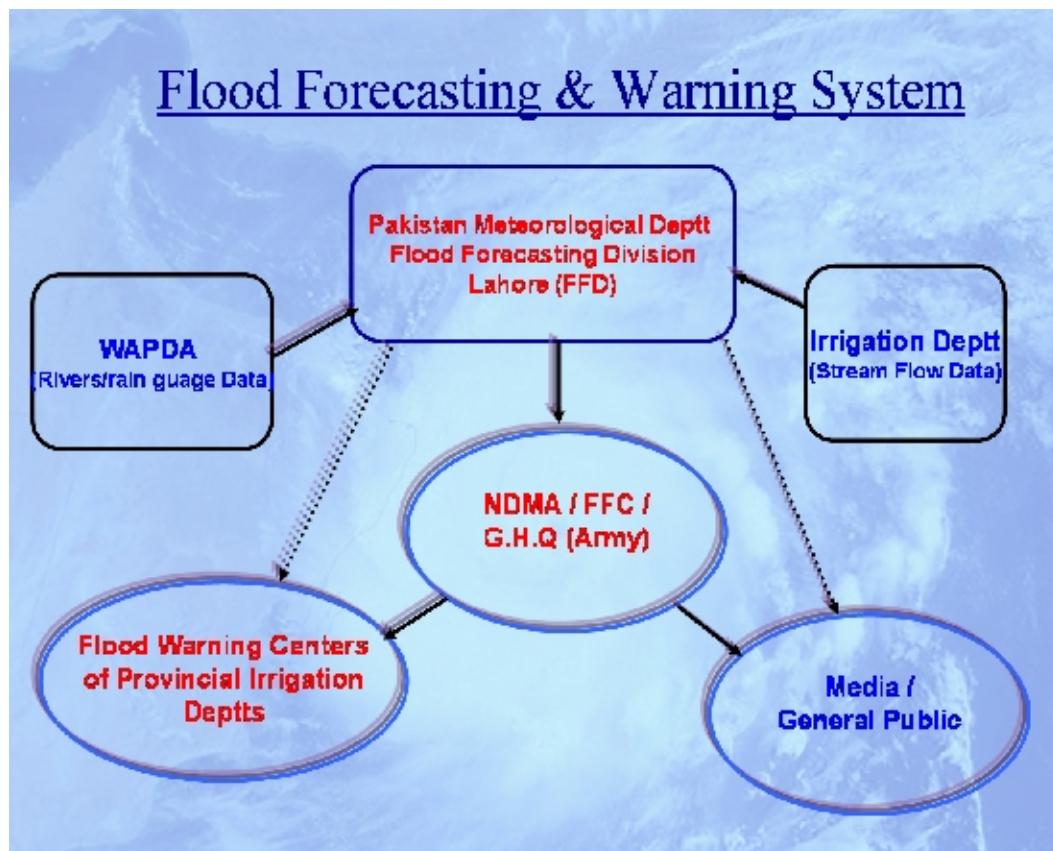
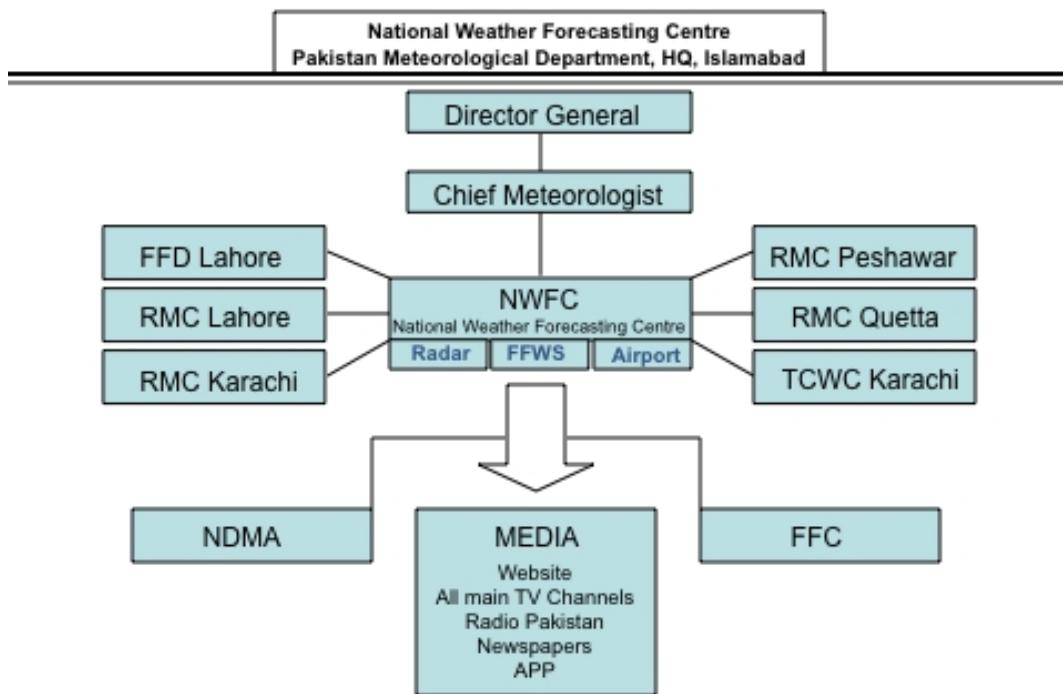
7.16. In the mean time the second wave was also generated due to the continuous high rainfall observed in the upper catchment of river Indus on 3rd, 4th and 5th August-2010. A fresh warning of very high wave likely to be observed at Tarbela, Kalabagh and Chashma ranging between 5 to 7 lac was issued at 1700 hrs PST on 7th August-2010 (No.32). While the actual peaks were observed at Tarbela (**5,72,000 Cusecs**) at 2300 hrs. PST on 9-08-2010, at Kalabagh (**6,89,742 Cusecs**) at 1500 PST on 10-08-2010 and at Chashma (**8,12,307 Cusecs**) at 2100 PST on 11.8.2010, more than 48 hrs after the time of issuance of warning.

7.17. Very high flood was again expected at Taunsa, therefore very high flood warning (No.35) ranging between 680000 to 730000 Cusecs was issued by FFD, Lahore at 1130 hrs. PST on 9.8.2010, while the actual peak of 7,79,227 Cusecs was observed at 1200 hrs PST on 14.8.2010, actually 5 days after the issuance of warning by FFD, Lahore.

7.18. INQUIRY & FINDINGS

7.19. *Structure of PMD:* Two more relevant specialized early warning centres of PMD for this inquiry are the National Weather Forecasting Centre (NWFC), Islamabad and Flood Forecasting Division (FFD), Lahore. NWFC and FFD are structured in the following manner⁵⁵:

⁵⁵ PMD Ex IW3/1



7.20. **SOP⁵⁶ REGARDING HYDRO-METEOROLOGICAL FORECASTING BY FFD, PMD.** According to the SOP (Hydro-Meteorological Forecasting) floods are classified into five levels in the following manner:-

| Sr. No. | Classification | Detail |
|---------|--------------------------|--|
| 1 | Low Flood | It is that flood situation when the River is flowing within deep channel(s) but is about to spread over river islands/belas. |
| 2 | Medium Flood | The river is called in Medium Floods when River flows is partly inundating river island/belas but flow half of its highest flood level. |
| 3 | High Flood | When the water level of the River is almost fully submerging islands/belas and flowing upto high banks/bunds but without encroaching on the freeboard. |
| 4 | Very High Flood | When the water level of the river flows is between high banks/bunds with encroachment on freeboard. |
| 5 | Exceptionally High Flood | It is the flood situation where there is imminent danger of overtopping/breaching or a breach has actually occurred or high bank areas become inundated. |

7.21. According to the SOP, Floods in Pakistan are mainly caused by the heavy Monsoon rains during summer monsoon period from July to October. There are two situations which cause flood producing rains in the upper catchments of the Rivers. The two meteorological situations in relation to different conditions of intensity and movement of Monsoon low data depression may produce three categories of floods namely; **Category-I, II & III floods.**

7.22. Meteorological situation for Category-I flood is when seasonal low generally built over South Eastern Balochistan, South Western Punjab and adjoining parts of Sindh gets occasional intensity due to the passage of Westerly Wave and thus causes the moisture from the Arabian Sea to be brought up to the upper catchments of Chenab and Jehlum Rivers resulting in heavy downpour along the windward slopes and the mountain ranges due to the orographic lifting of the moist air mass. Floods in these conditions are Category-I floods,

⁵⁶ Ex.IW.3/2

which may cause a short peak ranging from 3 to 5 lac cusecs under extreme conditions. This poses no serious flood management problem for the Mangla Reservoir due to short duration and its less volume.

7.23. The second flood generating meteorological situation is the one linked with Monsoon low data depression such Monsoon systems originating from Bay of Bengal Region and then moving across India in a West/North westerly occasion arise over Rajasthan or any of the adjoining cities of India. After this the Monsoon depression may take any one of the following courses:-

7.23.19. Continue moving toward west causing heavy widespread rains over Sindh, Balochistan in river flooding course in this case.

7.23.20. Re-curve in the North South direction towards the upper catchments Setluj, Ravi and Chenab Rivers causing extremely heavy rainfall and consequently the flood first occurs in India and then at the rim station of Pakistan. This is the Category-II flood situation. In this situation floods first occurs in River Chenab. Ravi and Jhelum are affected in sequence followed by River Setluj. Floods in River Jhelum in this situation may be significantly greater than the Category-I Floods and may thus cause more flood management problems for the Mangla Reservoir. However, the problem can safely be resolved by resorting to safe pre-flood releases;

7.23.21. Continue moving in the Northern direction under the effect of considering Westerly Waves over Lahore/Gujranwala Division anywhere ending up over Rawalpindi / Hazara Divisions. However upper catchments of Chenab, Jhelum and Indus rivers comes under its influence extremely heavy rains may occur over Mangla and Tarbela catchments under this situation. This probable maximum flood (PMF) has an extreme case of Category-III Flood. These are most dangerous floods for Mangla Reservoir typical example of such flood is 1992 flood.

7.24. The Meteorological factors linked with each situation are generally well known and **24 hours advance prediction should be quite possible in each case.** In fact tracking of the depression from the Bay of Bengal and its reporting on continuous basis in the daily forecast bulletin issued by FFD. Once the depression reaches Rajasthan extremely close watch is kept using meteorological charts and satellite cloud pictures. As the depression advances towards Pakistan and comes within the meteorological range of Lahore Radar and intensify weather starts **color coded met alerts are issued as applicable.** There are two types of systems one is Westerly Wave and the other is Monsoon system.

7.25. Precipitation in weather (which is mainly in the form of snow) is on account of eastward moving low pressure weather systems called westerly waves, which mostly move about 30 degrees latitude and deposit snow over the mountains. Snow deposited during the winter becomes the major source of water supply in the summer.

7.26. Rainfall in the summer is on account of Monsoon weather systems unlike the westerly waves. The Monsoon weather system is a low level weather system with heaviest rainfall limited to till 5,000 ft elevation. During summer even through Monsoon rain changing weather system yet the system of westerly waves also continues to affect the country along the northern latitudes. Intensification of Monsoon weather system and Northern curving of the Monsoon depression is due to the westerly waves.

7.27. Flood forecasting system has three components namely: (i) Meteorological, (ii) Hydro-Meteorological; and (iii) Hydrological.

- a. Prediction and monitoring of the rainfall forms the Meteorological component; forecasting of the flood flows using the actual and predicted rainfall and flow data of the upstream stations constitutes the Hydro-Meteorological component of the flood forecasting system; and the routing of the flood wave below the rim station of the rivers is the Hydrological component of the forecasting system
- b. There are three kinds of flood forecasting: (i) Qualitative flood forecast; (ii) Quantitative Flood Forecast; and (iii) Early Warning.
 - i. QUALITATIVE FLOOD FORECAST is meant to provide advance information about the approaching weather systems, which may cause such loss as may result in generation of significant flood wave in the Indus basin river system. Qualitative Flood Forecasts are issued at the time when the approaching weather system is still outside the river catchments but may move into it in the due course of time. **Such forecast for longer reach time are thus extremely important in providing reasonable advanced information to activate the flood fighting measures at all levels.** Category-II & III Floods occur when Monsoon depression upon reaching Rajasthan State of India re-curves to the North or the North East. Chances of the major flood may thus develop in case the Monsoon low depression arise over Rajasthan. **This is the time when all the concerned government agencies need to be alerted to face the possible flood situation.** The following color coded alerts are therefore issued. “**Blue Alert**” in case possibility of flood within 24 to 72 hours depends upon the future improvement of the Monsoon. In case Monsoon starts to stagnate over the same position it either fizzles out or becomes stronger, depending upon the availability of the moisture in it. In case it starts to intensify the chances of re-curving shall increase and it starts to move northward, occurrence of flood may become imminent. Consequently this is important stage when another alert is issued. This is more alarming alert than the previous one is called “**Yellow Alert**”, in case the low depression starts to directly affect the catchments areas and the heavy flood producing rains are starts the “**Red Alert**” is immediately issued. Quantitative of the flood picture can only be done after the total storm rain becomes available. This however may be too low for rescue purposes as the time to peak flood if the rain is relatively small in case of most of rivers on account of steep slope of the upper catchments. Thus three qualitative flood forecasts color coded **Blue, Yellow & Red** alerts are issued to alert the

government agencies.

ii. QUANTITATIVE FLOOD FORECAST: Routine Daily Flood Forecast (RDFF) is issued once a day and is based upon the discharge measurements of 0600 hours PST, Meteorological Charts latest APT pictures data of Lahore, Sialkot, Mangla and Islamabad Radars and the Indian discharge data as received through PCIW the forecast is issued before the mid day for 24 hours period.

iii. EARLY WARNING: If the flood situation undergoes rapid fluctuations significant flood forecast is issued by FFD.

7.2.8. The seasonal forecast issued by the PMD on 23-6-2010 was as follows:

No.St-3(3)/2010/
GOVERNMENT OF PAKISTAN
PAKISTAN METEROLOGICAL DEPARTMENT
Climate Data Processing Center
University Road Karachi -75270
Phone No.021-99261412,021-99261413

PRESS RELEASE⁵⁷

Date: June 23rd, 2010

Normal Monsoon Rains Predicted during July-Sep (2010)

Meteorological data suggests that on all Pakistan Basis the monsoon rains during July to September (2010) in most parts of the country are likely to be NORMAL (#10%), which means that the over all availability of water in the country from monsoon rains would be sufficient.

Met-Office informed that due to high sea-land temperature contrast, the development of some mid-tropospheric circulations are likely in north Arabian Sea that may cause heavy rainfall events over southern area of Pakistan (Sindh) during July to September. **Due to the interactions of westerly-easterly waves, few very heavy rainfall events would also occur over north-east Pakistan that may cause urban/flash flooding during July to September.** (emphasis supplied)

This is seasonal forecast with confidence level of 80% and meant for the planning purpose only. The normal area-weighted rainfall for July to September of Pakistan is 137.5 mm.

Sd/-
(NAEEM SHAH)
DIRECTOR C.D.P.C,
FOR DIRECTOR GENERAL
METEROLOGICAL SERVICES,
KARACHI

In June, 2010 PMD issued seasonal forecast predicting interactions between westerly-easterly waves and very heavy rainfall events over north east of Pakistan. This forecast had a

⁵⁷ Ex I.W. 3/10

confidence level of 80%. The seasonal forecast seems to have missed the attention of the flood managers. It is also not clear if the said seasonal forecast was communicated to the I & P Department by PMD or it was simply a (one off) press release ? This information should have been widely circulated and flood managers should have internalized it as a useful information in their flood strategy.

7.2.9. The [Meteorological Analysis](#)⁵⁸ of PMD of the critical dates are relevant:

7.30. **July 24th, 2010- Upper Air Situation**-According to upper air charts, the [cyclonic circulation](#) was found at 5000 feet over Bay of Bengal. The incursion from Bay of Bengal was reaching upto U.P. India. However light Westerly winds prevailed over north parts of Pakistan." [Weather Advisory-I of the said date](#) forecasted weather for KPK in the following manner:- "[Heavy falls expected on Tuesday, Wednesday](#)" (i.e., 27 & 28th July, 2010).

7.3.1. **25th July, 2010** The Meteorological analysis for the above dates states "fairly wide spread rains were expected with heavy falls over the most parts of the country during next 72 hours. It was based upon the movement of cyclonic circulation over Bay of Bengal and the presence of a westerly trough over Afghanistan."

7.3.2. **26th July, 2010** -Meteorological Analysis: The cyclonic circulation over India has moved rapidly in NW direction and today lies over North Madhya Pradesh. [Under its influence moist air currents from Bay of Bengal and from Arabian Sea have started converging over North of Pakistan. Weather Advisory-2](#) (26th July, 2010. Time 18:00 PST) "A low pressure system that developed over North Bay of Bengal on Saturday, is now located over central parts of India. [This low pressure system is now likely to move westward and instead of south-southwest ward. Under the influence of this weather system, strong monsoon currents will start penetrating Pakistan territory tonight, particularly in Punjab, and the intensity of monsoon currents is likely to increase from Tuesday.](#)" i.e., 27th July.

7.33. **27th July, 2010**-Meteorological Analysis-Upper Air Chart- "The 850 mbs and 500 mbs charts indicate that the moist current from Arabian Sea had increased and the trough of westerly wave had also become prominent over **North of Pakistan indicating the situation becoming dangerous.**"

7.3.4 The [Significant Flood Forecasts](#)⁵⁹ issued by PMD are as follows:

7.3.5. **Significant Flood Forecast (No.9) issued on 28-7-2010 at 1900 hrs PST** predicts that **medium to high flood level** at Tarbela ranging between 3,90,000 to 5,30,000 cusecs during the period 1930 hrs PST 28-7-2010 to 1000 hrs PST of 29-7-2010.
(Note: This forecast is issued just 30 mins before the actual event. While the presentation of PMD states that the quantitative forecast is 12 hours in advance).

⁵⁸ Ex I.W. 3/2

⁵⁹ Ex I.W. 3/2

7.36. **Significant Flood Forecast (no. 10)** issued on 28-7-2010 at 2200hrs predicts medium to high flood at Kalabagh ranging between 4,00,000 to 5,40,000 cusecs during the period 0400 hrs of 29-7-2010 to 2200 hrs PST of 29-7-2010.

(Note: This forecast is also has less than 12 hrs to the actual event).

7.37. **Significant Flood Forecast (no. 12)** issued on 29-7-2010 at 12:45 hrs predicts High to Very High flood level ranging between 600,000 to 700,000 at Taunsa Barrage during 0600 hrs of 31-7-2010 to 0600 hrs of 1-8-2010.

7.38. **Significant Flood Forecast (no. 14)** issued on 30-7-2010 at 1030 hrs predicts very high to exceptionally high flood ranging from 7,60,000 to 900,000 cusecs during 1600 hrs of 30-7-2010 to 1800 hrs of 31-7-2010 at Kalabagh.

(Note: six hours before the predicted flood).

7.39. **Significant Flood Forecast (no. 15)** issued on 30-7-2010 at 1040hrs predicts that river Indus at Chasma is likely to attain a very high to exceptionally high flood level ranging between 7,80,000 to 900,000 cusecs during the period from 0400 hrs of 31-7-2010 to 2000 hrs of 31-7-2010.

7.40. **Significant Flood Forecast (no. 16)** issued on 31-7-2010 at 1340hrs predicts that River Indus at Taunsa is likely to attain an exceptionally high flood level ranging between 8,50,000 to 950,000 cusecs during the period 1800 hrs of 1-8-2010 to 1800 hrs of 3-8-2010.

7.41. Flood Forecast issued by FFD is as under:

FLOOD FORECASTING DIVISION⁶⁰
FLOOD FORECAST (IN 000 OF CUSECS)

| Sr no. | date | stations | actual 0600 | forecast | TARBELA DAM LEVEL (FT) |
|--------|-----------|----------|-------------|-----------|------------------------|
| 1 | 24-7-2010 | TARBELA | 120.5 | 220-250 | 1503.05 |
| | | KALABAGH | 251.7 | 240-270 | |
| | | CHASMA | 300.4 | 280-310 | |
| | | TAUNSA | 293.4 | 320 R 380 | |
| 2 | 25-7-2010 | TARBELA | 121 | 200-220 | 1505.9 |
| | | KALABAGH | 204 | 210-245 | |
| | | CHASMA | 281.3 | 250-290 | |
| | | TAUNSA | 323.7 | 345-380 | |
| 3 | 26-7-2010 | TARBELA | 280 | 210-230 | 1507.46 |
| | | KALABAGH | 190.7 | 200-R-270 | |
| | | CHASMA | 281.3 | 250-300 | |
| | | TAUNSA | 290.6 | 310-F-250 | |

⁶⁰ Data collected from Ex I.W. 3/2

| Sr no. | date | stations | actual 0600 | forecast | TARBELA DAM LEVEL (FT) |
|--------|-----------|----------|-------------|------------|------------------------|
| 4 | 27-7-2010 | TARBELA | 219.5 | 250-290 | 1508.44 |
| | | KALABAGH | 245.6 | 260-300 | |
| | | CHASMA | 255.7 | 300-360 | |
| | | TAUNSA | 265.2 | 260-280 | |
| 5 | 28-7-2010 | TARBELA | 115.8 | 290-340 | 1511.98 |
| | | KALABAGH | 276.2 | 290-330 | |
| | | CHASMA | 234.8 | 300-450 | |
| | | TAUNSA | 246.8 | 240-265 | |
| 6 | 29-7-2010 | TARBELA | 439.1 | 500-620 | 1515.88 |
| | | KALABAGH | 410.4 | 450-R-700 | |
| | | CHASMA | 507.9 | 520-R-700 | |
| | | TAUNSA | 235.4 | 230-245 | |
| 7 | 30-7-2010 | TARBELA | 603 | 600-750 | 1522.85 |
| | | KALABAGH | 685.5 | 750-900 | |
| | | CHASMA | 743.5 | 750-900 | |
| | | TAUNSA | 269.3 | 280-350 | |
| 8 | 31-7-2010 | TARBELA | 476 | 400-500 | 1524.22 |
| | | KALABAGH | 855.9 | 800-F-650 | |
| | | CHASMA | 974.2 | 950-F-700 | |
| | | TAUNSA | 407.9 | 450-R-700 | |
| 9 | 1/8/10 | TARBELA | 357 | 370-440 | 1525.22 |
| | | KALABAGH | 776.6 | 750-F-600 | |
| | | CHASMA | 1001 | 1000-F-790 | |
| | | TAUNSA | 617.6 | 650-R-850 | |
| 10 | 2/8/10 | TARBELA | 327 | 350-370 | 1526.22 |
| | | KALABAGH | 736.4 | 700-F-550 | |
| | | CHASMA | 837.8 | 800-F-700 | |
| | | TAUNSA | 793.7 | 800-R-950 | |
| 11 | 9/8/10 | TARBELA | 490 | 562-650 | 1536.10 |
| | | KALABAGH | 595 | 600-R-750 | |
| | | CHASMA | 708.9 | 710-R-760 | |
| | | TAUNSA | 566.4 | 570-R-620 | |

R= Rising F= Falling

7.42. I & P DEPARTMENT'S POSITION ON FLOOD FORECASTING

7.43. According to Secretary I & P Department⁶¹: "The significant flood forecast for River

⁶¹ I.W.6

Indus at Kalabagh was received by the I & P Department from PMD on 28th July, 2010 (warning no. 10) time of the said forecast was 2200 hrs... Canal Wire no. 2911 dated 29-7-2010 was issued around 2pm on 29-7-2010 to all the Chief Engineers as well as Executive Engineers, in the light of the forecast issued by the PMD."

7.44. According to the record, Secretary, Irrigation & Power Department directed the Flood Emergency Cell (FEC) on 08.06.2010 to start functioning in the Irrigation & Power Department w.e.f. 16.06.2010 under the overall control and supervision of Director, Indus Water Treaty & Regulation, Punjab⁶².

7.45 The above Flood Emergency Cell had the following functions:

- To receive, collect and maintain all the information related to river discharges and flood situation in Punjab
- To receive and review the flood damage reports from the field formations/Zonal Cells and immediately bring to the notice of Secretary, I & P for further necessary action.
- **To keep a close liaison with the Flood Warning Centre and Regional Meteorology Office, Lahore for obtaining information regarding flood forecasting/expected river and flood discharges.**
- **To plan course of action in case of anticipated/approaching flood emergencies.**
- **To brief the Secretary, I&P about the flood situation on daily basis.**

7.46. Zonal Flood Emergency Cells/Centers were also set up on 05.06.2010 and 11.06.2010 in Sargodha Zone Sargodha and D.G. Khan Zone respectively⁶³. Office order whereby Zonal Flood Emergency Centers were set up stated:

"The above named officials will not attend their offices during flood duty period. Sick or C/leave of the above officials will be approved/sanctioned very sparingly by the Head of their offices with the provision of substitute. The officials so deputed will also perform their duty on Saturday, Sunday / Holidays according to their turn."

7.47. Additionally, a frontline Flood Warning Centre (FWC) of the I & P Department works alongside the Flood Forecasting Division of PMD in Lahore and is the pivotal warning centre of the Department. This internal early flood warning capacity of the I & P Department is set up in parallel to the FFD of PMD.

⁶² Mark 88

⁶³ Mark 89

7.48. Summary of the flood warnings⁶⁴ issued by FWC during the critical dates have been plotted hereunder from the data called from FWC:

At Tarbela

| Sr. No. | Location | Flood level | Discharge | Date | Time | Rising/ Falling. |
|---------|-------------|--------------|------------|------------|------------|------------------|
| 1. | Tarbela Dam | Medium flood | 390700 Cfs | 28.07.201 | 1200 hours | Rising |
| 2. | Tabela Dam | Medium flood | 392100 Cfs | 06.08.2010 | 1600 hours | Rising |

At Kalabagh

| Sr. No. | Location | Flood level | Discharge | Date | Time | Rising/ Falling. |
|---------|--------------|--------------------------|------------|------------|------------|------------------|
| 1. | Kalabagh | High flood | 501060 Cfs | 29.07.2010 | 1200 hours | Rising |
| 2. | Kalabagh Dam | Very high flood | 658770 Cfs | 29.07.2010 | 2000 hours | Rising |
| 3. | Kalabagh Dam | Very high flood | 731403 Cfs | 1.8.2010 | 2000 hours | Falling |
| 4. | Kalabagh Dam | High flood | 624500 Cfs | 10.08.2010 | 0600 hours | Rising |
| 5. | Kalabagh Dam | Very high flood | 667921 Cfs | 10.08.2010 | 1700 hours | Rising |
| 6. | Kalabagh Dam | Exceptionally high flood | 869512 Cfs | 1.10.2010 | 1000 hours | Rising |

At Chasma Barrage

| Sr. No. | Location | Flood level | Discharge | Date | Time | Rising/ Falling. |
|---------|----------------|--------------------------|------------|------------|------------|------------------|
| 1. | Chasma Barrage | Medium flood | 378809 Cfs | 21.07.2010 | 2400 hours | Rising |
| 2. | Chasma Barrage | Medium flood | 397940 Cfs | 28.07.2010 | 2400 hours | Rising |
| 3. | Chasma Barrage | High flood | 507904 Cfs | 29.07.2010 | 0615 hours | Rising |
| 4. | Chasma Barrage | Very high flood | 663072 Cfs | 29.07.2010 | 2000 hours | Rising |
| 5. | Chasma Barrage | Exceptionally high flood | 818724 Cfs | 30.07.2010 | 1000 hours | Rising |
| 6. | Chasma Barrage | High flood | 549899 Cfs | 05.08.2010 | 0600 hours | Rising |
| 7. | Chasma Barrage | Very high flood | 755744 Cfs | 10.08.2010 | 0600 hours | Falling |
| 8. | Chasma Barrage | Exceptionally high flood | 803578 Cfs | 11.08.2010 | 1400 hours | Rising |
| 9. | Chasma Barrage | High flood | 512584 | 25.08.2010 | 0400 hours | Rising |

At Taunsa Barrage

| Sr. No. | Location | Flood level | Discharge | Date | Time | Rising/ Falling. |
|---------|----------------|--------------------------|------------|------------|------------|------------------|
| 1. | Taunsa Barrage | Exceptionally high flood | 841399 Cfs | 2.8.2010 | 0900 hours | Rising |
| 2. | Taunsa Barrage | High flood | 608205 Cfs | 10.8.2010 | 0600 hours | Falling |
| 3. | Taunsa Barrage | Very high flood | 652017 Cfs | 10.08.2010 | 1600 hours | Rising |

⁶⁴ Mark 87/1-22

7.49. According to the record of the Irrigation Department, the significant flood forecast for River Indus was received on 29.7.2010 at 12:55pm⁶⁵ from Chief Meteorologist, PMD, Lahore stating that river Indus at Taunsa is likely to attain **High Flood to Very High Flood level** ranging from 600,000 Cfs to 700,000 Cfs during the period of 0600 hours of 31.07.2010 to 0600 hours of 01.08.2010. On the basis of same, Canal Wire No.2911, date 29-7-2010 was issued by Chief Monitoring, PMIU with the following directions from Secretary, I & P Department, namely:

- i. **Chief Engineers and S.Es. should inspect the barrages and embankments and ensure their safety by taking appropriate measures;**
- ii. Ensure that the flood management mechanism is in place;
- iii. The supervisory staff should also camp on the embankments as prescribed in the flood fighting plan.
- iv. Duties to the staff be assigned according to the forecast as prescribed in the flood fighting plan.

7.50. Through Canal Wire No.2910 of the same day Chief Engineer, Development, Irrigation & Power Department was directed to keep machinery ready for flood protection as and when required by the canal officers.

7.51. The next forecast was received from Chief Meteorologist, FFD, PMD on 30.7.2010 which states the following:

“The expected flows in river Indus at Kalabagh is likely to attain a **very high to exceptionally high flood** ranging between 760,000 Cfs to 900,000 Cfs during the period 1600 hrs PST on 30.07.2010 to 1800 hrs PST on 31.07.2010.

7.52. According to Dr. Qamar-uz-Zaman Chaudhry, former Director General, PMD⁶⁶, in Pakistan (but was the Director General, PMD during the Floods under investigation) we have the flood forecasting system based on Hydro Meteorological System, which is an advanced system as compared to the Hydrological System. **Under this system with proposed precipitation, floods can be forecasted which is not so in the hydrological system, which measures the run off water to estimate floods. The PMD has three Precipitation Measurement Radars (PMR)** for the said purpose and there is a special Flood Forecasting Division within the PMD. However, on the contrary, Hazrat Mir, Chief Meteorologist, FFD in his statement submitted that the FFD⁶⁷ did not forecast the flood on the basis of the NWFC forecasts which showed extreme monsoon on 27.07.2010 and, in fact, relied on the real time data received from WAPDA and Irrigation Department.

7.53. The Director General of PMD further submitted that he had pointed out in the pre flood meeting held under the auspices of NDMA at the Prime Minister's Secretariat,

⁶⁵ fax machine time appearing on the document.

⁶⁶ IW-88

⁶⁷ IW-89

Islamabad that there was a possibility of extreme monsoon event this year. This was based on the data received from WMO through emails and website showing convergence of Easterly and Westerly winds in the north of the country. The Director General submitted that by 27th July 2010, PMD had noted that weather in the catchment area of River Indus over KPK was an extreme monsoon, which was unprecedented. According to him, the weather advisory reports issued subsequent to 27th July 2010 were issued keeping this information in mind. He submitted that PMD had found out that KPK was to receive high rainfall on 26th and 27th July, 2010. “However, the said data was not relied upon for the purposes of flood forecasting because of low confidence of PMD in the said data due to the fact that over the last 100 years, such rainfall/data had not been received. Therefore, the actual flood warning of heavy floods was given after the actual rain.” We do not endorse this view. Stagnation of the two weather systems was not an unprecedented event for PMD. “low confidence” by our weather forecasters is disappointing.

7.54. According to Dr. Muhammad Hanif, Director, NWFC, PMD, Islamabad⁶⁸, “on 27.07.2010 it was confirmed to PMD that weather was heading in the direction of KPK which is its catchment area. At this time it was clear to PMD that weather system contained very heavy rainfall. It was also clear to PMD that there would be stagnation due to the interaction of Western and Eastern systems. I admit that the seriousness and the urgency was not fully communicated in the weather advisory report on 26.07.2010 or 27.07.2010 which simply forecasted wide spread rain/thunder showers”. He further submitted “that the forecast issued by PMD and FFD in my understanding had the ability to work out the flood [forecast].” He further commented that: “I also admit that the observatories preparing the forecast do not factor in climate change. I admit that we have to be very careful as such weather system can develop even next year on any catchment area/KPK.”

7.55 Dr. Ghulam Rasool, Chief Meteorologist (R&D), PMD⁶⁹ submitted that NWFC had predicted on 27th July 2010 that there was extreme weather in KPK with very heavy rainfall within next 24 hours. I admit that the seriousness and urgency as predicted by NWFC was not translated in the forecast issued. He further submitted “that on the basis of weather forecast by HRM, FFD could have assessed the water flow and the flood levels.” Both NWFC and FFD failed to deliver timely weather forecasts.

7.56. On institutional level, the erstwhile Director General submitted that PMD does not have a Precipitation Measurement Radar that can cover the catchment area of River Indus. There is also no weather radar in the said area. For this purpose a radar has been proposed at Cherat and is under consideration for the last many years. In the absence of Precipitation Measurement Radar, as well as, weather radar, PMD relied on the satellite information as well as HRM model, which in turn relies on global data, to develop weather forecast for the area in question (i.e., KPK). The former Director General submitted that PMD needs more weather radars to enhance coverage all over Pakistan as well as up-gradation of various

⁶⁸ IW-90

⁶⁹ IW-91

models and forecasting system for the hill torrents. The Director General in his pre flood meetings did not flag this institutional deficiency. No document has been placed before us to show that PMD made desperate efforts for procuring the radar at Cherat. FFD on the other hand developed forecasts on the basis of the real time rain data and placed no reliance on the satellite information mentioned by the Director General.

7.57. Dr. Muhammad Hanif, Director, NWFC, PMD, Islamabad submitted that in Pakistan there are 80 fully equipped Weather Observatories (in addition to five semi equipped observatories). These observatories generate data every three hours. Once the data is collected by the observatories, it is transmitted within five minutes to Central Data Base, Karachi (PMD) which is then shared internationally. He pointed out that radars can only estimate weather condition in real time whereas the Weather Observatories can carry out forecast. PMD/NWFC is now using High Resolution Model (HRM), 11 km x 11 km to convert low resolution data into high resolution data. The data generated by HRM is called Grid Point Data and it is not real time data and HRM largely covers the entire country. However, inspite of the above, the forecast issued by NWFC left much to be desired. There are four Chief Meteorologists looking after Droughts, R&D, Flood and Seismology Departments. Seasonal forecast is the mandate of Climate Data Processing Centre (CDPC), Karachi Centre, also referred to as the Data Bank. CDPC generates seasonal forecast issued in the end of June for the next three months which this year predicted that Monsoon will have 10% increased rainfall. The said seasonal forecast was later on improved by the PMD. It was noticed by PMD that this year Eastern and Western Weather System will converge during Monsoon season, resulting in **very heavy rainfall over northern part of the country**⁷⁰.

7.58. According to the Director, NWFC, Seasonal Forecast this year regarding heavy rainfall was publicly advertised through website and newspaper in the last week of June, 2010. The Director narrating the extreme weather that developed over KPK submitted that on 18th/19th July, 2010 the Weather System over Bay of Bengal had developed and on 20th July, 2010 its intensity in the vertical column was upto 20,000 feet and it was a strong weather system. When the weather system reached Central India on 21.07.2010, it is at Rajasthan that the weather system determines its future course, it decides either to move into Sindh or dissipate in the Arabian Sea or to move upward to Kashmir and hit the catchment area of Indus basin resulting in heavy rainfall. This year weather system moved in the direction of DIK and then upward and as a result the weather stagnated over KPK when westerly weather system was also present in the said area. Due to the interaction of two weather systems, namely, Western and Eastern, stagnation took place over catchment areas resulting in heavy rainfall. According to the historical data, such rainfall never occurred in KPK. Said stagnation, however, occurred in Lahore and Kashmir previously. According to the data, stagnation earlier had lasted 8 to 12 hours, however, in the present case the stagnation was between 24 to 36 hours over KPK⁷¹.

⁷⁰ IW-90

⁷¹ IW-90

7.59. *Level of Research at PMD:* According to Mr. Arif Mahmood, Acting Director General, PMD, Research and Development Division of PMD was established in the year 2005-2006 and is headed by Chief Meteorologist. **Since its establishment no report has been submitted by the Division regarding monsoon, which could contribute in upgrading the forecasting capacity of PMD.** He submitted that the main focus of the said Division is to research on climate change. He submitted that PMD has only seven radars installed in the country with the following details:-

“Four Weather Surveillance Radars at Karachi, Rahim Yar Khan, Islamabad and Dera Ismail Khan (DIK), three Doppler Quantitative Precipitation Measurement (QPM) Radars at Lahore, Mangla and Sialkot. The ranges of these Radars vary between 250 km to 400 km.”

7.60. Chief Meteorologist (R&D) also submitted that R&D Division does not submit any annual or bi-annual report to PMD. He also submitted that there is no separate budget for the said Division⁷³.

7.61. PMD (FFD or NWFC) are the harbingers of rain and flood. Forecast means to predict, to foretell or to forewarn. The strength of PMD lies in qualitative and quantitative flood forecast and early warnings. Timing of forecast is fundamental in gauging the performance of PMD. According to the data placed before us PMD could have issued qualitative forecast (coloured alerts) on 24th July, 2010 and onwards and more specifically on 26th July, 2010 when it was certain to PMD that monsoons are heading northwards. Seasonal forecast indicated the interaction of easterly and westerly waves in June, 2010, later on when the monsoons entered Pakistan no colour coded alerts were sent out. No forecasts were issued on the 26th of July, 2010 when exceptional weather and violent rain was in the knowledge of PMD and finally the flood forecast in a haphazard manner started coming in on 28th July, 2010 when real time data was available. PMD must maintain unwinking vigilance like an eagle. As a herald of rain and flood, PMD acts as a trustee for the people of Pakistan. The record shows that PMD has failed to discharge this public trust.

7.62. The Hydro Meteorological System installed at FFD did not perform. The flood forecasting was generated on the basis of the real time data and the ability to forecast flood on the basis of the proposed precipitation was not applied. Hydro Meteorological System was of no use in the recent floods. The sad and disturbing part was that the Chief Meteorologist⁷⁴ failed to admit this fact before us and kept justifying how well FFD had done under him during the recent floods. He miserably failed to show to the Tribunal how he carried out the quantitative flood forecasting and reasons for not carrying out hydro meteorological forecast. His performance before us was disturbingly disappointing.

⁷² IW-3

⁷³ IW-91

⁷⁴ Mr. Hazrat Mir

7.63. That PMD failed in its primary function to make timely and accurate forecasts. PMD had the knowledge about extreme weather developing during these monsoons way back in June, 2010 (seasonal forecast below) and then later on with more detail on 26.07.2010 but inspite of all the information gathered from WMO and through its own sources PMD failed to communicate the seriousness of the situation in its forecasts as has been admitted by the PMD officers above.

7.64. The statements of the officers heading FFD and NWFC on hydro meteorological flood forecasting are contradictory showing a disconnect within the PMD.

7.65. It is also pointed out that the statement of erstwhile Director General that he pointed out during his pre-monsoon coordination meeting at the Prime Minister's Secretariat on 28.6.2010 that there will be extreme monsoon this year is incorrect as the minutes of the meeting supplied by NDMA attribute the following⁷⁵ to the Director General:-

“This year's monsoon will be slightly higher than the previous year and expected to be normal”

7.66. PMD should have issued qualitative forecast from 24th July onwards leading to a more quantitative forecast 26th July onwards- but this was not done. The forecast issued also leaves much to be desired. It does not depict the seriousness of the situation. The lame forecast issued rightly did not raise any alarm. This euphemized use of language in the forecasts has been admitted by the officers of PMD above.

7.67. I & P Department received the first forecast on 29-7-2010, when it could have been issued on 24th July onwards. The forecast or early warning information disseminated did not include the information generated at the PMD from 24th July onwards. Why ? There was no answer from PMD except apologetic silence. This extra lead-time could make all the difference and allow the flood managers to plan and prepare themselves. This is the real test and role of a forecasting agency.

7.68. FWC works closely with FFD, but it too failed to generate any value added information for its own department. The summary of warning issued by FWC have not been relied upon by the department. There is no importance given to FWC in the position paper of the Secretary I & P and reliance has been singly placed on forecasts of PMD. It is therefore not clear why FWC is required and what became of the numerous flood emergency cells ? There is a lot on the paper and there is a lot of talk but the institutions have failed to walk their talk.

7.69. According to the presentation placed on the record of the acting DG PMD⁷⁶. “FFD provides qualitative forecast minimum 24-36 hours in advance of actual precipitation

⁷⁵ Ex I.W.95/1

⁷⁶ I.W. 3/3

indicating the intensity of rainfall bearing system and FFD provides quantitative forecast about 12 hours in advance of actual peak describing range of peak and minimum & maximum volume of flood hydrograph." The presentation further provides the following three kinds of qualitative forecasts. **But none were issued.**

| | |
|--------------|------------------------------|
| BLUE ALERT | Depression at Rajasthan |
| YELLOW ALERT | Turing towards the catchment |
| RED ALERT | Arrives in the catchment |

7.70. *Flood Forecasting within I & P Department:* However, inspite of Emergency Cell at the Irrigation Department, as well as, the Flood Emergency Centres/Cells at the Zonal Offices, Secretary, I&P, as well as, Chief Engineers of the respective Zones have failed to highlight the work done by the aforesaid Cells . There is no mention of the said cells in the position papers or in their depositions.

7.71. The Emergency Cell at the I & P Department, the Zonal Flood Emergency Cells/Centres and the Flood Warning Centre of the I & P Department have nothing to show for themselves. Nothing has been mentioned about them by the Secretary I & P or the C.Es of the respective zones. No correspondence made by them during the critical days has been placed on the record.

7.72. The Flood Warning issued by the Secretary I & P Department through Chief Monitoring, PMIU on 29-7-2010 was based on the forecast received from PMD. There is no mention of the Flood Warning Centre of the Department.

7.73. We called for the record of FWC. The first warning issued by the FWC of the Department is dated 28-7-2010 forecasting medium flood (3,90,700 Cfs) in Tarbela at 1200 hrs (before PMD) . No action seems to have been taken on this warning by the Department. No canal wire is on the record.

7.74. The next warning of the FWC was on 29-7-2010 showing high flood (5,01,060 Cfs) in Kalabagh at 1200hrs. This also went unnoticed. The only warning received by the zones is the canal wire dated 30-7-2010 based on the forecast issued by PMD at 1245 hrs on 29-7-2010 which predicted high to very high flood at Taunsa Barrage. Preference was given to flood forecasts of PMD for Taunsa Barrage over FWC's forecast for Jinnah Barrage. This paints a picture of confusion and poor structure at the Department's end.

7.75. The under-mentioned warning⁷⁷ by the FWC is absolutely incorrect and does not correspond with the data on the record.

⁷⁷ Ex I.W. 87/1-22

| | | | | | | |
|----|--------------|--------------------------|------------|------------------|------------|--------|
| 7. | Kalabagh Dam | Exceptionally high flood | 869512 Cfs | <u>1.10.2010</u> | 1000 hours | Rising |
|----|--------------|--------------------------|------------|------------------|------------|--------|

7.76. Even the canal wires were issued by the Chief Monitoring, PMIU on behalf of the Secretary I & P Department, the Emergency Cell set up at the I & P Department finds no presence in the scheme of things.

7.77. It is surprising that FFD issued forecast of [high flood and very high flood at Taunsa](#) on 29.7.2010 (at 1245 hours), while the forecast regarding Kalabagh was issued a day later. No forecast is available with PMD of any significance before the 29-7-2010.

7.78. FFD issued its first forecast for [exceptionally high flood](#) at Kalabagh on 30.7.2010 at 1030 hours. By this time, the LGB at Jinnah Barrage already stood breached (7.00 p.m. on 29.7.2010). The said forecast was of little significance.

7.79. **CONLCUSION**

7.80. PMD and FFD had indications in June, 2010 that this year will have extreme monsoons. Later on the on 24th July, 2010 PMD knew that the monsoon is heading towards the upper catchment of KPK but no colour coded alerts were issued. The unusual but not unprecedented stagnation of the westerly and easterly system over KPK was discovered by the PMD on the same day but the same was not forecasted because PMD was not confident to do so. The forecasts issued also did not carry the alarm they were required to generate. It is admitted by the meteorological officers that the language of the forecast did not correctly depict the true nature of the urgency at the time. We are of the view that PMD, being the prime harbinger of rain and flood did not act with the alacrity that was expected of them.

7.81. PMD, NWFC or the FFD are required to be extremely quick on the forecast. Once the real time data starts flowing in, WAPDA and I & P Department are the first ones to get it. Therefore, the role of PMD for those initial few hours when no other department in the country has the capacity or the infrastructure to predict are crucial. PMD did not act swiftly and also failed to employ the right language (as prescribed by WMO) to generate the sense of urgency that was required.

7.82. We also noticed that the qualified human resource employed at the PMD is lacking and the existing staff is not trained as meteorologists.

7.83. The Research Division at PMD also has nothing much to show for themselves. PMD should have been the apex research centre on Monsoons and should have had several quality papers to show for themselves. This was not the case.

8. FLOOD FIGHTING

8.1. As per Regulations Rules of Jinnah Barrage⁷⁸, Executive Engineer (XEN) Kalabagh is the officer incharge of the general control of the Headworks who has to issue instructions for the regulation and guidance of the SDO, Headworks from time to time⁷⁹. The Sub Divisional Officer (SDO) (Headworks) is officer immediate incharge of the Kalabagh Headworks and is responsible to the XEN for the maintenance and control of the Headworks. The objects to be kept in view during the passage of floods from weir are:

- i. **To pass flood without damage to the Headworks and training works.**
- ii. **To employ the flood to remove undesirable obstruction in the river so as to facilitate regulation and silt control.**
- iii. To pass the flood with the minimum interruption to the canal supplies.
- iv. To record various phases of flood for future reference.

8.2. It is duty of the Sub Divisional Officer (SDO) Headworks to supervise personally the passage of floods⁸¹. A survey of that portion of the river which affects the Headworks has got to be made annually⁸².

8.3. According to the flood fighting plan the limits of flood fixed by the “Punjab Flood Commission⁸³” are as under:-

| | | |
|--------------------------|--------------|----------|
| Normal | Up to 2.50 | lac Cfs |
| Low Flood | 2.50 to 3.75 | lac Cfs. |
| Medium Flood | 3.75 to 5.0 | lac Cfs |
| High Flood | 5.0 to 6.50 | lac Cfs. |
| Very high flood | 6.50 to 8.0 | lac Cfs |
| Exceptionally high flood | above to 8.0 | lac Cfs |

8.4. According to Duty Roster⁸⁴ Battle Station of key personnel required at the Barrage during high flood flow, flood season 2010 the persons required to be deployed at on the LMB and LGB is as follows:

⁷⁸ Ex IW 121/2

⁷⁹ Clause 2.1 (i) of the Regulation Rules

⁸⁰ Clause 5.2

⁸¹ Clause 5.2 (i) [sic].

⁸² Clause 6.6 of the Regulation Rules of Jinnah Barrage.

⁸³ Provincial wing of the Federal Flood Commission (legal structure not clear)

⁸⁴ Ex I.W. 121/1 (page 16537)

DUTY ROSTER BATTLE STATION OF KEY PERSONAL DURING HIGH FLOOD FLOOD SEASON 2010.

| SITE | LENGTH FT | STAGE-1 DISCHARGE | LABOUR REQUIRED FOR WATCHING TO BE DEPUTED | STAGE-II DISCHARGE | LABOUR REQUIRED | LABOUR WATCHING TO BE REQUIRED | MATE | BELDAR | ESTABLISHMENT TO BE DEPUTED | | | STAGE-IV DISCHARGE EXCEEDING 8- LAC |
|-----------------------------|--------------|----------------------|--|-----------------------|--------------------|--------------------------------------|-------------|--------|-----------------------------|-----------------|---------|--|
| | | | | | | | | | SDO | SUB ENGINEER | MATE | |
| 1-Left Guide bund U/S | 4099 | 3.75 lac CS | One man | - | 5 | 5.0 lac Cs | Three times | 1 | 15 | Six times | SDO/HW | SEN/HW |
| 2-Left Guide Bund D/S | 606 | To | Per | - | 1 | To | | 3 | | | SDO/HW | SEN/HW |
| 3-Right Guide bund U/S | 5487 | 5.0 lac CS | 1000ft | - | 5 | 6.0 lac Cs | | 1 | 15 | | SDO/HW | SEN/HW |
| 4-Right Guide bund D/S | 8080 | | | 1 | 8 | | | 3 | 24 | | SDO/HW | SEN/HW |
| 5-Left Marginal bund | 7410 | | | 1 | 7 | | | 3 | 21 | | SDO/S&I | SEN/CC |
| 6-Right Marginal bund | 9084 | | | 1 | 9 | | | 3 | 27 | | SDO/HW | SEN/CC |
| 7-T-Head Spur | 4820 | | | 1 | 5 | | | 2 | 15 | | SDO/HW | SEN/MLU |
| 8-T-Head Spur at Piplan | 3514 | | - | 4 | | | | 1 | 12 | | SDO/KDN | SEN/Piplan |
| 9-Guide Spur at Alluvial | 2000 | | - | 2 | | | | 1 | 16 | | SDO/KDN | SEN/Rodi |
| 10-T-Head Spur at Bhakra | 2500 | | - | 3 | | | | 1 | 9 | | SDO/KDN | SEN/KDN |
| 11-Guide Spur at Musso-Wali | 2000 | | - | 2 | | | | 1 | 6 | | SDO/KDN | SEN/' Ghulaman |

8.5. As mentioned above, in STAGE FOUR, Left Guide Bund upstream should have an SDO, S.ENG., 3 Mates, 30 Beldars and 6 men every **1000 feet** (i.e., around 24 persons) while for LMB, one SDO, one S.ENG., one Mate, 60 Beldars and 6 labourers per **1000 feet**. This is in addition to the support sought from Civil Authorities as well as the Army. At least 100 Army Jawans should be available when the discharge exceeds 8-lac Cfs.

8.6. As per Flood Fighting Plan, Flood material is under the charge of S.ENG stationed at Headworks. During flood, the flood fighting material is taken out and distributed at suitable points along the bund. This quantity is to be brought up to scale before the start of flood season. List of flood fighting materials mentioned in the Flood Fighting Plan, 2010 is as under: -

| S.No. | Name of Articles | Unit | Qty. Required | Qty: in | Balance to be Arranged. |
|-------|---------------------------|-------|---------------|---------|--|
| 1 | Lanterns | No. | 250 | 200 | 50 |
| 2 | Lanterns, Chimney. | No. | 250 | 200 | 50 |
| 3 | Gas lamps | No. | 10 | 10 | - |
| 4 | Mantles | No. | 70 | 20 | 50 |
| 5 | Three cell tarches | No. | 50 | 30 | - |
| 6 | Gunny bages/ E.C. Bags | No. | 1500 | 1000 | 500 |
| 7 | Axes | No. | 10 | 10 | - |
| 8 | Kassies with handle. | No. | 100 | 100 | - |
| 9 | Killas | No. | 1500 | 1000 | 500 |
| 10 | Ballies 10 Ft. long | No. | 3000 | 1000 | 200 [sic] (should have been 2000) ⁸⁵ |
| 11 | Basket | No. | 200 | 200 | - |
| 12 | Manile rope | Mds. | 3 | 3 | - |
| 13 | Generator | No. | 3 | 3 | - |
| 14 | Hammer. | No. | 10 | 10 | - |
| 15 | Chouldary | No. | 3 | 3 | - |
| 16 | K. Oil | Litre | 120 | 120 | - |
| 17 | Patha munj ban/ Tarangers | Mds. | 5 | 4 | 1 |
| 18 | Boat. | No. | 3 | 3 | - |

Source: Flood Fighting Plan, 2010 for Sargodha Zone.

⁸⁵ this shows callousness of the I & P Department in attending to the pre flood preparation.

8.7. According to the current XEN⁸⁶ (appointed after the floods) at Jinnah Barrage: “According to the record no reserve stock was available before the start of flood. According to the flood fighting plan inventory maintained was not upgraded and the flood fighting material as required was not available on critical dates.” No one bothered to complete the inventory of the flood fighting material as mandated under the Flood Fighting Plan, 2010.

8.8. According to the Inquiry Report⁸⁷, the breach at RD 3000 is reported to have occurred at 7:00 p.m. on 29.7.2010 when the discharge in the river was 622,260 Cfs. Breach was first reported by Sub Engineer to SDO and XEN at 7.00 p.m. who reached the site but were “just spectators as there was no stone available at site except a small quantity of 5,426 Cft.” Trees were launched to arrest the erosion but according to the Report, first tree was launched at 9.00 p.m. when the breach was out of control.

8.9. The Report further states that Maple Leaf Cement Factory Limited (“MLCFL”) provided loaders, dumpers and stones to check the erosion of the floodwater. The dumping of the stones/boulders by MLCFL continued till the evening of 02.08.2010. Although LGB was almost washed away in its entire length but due to timely assistance and efforts of MLCFL further erosion was arrested before the start of the LMB. As a result, LMB and Thal Canal Head Regulator remained safe and intact.

8.10. According to the affidavit of the Chief Engineer⁸⁸, Sargodha Zone, Sargodha, the C.E received information on telephone from S.E. Thal Canal Circle on 29.7.2010 at about 7.00 p.m. (the C.E. deposed⁸⁹ in the following manner before the Tribunal: “I came to know of the breach of LGB at 7.30 p.m on 29-07-2010 while I was at my house at Sargodha) that upstream LGB of Jinnah Barrage has been breached at RD 3000. The C.E. directed Muhammad Abid XEN and Azher Merani XEN to reach Kalabagh Headworks on 29.7.2010 to assist the existing staff. The Chief Engineer himself reached Mianwali at 10.30 p.m. on 29.7.2010 alongwith Commissioner and R.P.O. Sargodha. At the time the width of the breach in LGB was approximately 900 ft. The nose of the LGB (approximately 200 ft) was existing at the site. LGB was continuously being eroded and its length in the evening of 30.07.2010 had reduced to 2100 ft.

8.11. C.E. further submitted that in the morning of 31.07.2010 the length of LGB was reduced to only 300 ft. The breach had been contained due to tree launching, however the erosion started again at 02:00 p.m. Thereafter the Chief Minister, Punjab, visited the site at 04:00 p.m. and with the help of Maple Leaf Cement Factory, who supplied Boulders Stone, Loaders, Dumpers, which reached the site at 06:30 p.m. on 31-7-2010. Therefore from 06:30 p.m. (on 31-7-2010) till the evening of 02.08.2010 dumpers and loaders continued to fight the erosion of LGB and it was in the evening of 02.08.2010 when the erosion was checked. By that time LGB had totally washed away.

⁸⁶ I.W.121

⁸⁷ Headed by Mian Asrar ul Haq - Ex I.W 6/1

⁸⁸ I.W. 5/2

⁸⁹ I.W.5

8.12. C.E stated that the Army Authorities were contacted at Kharian/Sargodha Cantt to reach Kalabagh Headworks immediately alongwith explosive material/staff in order to operate the breaching section, if required. Breaching section was also inspected with the Army Engineers at 4.30 p.m. on 30.7.2010. XEN/SE were directed to continue flood fighting on LGB by employing all possible means to check further erosion.

8.13. According to the affidavit of the C.E., Flood fighting on LGB was being done through tree launching “**as no stone was available**”. Stone being carted from Sikhanwali Quarry could not reach site because culvert of Highway Department near Khawajabad had given in and one truck had also fallen into it. Irrigation Department engaged a contractor on 2.8.2010 who carried 2-lac cusec feet stone from Musakhel Stone Quarry.

8.14. Mr. Muhammad Afzal⁹⁰, Executive Engineer, Jinnah Barrage admitted in his statement that the Reserve Stone of **7,50,000 cft** was not available on the site during the flood season. He also admitted that he could invoke Clause 2.89 of PWD Code to procure the above stone but he did not do so. According to the XEN other than the stone received from Maple Leaf Cement Factory Limited, **40,000 to 45,000 cft** stone was procured from down stream RGB while another order was placed for **1,22,000 cft** from a private quarry in Sargodha.

8.15. As per the depositions of the Secretary and the CE no labour was deployed on work charge basis on the LGB. According to the XEN except the muster roll showing six people nominated in June, 2009 **there was no additional labour employed from the department**. There is no evidence to suggest that even these six people were present on the critical dates. The new X.E.N⁹¹ stated that: “According to the record available no muster roll has been prepared and no person was engaged for the purpose of flood fighting by the erstwhile XEN.” Therefore, work force to be deployed in exceptionally high flood as per flood fighting plan, 2010 was not deployed.

8.16. According to the (new) Chief Engineer, Irrigation, Sargodha vide his letter dated 22.11.2010⁹² there is no inventory for the Machinery available at the Barrage for flood fighting prior to 28.07.2010. There is no information regarding the indent/requisition sent to the Machinery Circle of the Development Zone for Machinery, however, Machinery mobilized from private contractor namely Al-abbas Construction Company are as follows:-

| | | |
|-------|--------------------------|---------|
| (i) | Excavator | = 2 No. |
| (ii) | Loader | = 2 No. |
| (iii) | Dumper | = 4 No. |
| (iv) | Tractor with Trolley | = 8 No. |
| (v) | Tractor with Front Blade | = 2 No. |

⁹⁰ IW 123

⁹¹ I.W. 121

⁹² Mark-28

8.17. It is further submitted that the above machinery arrived at the Barrage on 2.8.2010 and remained there till 15.08.2010. The Chief Engineer failed to give the cost of the Machinery involved. **From the above it transpires that no machinery for flood fighting was available on the LGB till 1.8.2010 except the one brought in by Maple Leaf Company.**

8.18. A departmental committee of following officers was constituted to probe into the causes of breach at LGB namely: Mr. Asrar-ul-Haq, S.Mansoob Ali Zaidi and Hanif Khalid Bhatti. The committee reported⁹³ as follow:-

“a). No stone was available as reserve stock against approved limit of 750,000⁹⁴ Cft.

b). The other flood fighting material was kept in store and not provided at specified points on the guide banks and marginal bunds (there is to be one material storage point at every 5,000 ft of an embankment). The provisions of flood fighting plan were thus ignored....The Chief Engineer did assign additional officers to help the barrage officials but this step could not prove to be effective due to lack of logistics. The flood fighting plan of the barrage provides for adequate level of short term/work charge staff for flood fighting purposes but unfortunately no work charge staff was engaged in accordance with the prescribed flood fighting strategy....In overall perspective the technical and administrative measures were apparently inadequate.”

(emphasis supplied)

8.19. **Reserve Stone:** According to the affidavit of the C.E, on 2.8.2010 Irrigation Department engaged a contractor who carried 2 lac cft from Musa Khel Stone quarry. It is not clear from the Stock Register or the statement of current XEN whether the stone carted from Sikhanwali quarry (40,825 cft) , as well as, **2 lac cft** from Musa Khel Stone quarry ever reached the site. The written statement filed by the Chief Engineer also does not mention whether the said stone finally reached the site.

8.20. Additionally, the depositions of S.E., XEN and S.ENG before the Tribunal reveal that on 30.07.2010 order for **1,22,000 cft** through Faiz & Company from a private quarry from Sargodha was made, which was delivered at the site in the evening of 31.07.2010 in the presence of the Chief Engineer, Commissioner, RPO Sargodha and District Coordination Officer, Mianwala.

8.21. Mr. Abdul Rauf⁹⁵ of Hafiz Rab Nawaz & Company stated that through wire No.548 dated 29.07.2010 issued by Executive Engineer, Kalabagh, Hafiz Rab Nawaz & Company and Shafqat Mansoor were directed under para 2.89 of PWD Code to supply stone. In this regard Hafiz Rab Nawaz & Company supplied **1,16,100 cft** at the cost of Rs.3.2 million. The said stone was procured from Pak Mecca (Raja Atta) and Lahore Gujranwala (Ch. Muhammad

⁹³ Ex IW 6/1 (page 1045)

⁹⁴ The approved limit is 10 lac cft as mentioned above.

⁹⁵ I.W.118

Nawaz). Mr. Abdul Rauf also stated that as far as stone pitching on loose apron of downstream RGB is concerned, the said work was done by Shafqat Mansoor and not by Hafiz Rab Nawaz & Company. Raja Atta Muhammad⁹⁶ of Pak Mecca on the other hand deposed that he supplied only 45 to 50 trucks between 29th to 30th July 2010 at the cost of **Rs.13,50,000/-**.

8.22. Muhammed Nawaz⁹⁷ deposed as follows: "The name of my business concern in Sargodha is Ch. Construction Service and the main business is supplying stone. Mr. Rauf of Rabnawaz & Co placed order of 200 trucks of stone on 29-7-2010 for Jinnah Barrage, however, I could only supply 69 trucks (2652.397 tons of stone) on 29-7-2010 and 30-7-2010. The total value of the stone supplied by me is in the sum of **Rs 1,591,438/-**. Out of which I have been paid in cash **Rs 5,43,000** by Mr. Rauf and the remaining balance is outstanding.... All supplies made by me were paid by Mr. Rauf of Rabnawaz & Co and I have no direct relation with the Irrigation Department. Normally it takes 15 hours for a truck to reach Jinnah Barrage from Sargodha and in this particular case, trucks sent on 29-7-2010 and 30-8-2010 were duly delivered after 15 hours and delivery was confirmed to me by the drivers of the trucks. Both the assignments on 29-7-2010 and 30-7-2010 left Sargodha around 5pm and therefore reached Jinnah Barrage at around 8am on 30-7-2010 and 31-7-2010." Shafqat Mansoor⁹⁸ stated as follows: "I work as contractor at Jinnah Barrage as well as Taunsa Barrage. I sent 14 trolleys, 2 dumpers, 4 excavators, 1 loader, 2 mates and 100 labourers with Jamshed Ahmed on the night of 30-7-2010. The said team worked till 2pm on 1-8-2010 and shifted **56,000 cft** of stone from downstream RGB of the Barrage."

8.23. It is also stated by the SDO⁹⁹ that **60,000 cft** of stone reached downstream RGB on 26th July 2010 for the emergent work undergoing at the flexible loose apron. Similarly in the statement of Abdul Rauf approximately 30,000 cft stone was available upstream and downstream RGB, respectively.

8.24. The current XEN (Mr. Chughtai) was asked to confirm from XEN Development regarding the reserve stone available at the closure of the work on RGB on 21-7-2010. The said XEN deposed¹⁰⁰ that **1349 cft** stone was available at RGB upstream.

8.25. The Chief Engineer¹⁰¹ deposed before the Tribunal that:-

"It is astonishing to note that considering **that there was no stone** to avoid the breach of LGB, later on the concerned team of Superintending Engineer raised a bill of **Rs.82,00,000/-** for the alleged procurement of **1,65,191 cft** and it was shown that it was used on 30th and 31st July 2010 on the LGB for flood fighting, which was

⁹⁶ His statement was recorded before the Learned Senior Civil Judge, Sargodha and has been placed on the record as Mark 18.

⁹⁷ I.W. 145

⁹⁸ I.W. 146

⁹⁹ I.W. 117

¹⁰⁰ I.W. 121

¹⁰¹ IW-5

absolutely bogus."
(*emphasis supplied*)

8.26. The C.E. in his letter dated 30-8-2010¹⁰² written to the Secretary I & P Department reported the following:

"2. As per measurement book the stone i.e., 1,65,191 Cft was dumped on 30-7-2010 and 31-7-2010....only 16 trucks reached site on 31-7-2010 and were utilized on LMB alongwith the stone carted by Maple Leaf Cement Factory.

As per record of the Sikhanwala Quarry the following stone left quarry against the work: "[Supplying Pitching Stone above 27 kg from Sikhanwala Quarry for Reserve Stock at Jinnah Barrage Kalabagh Division](#)" on the dates mentioned below:

| Sr. | dated | Pitching Stone |
|-----|--------------|-------------------|
| 1. | 31-7-2010 | 4,600 Cft |
| 2. | 01.08.2010 | 25,300 Cft |
| 3. | 02.08.2010 | 9,200 Cft |
| 4. | 03.08.2010 | 1,725 Cft |
| | Total | 40,825 Cft |

It may be pointed out that only 4600 Cft (approximately 16 No, Trucks) left quarry on 31-7-2010. The balance stone is lying on RGB."

8.27. Mr. Abdul Jabbar, District Police Officer, Mianwali¹⁰³ as well as Mr. Javed Islam¹⁰⁴, Regional Police Officer, Sargodha Region submitted identical replies to the questions posed by the Tribunal.

| | |
|---|--|
| <p>Q. Did you witness the delivery of stone for the purpose of flood fighting from Maple Leaf Cement Company or any other private quarry? Give details (name of contractor, if any, and number of trucks you witnessed).</p> | <p>Ans. On 31.07.2010 keeping in view the dangerously growing erosion of LGB/LMB of Jinnah Barrage the district police Mianwali made an earnest request to the General Manager (Admin & IR) Rana Muhammad Akram of Maple Leaf Cement Factory Iskander Abad, Daud Khel to provide trained manpower, heavy Machinery and boulder stones to strengthen the LMB/LGB. It was done to save the lives and property of general public of Mianwali. Maple Leaf Cement Factory Iskander Abad, Daud Khel respondent promptly and provided the requisite</p> |
|---|--|

¹⁰² Ex IW 5/3

¹⁰³ Mark-80

¹⁰⁴ Mark 96

| | |
|--|---|
| | <p>machinery, trained manpower and stone. I witnessed the supply of a large number of trucks of stones from 31.07.2010 to 3.8.2010 from the said Maple Leaf Cement Factory Iskander Abad, Daud Khel on gratis basis.</p> <p>A large number of police jawans were engaged to dislodge the stones from the trucks coming from the Maple Leaf Cement Factory Iskander Abad, Daud Khel and subsequent filling in to strengthen the embankments.</p> <p>Similarly, on request, DPO Khushab and DPO Chakwal also sent 60 numbers of stones trucks on 1st August 2010 to 03 August 2010 on the site. <i>(Emphasis supplied)</i></p> |
|--|---|

8.28. According to Mr. Jawwad Rafique Malik, Commissioner Sargodha Division, Sargodha¹⁰⁵, a number of truck loads of stones which were stuck on Mianwali Kalabagh road due to damaged culvert of Highway Department near Khawajabad also arrived at Jinnah Barrage on 1.8.2010 after the road was repaired. He also confirmed that he was witness of the delivery of the stone from Maple Leaf Cement Factory, which started arriving at 06:30 P.M.

8.29. DCO, Mianwali (Mr. Tariq Mahmood) vide his written submission dated 30.11.2010 submitted that he was present at Jinnah Barrage from 6:00 a.m. till 10:00 p.m. on Friday, the 30th of July 2010¹⁰⁶. He submitted that the Chief Engineer, SE and XEN were present at Jinnah Barrage but he did not witness the delivery of stone for the purposes of flood fighting from Maple Leaf Company or any other private quarry on 30.07.2010

8.30. **INQUIRY & FINDINGS**

8.31. **No Reserve Stone:** On the basis of the evidence before us, we are of the confirmed view that there was **no reserve stone** (requirement as per para 6.39 M.I .P is 10 lac Cft) at the LGB on the critical dates (29th July, 2010 till 31st July, 2010 (when stone arrived from Maple Leaf Cement Company Ltd) to flood fight the breach and subsequent erosion of the LGB. Store Register¹⁰⁷ shows NIL balance in June, 2009 and only procurement shown in the

¹⁰⁵ Mark-94

¹⁰⁶ Mark-114

¹⁰⁷ (Ex.I.W.121/6)

Stock Register is an entry showing **5426 cft** on 22.06.2010. Therefore, as per record, no reserve stone was available on the Barrage.

8.32. Inspite of this clear position, effort was made before us by the S.E., XEN & SDO to show that reserve stone was shifted from the RGB and also procured from private quarries to meet the requirement of flood fighting. Statements of the Secretary and C.E deny this position, Stock Register maintained at the Barrage does not reflect any such procurement, there is nothing on the record to show that para 2.89 PWD Code was complied with and permission of the Secretary was obtained. C.E. has also brought on record procurement made by him from two different quarries, however the same also did not reach the Barrage on time. Current XEN¹⁰⁸ deposed that the stone available at the time of the closure of work on the downstream loose apron on 21-7-2010 was **13,495 cft**. The private contractors on the other hand have deposed that they supplied the stone. Mystery shrouds this unsanctioned and unrecorded procurement of stone. Whatever may be the case this aspect of the matter requires a detailed third party validation /audit by the Auditor General or any other credible institution. To us this reflects of naked corruption and total collapse of flood governance at the Barrage in the midst of a national calamity that gripped Jinnah barrage during 29th July till 2nd August, 2010.

8.33. According to the statement of the XEN and the SDO stone was available on the RGB stocked for the emergent work of the loose apron downstream. If this is taken to be true, why was the same not shifted to the training works immediately on receiving the flood forecast from the PMD and the I & P Department? Why was the same not recorded and reflected in the Stock Register maintained at the Barrage (prior to the flood)?

8.34. C.E. allegedly ordered stone from Musa Khel and Sikahnwali Quarries, this being under para 2.89 PWD Code. No approval was sought from the Secretary I & P Department in this regard. This procurement also does not corroborate the stand taken by the C.E that he was under an impression that the reserve stone had been recouped from the RGB and was in order.

8.35. At the same time the statements of S.E, XEN and SDO reveal that fresh orders were placed for the procurement of reserve stone from private quarries. The Orders were allegedly placed on Rabnawaz and Co and one Shafqat Mansoor. According to the above officers the said stone was received at the site and the contractors confirm that the deliveries were made. The statements of the Secretary, C.E and other officers (RPO, DPO and Commissioner above) belie this.

8.36. We are not convinced with the contradictory statements made before us regarding procurement of Reserve Stock Stone. The position taken by the Chief Engineer is inconsistent with the S.E./XEN and SDO and so is the case regarding the statements of Mr. Rauf of Hafiz Rab Nawaz & Company, Raja Atta of Pak Mecca and Muhammed Nawaz of Lahore

¹⁰⁸ IW 121

Gujranwala. From the evidence, it appears that only stock of stone available for active flood fighting was from Maple Leaf Cement Company. Even the stone, allegedly ordered from Sikhanwali quarry as well as Musa Khel Stone quarry did not reach the site on time.

8.37. The emergent work remained incomplete even after passage of 1 ½ years. Technical sanction of the estimate was done three times i.e., dated 8.5.2009, 2.1.2010 and 22.04.2010¹⁰⁹. The cost of the work was increased from Rs.59.32 to Rs.126.52 Million. Upto July, 2010 total payment of the said work is around 55% and most of disbursements were made during June, 2010. The S.E. issued interim approval for the package C & D during March & April 2010, whereas the formal approval was issued by the Chief Engineer on May 20, 2010. This delay creates many doubts. Further, the Chief Engineer in his letter dated 30.08.2010 showed lack of confidence on his field staff. This leaves little room with the C.E. for relying on the revised estimates initiated by the same staff.

8.38. *No workforce/ labour for flood fighting:* There was no labour deployed at the bunds as confirmed by the XEN and the Departmental Inquiry Committee. Flood Fighting Plan was blatantly violated and totally disregarded.

8.39. Inventory of the Flood Fighting Materials was not upgraded¹¹⁰. No flood fighting material was supplied out by the Sub Engineer. No camps were set up on the training works. Flood Fighting Plan was ignored.

8.40. Flood fighting is very similar to war. Appropriate preparedness and strategy is required on war footing especially so when the Barrage was declared to be a sick barrage.

8.41. *Poor Human Resource:* Failure of flood management is also because of poor capacity of officers who lacked the requisite expertise and qualification e.g., the Chief Engineer was a Mechanical Engineer, Superintending Engineer was also a Mechanical Engineer, Executive Engineer although a Civil Engineer had no past experience of Headworks. Sub-Divisional Officer is a Diploma Holder (B-Tech). Why was such poor human resource deployed on a sick Barrage during the flood season ? We heard no answer.

8.42. The Secretary¹¹¹, Irrigation & Power Department deposed before the Tribunal that: "According to details of posting held by Muhammed Afzal XEN, he was appointed at Kalabagh Head Works on 24-7-2009 on current charge basis. He had no past experience of a Barrage and was never appointed as an SDO on any of the Barrages earlier in his entire career which starts in the year 1990. Ideally an XEN appointed at a barrage should have worked on a Barrage as SDO but this was not the case here...service profile [of Khalid Iqbal S.E.] shows that he is B.S. 19 (current charge) with degree in Mechanical Engineering and was promoted in the year 1992 as XEN, however, through out his career he has never held a posting on Barrage except once in the year 2008-2010 at Sidhnai."

¹⁰⁹ IW 121/10

¹¹⁰ confirmed by the current XEN. I.W. 121

¹¹¹ I.W.6

8.43. The Secretary further submitted that “there is a tradition that best of the lot has to be appointed on the Barrage. In my view Muhammed Afzal, XEN did not fit the qualifications.” “..... posting of a Mechanical Engineer on a Barrage was considered to be a sin.” “Traditionally Mechanical Engineers are [sic] not even posted on the canals.” Yet he allowed mechanical engineers to manage the Barrage. This administrative lapse falls squarely in the lap of the Secretary I & P who took over the reigns of the department in February, 2010 much before the start of the Flood Season. He should have meticulously scrutinized the human resource at the Barrages and handpicked the best to manage it. He miserably failed to do so. Nothing has been brought on the record to show that the Secretary deliberated upon the quality of the team managing the barrage or that he made efforts to revise the team when he took over in February, 2010. The general impression that such an exceptional flood was not expected is no excuse. Good governance required that flood or no flood, the Secretary should have taken pain to know the expertise and quality of his field formation especially on a Barrage which is a sick barrage. It is this lack of interest and poor vigilance by the senior bureaucracy that results in tragedies which is conveniently blamed on the vulnerability of the weather and the vicissitudes of nature. The huge loss at Jinnah Barrage could have been avoided had the Secretary taken pain before the flood season to appoint the right people for the job.

8.44. *Corporate Social Responsibility on behalf of Maple Leaf Cement Company.* The report will be remiss if the effort of a business house owned by the Saigols namely Maple Leaf Cement Factory Limited (MLCFL) is not praised and appreciated for their national service. The General Manager¹¹² of the Company deposed:

“I was contacted by the local administration namely DPO Rana Jabbar, Commissioner Mianwali and Muhammad Afzal XEN around 2.30 p.m on 31.07.2010 seeking support to help fight LGB at Jinnah Barrage. I immediately sought instructions from Muhammad Saeed Saigol (CEO of Maple Leaf Cement Factory Ltd.) and mobilized 20 Dumpers and 3 Loaders. My team reached the site (Jinnah Barrage) at about 4.30 p.m. on 31.07.2010. We would have reached earlier but due to Chief Minister's visit at the Jinnah Barrage we got delayed due to the VIP activity. We continuously rendered support round the clock from 31.07.2010 to 05.08.2010 supplying 1.5 to 1.75 lac M/Tons of stone which according to our estimate has a value of Rs.45 lacs. The 20-Dumpers and 3-Loaders mobilized made 345 trips (distance from factory to the site is 10-k.m.). The Chief Minister did not contact Mr. Saeed Saigol or Mr. Tariq Saigol. It was the local administration who reached out to me on 31.07.2010 for help and assistance, subsequent to which our relief efforts were initiated.”
(emphasis supplied)

8.45. The support rendered by MLCFL has been confirmed by the I & P Department and the civil administration. MLCFL has displayed a wonderful example of national spirit and corporate social responsibility and has set itself out as an example to other companies. The

¹¹² I.W.116 Statement of Rana Muhammad Akram, General Manager (Admin & IR) Maple Leaf Cement Factory Ltd., Mianwali

people of Punjab in general and Mianwali, in particular, will remain indebted to the timely and selfless help rendered by the company.

8.46. *Poor Institutional Design:* Once the Secretary has appointed the right officers at the Barrage. Floods are to be handled by the C.E, XEN SDO and S.ENG with the help of civil administration and army.

8.47. We have noticed that the Chief Minister and other Secretaries rushed to Jinnah Barrage in the middle of the emergency. Time and again the senior bureaucracy has tried to convince us of their patriotic zeal and passion for reaching out during national calamities and of their last minute innovative relief measures. While their untiring effort to control post flood damage is noted, what gets hidden under this frenzied VIP activity is the ugly face of a chocked and sluggish system that fails to deliver on its own. It is precisely because of this faulty system that the senior leadership runs amok over the entire provincial landscape, when actually it is the C.E, XEN & SDO who ought to be in worried, if at all.

8.48. We need to build strong systems manned by able people who can dexterously withstand the onslaught of a natural calamity. **It is this solid functional infrastructural and institutional construct that requires IMMEDIATE attention.**

9. TECHNICAL CAUSE OF BREACH

9.1. Departmental Committee was constituted to probe into the causes of breach at LGB comprising the following members: Mr. Asrar-ul-Haq, S.Mansoob Ali Zaidi and Hanif Khalid Bhatti. The Committee reported as follow:-

“Normally the guide bank noses and the adjacent portion of the shank can come under river action. The shank can be attacked by swirls due to curved river flow on the country side. The river side is generally affected by both the high velocities and swirls which are generated due to high velocity currents brushing past a stagnant or slow moving water body. According to statements of Sub Engineer, SDO and Executive Engineer, the damage started from the river side slope at RD 3-4 of the LGB. According to them a swirl was the cause. [A reference to the regulation record contained in the log books, revealed that regulation was pathetically mishandled. Bays # 40-56 were kept virtually closed for over 2 weeks \(opening an insignificant 0.3 ft\) upto the high flood discharge of 503,000 cs and opened after 12:00 hrs on 29/7/2010.](#) This resulted in:

- a. excessive stress on left side bays
- b. Intensities of flow increased to about 133% resulting in increase velocities in the left half and along the left guide bank and creation of a deep channel and flow concentration in the left half which apparently started the damage at the breach point
- c. Pier # 39 was also subjected to heavy differential thrust caused by the difference in openings on both sides of the order of 12.5 ft. We have been lucky in that the pier did not over turn; probably due to support by the bridge deck.

[The committee feels that the regulation staff i.e. Sub Engineer, SDO and the Executive Engineer have all flouted the regulation rules which resulted in this damage. Less care and indifference in maintaining the regulation record and discharge calculations are also apparent.”](#)

9.2. The Departmental Committee recommended as follows:

- i. The SOPs for flood preparedness should be followed in letter and spirit by all the field officers. Any variation should be supported by reason.
- ii. The maintenance of reserve stock of stone should be made one of the top issues to be kept in view by all the functionaries from SDO to Chief Engineer.
- iii. The Civil Engineering graduates who are technically competent and having required experience may be entrusted with the custody, operation and maintenance of barrages.

- iv. The issue of dual working by headworks and development divisions is hazardous and leads to diffused responsibility towards reserve stock of stone by both the Executive Engineers. The arrangement therefore may be reviewed at the Departmental level.
- v. The pre-flood inspection teams should also comment on the availability of reserve stock and other flood fighting arrangements.
- vi. Capacity building and training of officers particularly those incharge of the barrage may be undertaken regularly.
- vii. Case studies approach for learning from the experience and for taking appropriate remedial measures/actions in case of flood events may be adopted by Irrigation and Power Department for improving flood management and avoiding the mistakes of the past.”

9.3. *Work on the Loose Apron Downstream at Jinnah Barrage:* Mr. Muhammad Afzal¹¹³, Executive Engineer, Jinnah Barrage deposed before the Tribunal that he had no past experience of the Barrage and was posted for the first time as an XEN on Jinnah Barrage. It is also admitted that work was going-on on the loose apron downstream as a result gates No. 41 to 49 were opened on **29.07.2010 at noon**. In the written statement submitted by the XEN he states that he observed swirling action, which resulted in the breach of LGB. According to him the reason for carrying out the work on the loose apron was the safety of the main barrage. He submitted that (Rao Irshad Ali Khan) Chief Engineer, I&P, Sargodha Zone was aware of the works being carried out at the downstream loose apron and he did not stop the same. He has referred to the tentative¹¹⁴ program of Rao Irshad Ali Khan, Chief Engineer, I&P, Sargodha Zone, for the month of July 2010, wherein on 8.7.2010, Chief Engineer was scheduled to inspect the replenishment of loose apron downstream Jinnah Barrage.

9.4. *Weir Gates: Daily Log Book Jinnah Barrage*, as well as, the Jamadar Charge Book, Jinnah Barrage, were sealed and collected from Jinnah Barrage vide order dated 16.09.2010 of the Tribunal.

9.5. Perusal of the Daily Log Book, Jinnah Barrage for the period 19.4.2010 to 25.07.2010 reveals that from **31-5-2010** onwards weir gates No.29 to 49 and right undersluice gates No.50 to 56 had a restricted opening of 0.3 feet (which means that they were practically closed).

9.6. On **19.06.2010** only weir gates No.30 to 49 and right under sluice gates No.50 to 56 had a by and large limited opening of 0.3ft (while the others gates were opened) and this

¹¹³ IW 123

¹¹⁴ Ex I.W. 123/1

continued¹¹⁵ till **02.07.2010**.

9.7. On **03.07.2010** main weir gates No.39 to 49 and right under sluices no. 50 to 56 had an opening of 0.3 ft. The said position continued till **28.07.2010** (except gate No.39 which on the said date had an opening of 2-feet).

9.8. On **29.07.2010** only main weir gates No.41 to 49 had an opening of 0.3 feet till **12:00 noon**. Recordings at 18:00 hrs and then 24:00 hours the same day show an opening of 13.5 feet and 14 feet, respectively. On **30.07.2010** the weir gates, as well as, the right under sluice gates had an opening recorded as **CLEAR** from 06:00 hrs and 12:00 hrs respectively.

9.9. **Jamadar Charge Book**, Jinnah Barrage shows the opening of main weirs 41 to 49 to 12.5 feet at 1300 hours on **29-7-2010**. Could the weir gates 41 to 49 be opened to 12.5 feet in one hour ?

9.10. According to the Jamadar Charge Book from 1900 hrs to 2400 hrs all the weir gates i.e., gates 38 to 49 were recorded as **CLEAR** while in the Daily Log Book opening of all the weir gates at 2400 hrs is recorded as 14-feet¹¹⁶. The recording of data in the two registers is not consistent. This undermines the credibility of the record and reflects poorly on the managerial competence of the officers incharge of the Barrage.

9.11. On 16.7.2010 SDO recorded the following canal wire No.362 in the Log Book:

Flood Warning.“River Indus at Kalabagh Head works in low flood U/S Left gauge 692-50 D/S left 680.10 U/S Discharge 280908 D/S Discharge 275608 total Thal Canal Discharge 5300. Discharge at 1500 hr on 16.07.2010 and rising.”

Inspite of the above, the work on replenishing loose apron downstream continued unabated.

9.12. S.E. recorded the following on 29.07.2010 in the Log Book

During inspection on 29.8.2010 [sic] morning time, gates No.41 to 49 were observed closed, XEN H/W and SDO H/W and S.D.E. H/W are instructed to operate/open the gates as per regulation rules w.e.f.
 Khalid Iqbal
 S.E. Thal
 29-7-2010

¹¹⁵ There is no recording of the opening of the weir gates 29-49 on 23-6-2010.

¹¹⁶ Extracts of above mentioned daily Log Book, Jinnah Barrage and Jamadar Charge Book, Jinnah Barrage have been placed on record as Ex I.W.5/4. As an abundant caution, three registers i.e. Daily Log Book, Jinnah Barrage (two registers) and Jamadar Charge Book, Jinnah Barrage (1 register) have been duly stamped by the Tribunal in order to secure the data recorded in the said registers. It is pointed out that last recording in the Daily Log Book is for 16th September, 2010.

26.8.2010 کو تقریباً 1.00 بجے دو پہر کو جناب ایس ای تھل
نے لاگ بگ پر درجہ بالا حکم جاری کیا۔

و سخن

26.08.2010 29 اگست ڈی یوئی جمادار

غلام شیخ خان ڈی یوئی جمادار

1.13. The dates recorded by S.E. i.e., 29.08.2010 and then by Head Jamadar i.e., 26.08.2010 creates suspicion regarding timely recording of the Log Book at the Barrage and also weakens its authenticity. Maintenance of Log Books with utmost punctilio is a sacred trust and an obligation of every public officer and cannot be maintained in an offhand manner.

9.14. Written submissions of the Chief Engineer¹¹⁷, LGB was breached as a result of mis-regulations. He stated that after going through the discharge, gauges and Gate Operation of the Barrage, it revealed that the Regulations, Rules were totally ignored. He stated that flow was concentrated towards left side of the Barrage due to the closure of the gates from 16.07.2010 03:00 p.m. till 28-7-2010 at 12:00 p.m.

9.15. He further deposed that: "This increased concentrated flow launched the apron of LGB and ultimate result was in the shape of Left Guide Bank breach¹¹⁸." He deposed before the Tribunal: "As per the Log Book of the Head Works right side gates were opened at 12:00 (noon), however, in my personal opinion this is not correct position and I think said gates were opened later in day....I am of the view that substantial damage of the LGB had taken place before 12 (noon) on 29.07.2010. There was nobody deployed on the LGB, who could have noticed said breach earlier. Mr. Muhammad Younas, Sub-Engineer informed me on 30.07.2010 that he heard stones hitting the under sluice gates around 18:45 p.m. on 29.07.2010. Thereafter, he reached the LGB and within a period of 10 minutes and the breach took place¹¹⁹."

9.16. The position taken by XEN, as well as, the SDO is that the weir gates (40-56) remained closed till 12.00 noon of 29.07.2010. The daily logbook, as well as, register of Jamadar and the discharge register show that the gates were opened around 1.00 p.m. on 29.07.2010.

9.17. Correspondence between the XEN and S.E is also disturbingly revealing. Letter written by XEN to the S.E. dated 23.07.2010¹²⁰ stating that the work of dumping stone from gates No.41 to 48/49 has been completed in all respects and S.E. is requested to check the

¹¹⁷ Ex I.W. 5/2

¹¹⁸ Ex I.W. 5/2

¹¹⁹ Ex I.W.5

¹²⁰ Ex.I.W.121/7/1

executed work on 27.07.2010 through checking committee constituted by the Secretary, Irrigation & Power Department on 17.03.2009. In the said letter it is clearly pointed out by the XEN that “checking be done by 27.07.2010 so that the gates could be opened”. More importantly, vide letter dated 29.07.2010, XEN once again wrote¹²¹ to the S.E. wherein the XEN states: “similarly on 29.07.2010 early morning S.E. Thal Canal Circle, Mianwali requested to check the work and they reached together with Committee members at Jinnah Barrage for checking the completed work. At that time, 4,91,840 Cfs discharge was passing and continuously increasing. The Committee members and S.E. Thal Canal Circle discussed and decided that “it is unsafe and not possible to check the work in this situation”. According to the Discharge Register¹²² the discharge flows 4,91,840 Cfs was around 9.00 a.m. Therefore, it is clear that the XEN and the S.E were fully aware that the gates were closed even during medium flood that was rising.

9.18. Chief Engineer was also aware of this work as is clear from the Tentative Tour Programme¹²³ of Rao Irshad Ali Khan for the month of July, 2010 besides letters referred to by the C.E mentioned above relating to emergent work on loose stone apron are self explanatory.

9.19. PRO Hydraulics was directed by the Tribunal to give his professional input on the breach of LGB and also to run a physical model of Jinnah Barrage at the Hydraulic Research Station Nandipur, IRI for a more precise qualitative assessment.

9.20. The relevant findings of IRI as recorded in his Report (IRR-1253¹²⁴) are as follows:

- i. Mis-regulation of gates in case of Jinnah barrage has been adopted in such a way that river concentration persisted along left half of the barrage and consequently, apron of LGB started launching at river stage of 4 Lac.
- ii. It has been observed in the nature that if any damaging phenomenon of flow starts at any hydraulic structure, then it is not possible to stop the same without timely external efforts.
- iii. As far as the critical gauge at RD 5+000 of LMB of Jinnah barrage is concerned, it is found that with reported gates operation at River stage of 856,949 Cfs. the gauge on model is achieved as 697.2 Cfs. However, in order to attain the critical gauge at R.D 5+000 of LMB at RL 700 as reported by field formation, about 12 gates have to be applied on model at the river stage of 856,949 Cfs. (*NOTE by the Tribunal: Due to want of clarity in the above para of the Report, we sought clarification from the PRO over the phone and it was explained to us that unless 12 gates were closed at 856,949 Cfs, the critical gauge could not have reached RL 700*)

¹²¹ Ex.I.W.121/7/2

¹²² Ex.I.W.121/8

¹²³ EX I.W. 123/1

¹²⁴ Mark 43

c. Additionally PRO submitted in para 2.1 of the Report submitted that since the bottom of apron level is higher than the floor level of the left undersluices, therefore apron of the LGB got launched.



Normal Operation of Barrage at $Q = 3,00,000$ Cusec



Site Operation of Barrage at $Q = 3,00,000$ Cusec



Normal Operation of Barrage at $Q = 4,00,000$ Cusec

Site Operation of Barrage at $Q = 4,00,000$ CusecNormal Operation of Barrage at $Q = 5,00,000$ Cusec



Site Operation of Barrage at $Q = 5,00,000$ Cusec



Normal Operation of Barrage at $Q = 6,00,000$ Cusec



Site Operation of Barrage at $Q = 6,00,000$ Cusec



Normal Operation of Barrage at $Q = 6,60,000$ Cusec



Site Operation of Barrage at $Q = 6,60,000$ Cusec



Site Operation of Barrage at $Q = 8,56,949$ Cusec

9.21. **INQUIRY & FINDINGS**

9.222. According to the Daily Log Book and the Jamadar Charge Book the weir gates (right side) and the under sluice remained practically closed (in varying degrees as noted above) from 31st May, 2010 till the 29th July, 2010 i.e, for almost two months with little regard to flood season and the medium flood on 29th July, 2010.

9.23. According to the Daily Log Book the weir gates (41 to 49) had an opening of 0.3 feet till 12noon on 29-7-2010 while the Jamadar Charge Book states that the said gates had an opening of 12.5 feet at 1300 hrs on the same date. It is not likely that the manually operated weir gates (41 to 49) could be opened from 0.3 feet to 12.5 ft in one hour. The record does not inspire confidence.

9.24. Further, the NOTE of S.E. allegedly recorded on 29-7-2010 in the Daily Log Book gives the date of inspection as 29-8-2010. The Note of the jamadar under the note of the S.E. confirms that the note of S.E was recorded on 26-8-2010 at 1 pm. Other than poor maintenance of registers, it is surprising why all of a sudden S.E. recorded a note in the Daily Log Book in the morning of 29-7-2010 considering that the said gates were closed much before the start of the flood Season 2010. Even the flood forecast issued by the I & P Department through a Canal Wire no. 2911 was at 2pm on 29-7-2010. We are of the view that the NOTE was recorded in haste and after the breach of LGB. We have drawn a negative inference and are of the view that S.E. in order to absolve himself got the said note recorded much after the event as confirmed by the Jamadar.

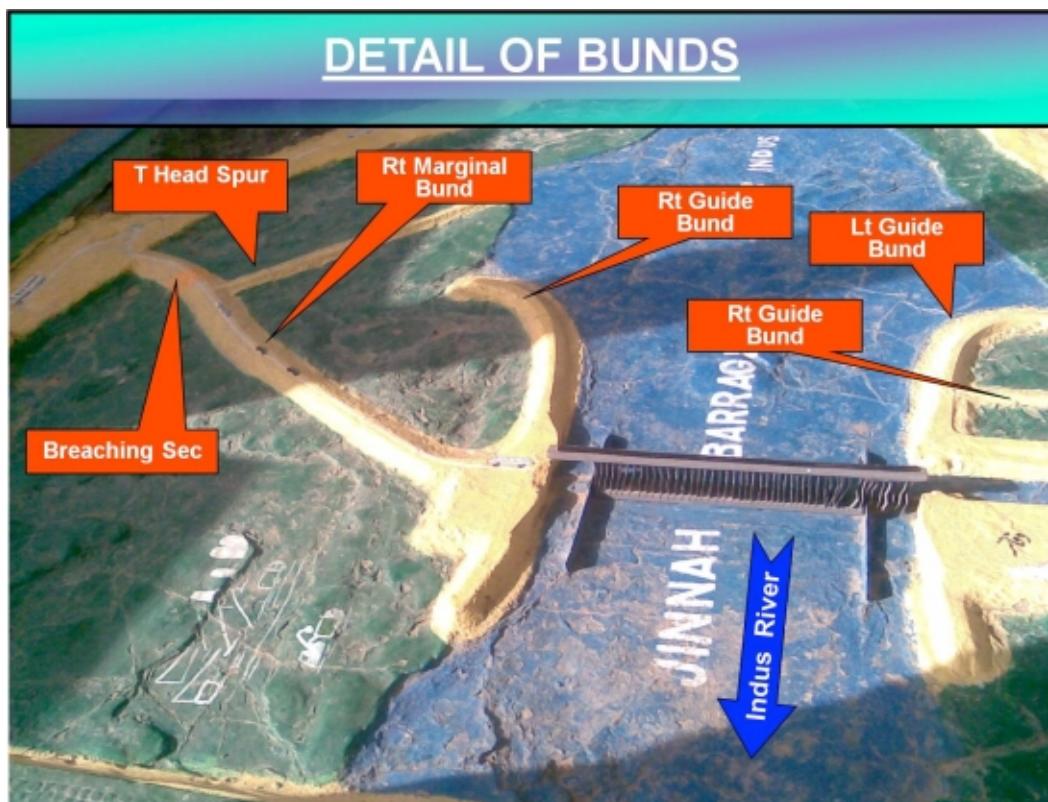
9.25. It is admitted position by the S.E., XEN, SDO that the gates on the right side remain closed till noon of 29-7-2010. Secretary and C.E are of the view that the gates were opened much later. The expert finding of the PRO Hydraulics has also confirmed that the closure of gates resulted in generating the swirl action resulting in the launching of the apron of the LGB. In any case the manual weir gates could not be opened in one hour as the Daily Log Book and Jamadar Charge Book reveals. Continuance of emergent work during medium flood, during the flood season and consequent closure of gates constitutes criminal omission and negligence by the officers incharge attracting criminal liability.

9.26. The C.E., S.E, XEN, SDO were aware of the closure of gates on the right side and also of the work going on downstream. Still the gates were not opened. The professional negligence of the XEN and SDO, besides the professional and supervisory negligence of C.E & S.E. stands established from the record and their admissions.

9.27. It has been established that the LGB was eroded due to mis-regulation and non-availability of the reserve stock of stone. Both of the factors were caused due to ongoing emergent work on the repair of Loose Stone Apron Downstream. No reason was given by the C.E. (who had initiated the said emergent work) for not stopping the said emergent work during the flood season. There is nothing on the record regarding the importance of the said emergent work. What has become of the said work during the recent floods is also not known. C.E. (D & F) todate has not bothered to inquire into the status of the said emergent work, post flood. Mismanagement of the Barrage has been clearly established. Accountability in this matter must start from C.E (D & F) down to the SENG including the C.E., S.E, XEN and the SDO.

10. OPERATION OF THE BREACHING SECTION

10.1. According to the Flood Fighting Plan¹²⁵, there is an approved breaching section between RD 6700 to RD 8700 of Right Marginal Bund. The critical RL for the operation of breaching section is RL 701 on the gauge of Left Marginal Bund at RD 5000 of the Jinnah Barrage. This breaching section has never been operated since the commissioning of the Barrage. The water of breaching section enters into the river after traveling three miles downstream. **No regular Abadi or industrial area exists on the course of water during the operation of breaching section.** Mianwali to Bannu metalled road is built on RMB (breaching section) which will be cut off in case the breaching section is operated.



10.2. The Chief Engineer inspected the breaching section and according to him Army Engineers reached the site at 04:30 p.m. on 30-7-2010. Captain Mujtaba Army Engineer was directed to operate the breaching section at 05:00pm on 30-7-2010 and written orders to this extent were delivered at 05:40 p.m on the same day.

10.3. Chief Engineer invoked the breaching section at 5.40 p.m on 30.07.2010 (in writing). The reasons given for operating the breaching section on RMB were as follows:

¹²⁵ Ex I.W. 6/1

- i. Critical gauge at RD 5000 on LMB was at RL-700.
- ii. There was parallel flow alongwith LMB and upstream LGB.
- iii. There was severe erosion action on downstream LGB (sic) and in matter of 12 hours almost 900 feet had eroded and a balance 2100 feet was left.
- iv. Discharge at Khairabad was 11 lac Cfs and was rising.

10.4. According to Brig. Muhammad Ajmal Iqbal¹²⁶, Director Engineering Corps GHQ, Rawalpindi, Jinnah Barrage down to upstream, Guddu Barrage is covered by 1st, 2nd and 5th Corps of Pakistan Army and its Engineering Corps is incharge of operating the breaching section. Army (Engineering Corps) reached the site i.e. RMB of Jinnah Barrage at 1630 hours on 30.07.2010. The Engineering Corps received instructions to operate the barrage from the relevant Breaching Committee at 1740 hours the same day. The breaching section comprises of four sections. The section was prepared with explosive placement from 1740 hours to 1915 hours. The first breaching section was operated at 1915 hours. The next section was operated at 2115 hours while the third and fourth sections were operated at 0200 and 0500 hours respectively. After receiving the instructions from relevant department, **it takes roughly between 1 to 2 hours for the Engineering Corps to prepare and final operate the breaching section.** After breaching the first section, time is required to clear the debris and also to read the hydraulic water pressure before operating the next section, therefore, **on average there is a time lag of 2 to 3 hours in operating the subsequent sub-breaching sections.**

10.5. The data of the breaching sections is as follows:

DATA OF BREACHES



| Sr. # | Location | Average Length | Average Depth |
|--------------|------------------|-------------------|---------------|
| 1. | RD.6900 | 330.00 ft | 28.23 ft |
| 2. | RD.7400 | 300.00 ft | 31.57 ft |
| 3. | RD.7900 | 22.50 ft | 17.00 ft |
| 4. | RD.8700 | 462.50 ft | 29.12 ft |
| 5. | Tie Bund RD.1000 | 225.00 ft | 28.97 ft |
| Total | | 1341.00 ft | |

¹²⁶ I.W. 99

10.6. Discharge through the breaches have been shown to be as follows:

| DISCHARGE PASSED THROUGH BREACHES AT RMB OF JINNAH BARRAGE | |
|---|---|
| RD.6900 | |
| Average Length | = 330 ft |
| Average Depth | = 23.58 ft |
| Area | = 7781.40 Sft |
| Velocity | = 6.0 ft / sec |
| Discharge | = $7781.40 \times 6.0 = 46688 \text{ Cs}$ |

| DISCHARGE PASSED THROUGH BREACHES AT RMB OF JINNAH BARRAGE | |
|---|--|
| RD.7400 | |
| Average Length | = 300 ft |
| Average Depth | = 23.23 ft |
| Area | = 6969.00 Sft |
| Velocity | = 6.0 ft / sec |
| Discharge | = $6969 \times 6.0 = 41814 \text{ Cs}$ |

| DISCHARGE PASSED THROUGH BREACHES AT RMB OF JINNAH BARRAGE | |
|---|---|
| RD.7900 | |
| Average Length | = 22.50 ft |
| Average Depth | = 11.58 ft |
| Area | = 260.55 Sft |
| Velocity | = 6.0 ft / sec |
| Discharge | = $260.55 \times 6.0 = 1563 \text{ Cs}$ |

**DISCHARGE PASSED THROUGH BREACHES
AT RMB OF JINNAH BARRAGE**



RD.8700

Average Length = 462.50 ft
 Average Depth = 22.10 ft
 Area = 10221.25 Sq ft
 Velocity = 6.0 ft / sec
 Discharge = $10221.25 \times 6.0 = 61327 \text{ Cs}$
Total discharge passed through breaching section = 151392 Cs
(46688 + 41814 + 1563 + 61327)

Government of the Punjab

10.7. INQUIRY & FINDINGS

10.8. According to the information tendered by the Chief Engineer (D & F), Lahore, breaching section at Jinnah Barrage is at RD 6.7 to 8.6 of the RMB and the critical gauge is RD 701 at RD 5 of LMB.¹²⁷

10.9. Vide notification¹²⁸ dated 26.5.2010 according to the directions of Chief Minister, single committee is responsible for operating the breaching section at Headworks/barrages. Previous Zonal Committee constituted vide notification dated 30.06.2001 were dissolved and the following Breaching Operation Committee was constituted with immediate effect:

| | | |
|-----|---|----------|
| i. | Executive Engineer of the Barrage | Convener |
| ii. | DCO or his representative not below the rank of BS-18 | Member |
| iii | Representative of respective Army Corps not below the Lt. Colonel | Member |
| iv. | Representative of Highway Department/ Railway not below the rank of BS-18 | Member |

10.10. Breaching Operation Committee is to monitor flood situation and emergency at each breaching site. Breaching Operation Committee is responsible for taking decision to operate breaching section as per prescribed criteria as contained in flood fighting plan.

10.11. Vide notification dated 24.3.2010 issued by Director Flood/Secretary, Punjab Flood

¹²⁷Mark-30

¹²⁸Mark 31

- a) History of the breaching section.
- b) Location, Design, quantity and variety of the explosive required for detonation.
- c) Arrangement of explosives and security of explosive stores.
- d) List of the security staff alongwith detail of their training etc.
- e) Detail of mechanical means as a standby arrangements in case of detonation failure.
- f) Duty Roster in case of critical situation.
- g) Breaching Committee with their action plan.
- h) List of the villages likely to be inundated in case of breach.
- i) Announcement and details of evacuation arrangements.
- j) Details of coordination with Civil/Army Authorities.
- k) Parallel communication arrangements.
- l) Index Plan.

Commission, "Standard Operating Procedure" for operating breaching section shall consist the following aspects¹²⁹:-

10.12. Brig. Muhammad Ajmal Iqbal, Director Engineering, GHQ, Rawalpindi¹³⁰ submitted that the breaching section is operated on the direction of the Breach Operation Committee which comprises the following:-

| | | |
|----|--|----------|
| 1. | Executive Engineer Barrage/ Headworks/Flood Bund— | Convener |
| 2. | DCO or his rep: not below rank of BS-18— | Member |
| 3. | Representative of Army not below rank of Lt. Colonel. | Member |
| 4. | Representative of Highway Department/Railway Department (BS-18)— | Member |

10.13. However, the direction to operate the breaching section was sent to him¹³¹ in writing by the Chief Engineer on 30.07.2010 at 5:40 p.m. and by the SE at 5:30 p.m. He submits that verbal consent of the DCO was obtained and written consent by CCE, 1-Corpos was given on 30.07.2010 as well. From the above, it is clear that the instructions received by the Brigadier were not from the Breaching Committee and were instructions primarily issued by the Chief Engineer himself. The purpose of the Breaching Committee is to collectively decide if the critical gauge has reached 701 RL and then decide to take the action. In this case it is certainly clear that the Committee was never constituted nor the Committee visited the critical gauge at RD5000 on the LMB. No concurrence was given by the representative of the Highway Department or the Railway Department as per the notification. We are of the view that the breaching section was operated by the Pakistan Army in violation of the rules and regulations.

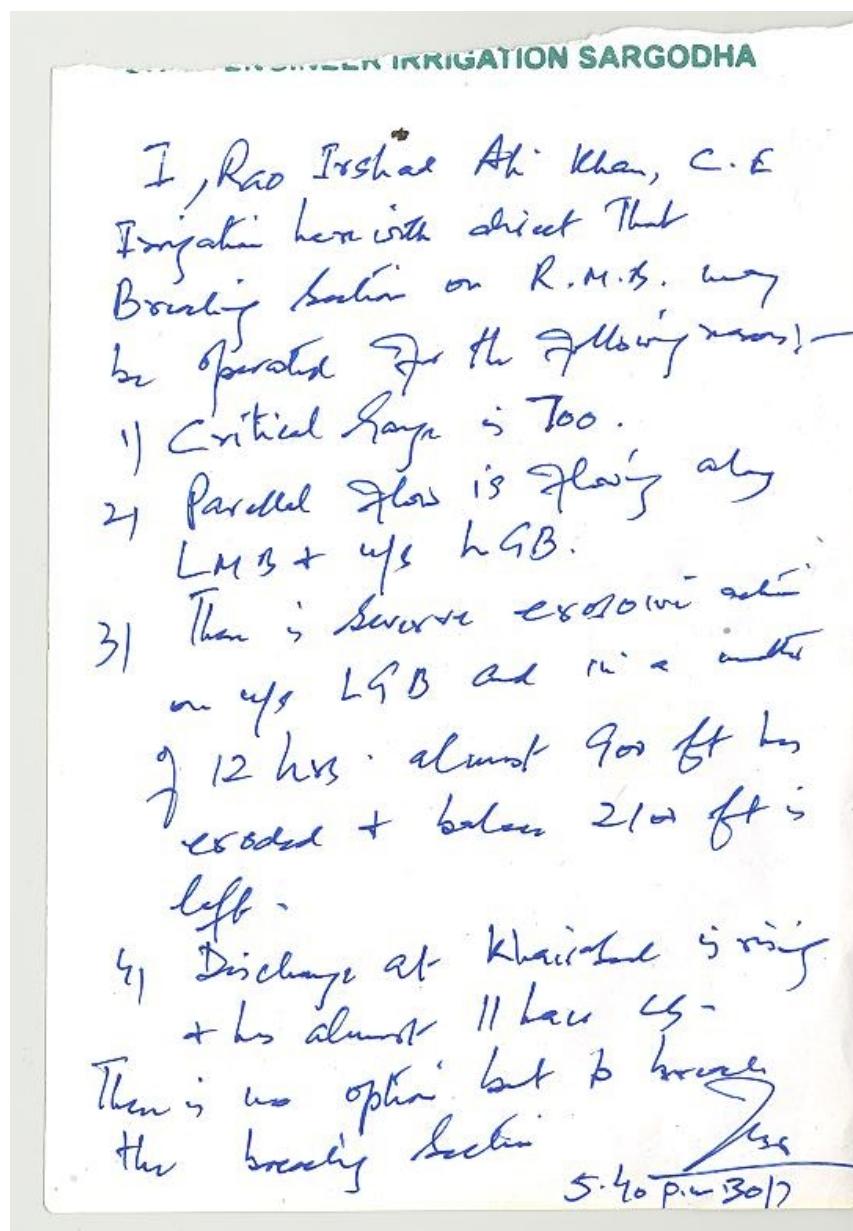
¹³⁰ IW-99 and Ex.IW-99/1 and Ex.IW-99/2.

¹³¹ Brig. Muhammad Ajmal Iqbal, Director Engineering, GHQ, Rawalpindi

¹²⁹ Mark-93

10.14. It is also stated in the written statement given by the Army that the direction was received at 5:40 p.m., however, the breaching section was prepared at 7:00 p.m. on 30.07.2010 and breaches were activated at 0500 hrs on 31.07.2010. Slight delay in operating the breaching section can play havoc with the barrage and the people in the vicinity.

Written orders by C.E. and S.E for operating the Breaching Section.



9. Khairi Dyal SE
The said circle
Grant permission
to demolish all four
breaching sections on
RMB as a result of
decision of Breaching
Committee today on
30.7.10 at 5.30pm

Final
SE Khairi Dyal

May

I Maj Zabid 89 LT AD hereby
direct Capt Mujtaba 2 Engrs
Bn to carryout demolition
on RMB on all four sections.
Dated 30 JUL 10

30 Jul 10

10.15. As per notification dated 26.05.2004 of the Irrigation & Power Department¹³², breaching operation committee was constituted for each breaching site with immediate effect. The Breaching Operating Committee is to monitor flood situation and the level of emergency at each breaching site and is responsible for taking decision to operate breaching section as per prescribed criteria as contained in the flood fighting plan. In the present case the C.E passed the orders bypassing the Breach Operating Committee in violation of the regulation.

10.16. Additionally, breaching section could only be operated if the critical gauge touched RL 701, however, in the present case, the breaching section was operated at RL 700 in violation of the Flood Fighting Plan.

10.17. Reasons given in the hand written order of Chief Engineer for operation of the breaching section is that there was a discharge of 11-lac Cfs at Khairabad. This is incorrect as according to the Hydrograph of Khairabad¹³³ the discharge on 30.07.2010 was in the range of 9.79¹³⁴ Cfs and was falling.

10.18. According to the physical model run by PRO Hydraulics at Hydraulic Research Station Nandipur, IRI, at a discharge of **856949 Cfs** at 6pm on 30.07.2010 the critical gauge at the model achieved RL 697.2 and it was not likely that the critical gauge would have touched RL 701. **It appears that the C.E panicked in advance and ordered the operation of the breaching section without assessing the situation and by disregarding the regulation. There is also no evidence on the record that the breaching committee visited RD 5000 and witnessed the critical gauge.** We are of the view that the CE in order to cover his mistakes like absence of reserve stone, closure of weir gates (right side) and emergent work unlawfully carried out during the flood season took reckless and rash decision of operating the breaching section prematurely. It is clear that the breaching section was operated in violation of the regulation and the reasons given for it are not corroborated by the evidence on the record. We are of the view that the breaching section was wrongly operated resulting in an additional damage to the exchequer in the sum of **Rs.18.50 million.**

10.19. The Breaching Section having been inspected on 30-7-2010 at 430pm by the C.E. and the Army officers, the time spent (two hours) in operating the first breaching section shows serious omission on the part of the Army. If the breaching section will actually get operated in several hours after it is directed to be operated the very purpose of the breaching section is frustrated and can cause huge damage to the headworks.

10.20. The Flood fighting plan also provides that the water course of the breaching section must be clear at all times. However, the hydel power plant had a temporary housing colony set up in the said watercourse. C.E should have ensured that water course remained clear.

¹³² (Mark-31)

¹³³ Mark 33 (Canal Wire 140 dated 23-11-2010 by XEN , Kalabagh Division.

¹³⁴ Mark 41- WAPDA has stated that peak discharge of 997,300 Cusecs was at 1500 Hrs on 30-7-2010.

11. RECOMMENDATIONS (JINNAH BARRAGE)

1.1. The breach of LGB at Jinnah Barrage can be attributed to poor flood preparedness, failure to observe the regulation, absence of reserve stone, continuance of emergent work on the loose apron downstream, closure of weir gates and abuse of para 2.89. It also brings to fore the premature operation of the breaching section, conflicting statements of the officers regarding procurement of reserve stone during the critical dates and poor capacity of human resource employed at the barrage especially the XEN. This resulted in a loss of **Rs 417 million**¹³⁵ to the public exchequer, which could have been avoided.

We therefore **recommend** as follows:

Penalties

11.2. The competent authority to initiate departmental disciplinary proceedings against Secretary I & P¹³⁶, under relevant service rules for **inefficiency**.

11.3. To initiate departmental proceedings against C.E¹³⁷, C.E (D&F)¹³⁸, S.E¹³⁹, XEN¹⁴⁰ and SDO¹⁴¹ under PEEDA, 2006 for **misconduct and inefficiency**.

11.4. Till the conclusion of the departmental inquiry Mr. Rab Nawaz, Secretary I & P be immediately replaced, so that the Department does not face the next flood season (2011) under his stewardship.

11.5. In order to conduct an impartial and transparent departmental proceedings and in order to avoid further loss and damage, the above named C.E, C.E (D&F), S.E., XEN & SDO be placed **under suspension** and a fresh team of able and competent officers be appointed at Jinnah Barrage for the upcoming Flood Season, 2011.

11.6. To initiate criminal proceedings against the above named C.E., S.E., XEN & SDO under sections **166, 167, 283, 322, 427 and 431 of the PPC**. The competent Authority on the basis of the inquiry and findings above as well as the damages recorded in chapter 7 below initiate criminal proceedings against the above named C.E., S.E., XEN & SDO under section **166, 167, 283, 322, 427, and 431 of the PPC**.

11.7. NAB (National Accountability Bureau) to hold an inquiry to verify the alleged procurement of reserve stone from private quarries, stone allegedly procured for the emergent work on the downstream loose apron, the quantity of stone recouped from the RGB, reserve stone of stock maintained at the Barrage, if any and the source of reserve stone made available for flood fighting between 30th July, 2010 to 2nd August, 2010.

¹³⁵ Ex IW-5/3 Headwise list of flood damages, Sargodha Division, Restoration works 2010. (Page 793 Appendix 9)

¹³⁶ Mr. Rab Nawaz

¹³⁷ Rao Irshad Ali Khan

¹³⁸ Rafiq Ahmed

¹³⁹ Khalid Iqbal

¹⁴⁰ Muhammed Afzal

¹⁴¹ Nawazish Ali

Reforms

11.8. *Pre Flood Preparedness* must provide for the following:

- i. Proper Pre-flood Inspection of the headworks including training works. Other departmental representatives must also be included and the reports put up on the website.
- ii. An inspection check list needs to be developed, showing in detail the areas to be covered in the inspection. The said check list to be filled out by the inspection team and duly submitted with the C.E. and C.E. (D &F). The entire pre flood inspection to be videographed.
- iii. The pre inspection to be counter checked by the C.E and C.E. (D & F) separately and independently of each other.
- iv. Total stoppage of works (U/S or D/s) on the barrage during the flood season.
- v. Severe penalties attached if there are lapses on pre flood preparedness.
- vi. I & P to develop a proper procedure of using Para 2.89 of the PWD code. A new emergency clause of the I & P Department can be developed and incorporated in the Flood Management Plan.
- vii. The officers posted out on a barrage must carry out the pre-inspection and should remain posted till the close of the flood season so that they can take ownership of the barrage during the flood season and effectively flood fight and coordinate with other departments.
- viii. There is also no effort on analyzing climate change and its effects. The I & P Department will have to develop its capacity to read the new trends in weather and climate change and be able to predict and forecast more intelligently. It is now common knowledge that due to global warming there will be extreme weather which could result in heavy and super floods and also severe droughts. This common knowledge wasn't available at the I & P Department and was never discussed during any pre flood meeting.

11.9. The *Flood Fighting* Plan must include:

- i. Quantity of Reserve Stone required under para 6.39 M.I.P. at every barrage. The Flood Fighting Plan must specify the Reserve Stone required.
- ii. Location must be marked for stacking the said stones- and a map showing such locations shall form part of the Flood Fighting Plan.

- iii. Duty roster per camp- clearly giving out names of officers.
- iv. List of Flood Fighting Material carries outdated items which are not required in this time and age. This list needs a proper revision after need assessment.
- v. List of Machinery (dumpers, trucks, etc) for flood fighting required to be specified according to the flood levels. The said machinery to be available throughout the flood season. There is no mention of the machinery in the flood fighting plan or its procurement mechanism from the Machinery Division.
- vi. Personnel of Army and Civil Administration to conduct rehearsals with the officers of the I & P Department and should remain standby throughout the flood season. Civil Administration and the Army must depute a point person on the Barrage who shall assist and facilitate the C.E or the XEN to arrange manpower and any other assistance as per flood fighting plan.
- vii. Flood Fighting camps and stations must be clearly demarcated on a site map.
- viii. Chief Engineer to closely monitor, supervise and manage the entire flood season, especially at the Barrages.
- ix. Emergent works should not generally be allowed to continue during the flood season. This requires to be clearly provided in the Flood Fighting Plan.
- x. Flood Fighting Plan has to be put in motion at the start of the Flood Season with weekly reporting to Flood Emergency Cell at Lahore.
- xi. The data pertaining to the management of the Barrage must be on line during the flood season so that the efforts made by the I & P Department are available to the public on the Flood Website of the I & P Department.
- xii. Complete Flood Fighting drill to be carried out before the Flood Season.
- xiii. Sensitive and high risk areas to be marked during the pre flood preparedness – so that flood fighting is based on a well thought out strategy.

11.10. **Breaching Section.**

- i. The Breaching sections must be ready to be operated.
- ii. Explosive should be housed near the barrage rather than 4 hours away in Sargodha Cantt. The explosives for the breaching section should be housed on the barrage at the start of the flood season so that there are no transportation delays. Army and Civil Administration needs to deploy a point person who shall be deputed

at the barrage for immediate coordination.

iii. Critical Gauge of RL 701 at RD 5000 needs to be revisited and its accuracy verified by IRI in close consultation with the I & P Department.

iv. The Flood Fighting Plan must clearly spell out the number of breaching sections and the time lag involved in utilizing all the sections.

v. The regulation setting down procedure for invoking the breaching section must be provided in the Flood Fighting Plan. Regulations spread into loose leaf circulars and notifications has also weakened the structure of governance. Without the majority of the members of the Breaching Committee being witness to the Critical Gauge, the breaching section should not be operated.

vi. Water Course of the breaching section must be a no go area and must be kept clear at all times.

vii. The delay in activating the breaching sections is also disturbing and in this aspect of the matter the I & P Department is directed to take up the matter in detail with the Pakistan Army

11.11. Pakistan Meteorological Department (PMD)

The Tribunal recommends the following to the Federal Government:

Penalties

11.12. Departmental action for **inefficiency** and **misconduct** be initiated against the Chief Meteorologist¹⁴² FFD of PMD for **inefficiency** under the relevant service rules.

11.13. Departmental action against ex-D.G¹⁴³, PMD for **inefficiency and misconduct** under the relevant service rules for failing to procure radars for upper catchment area of River Indus, failure to raise this as an urgent issue with the Federal Government and also in the Pre Flood Meetings held with other stakeholder organizations, failure of PMD to issue weather forecast with confidence on 26th July, 2010 when an unusual stagnation of the two weatherly systems had become clear to PMD, to issue timely forecast and issue coloured coded alerts when the monsoon moved into Pakistan on 24th July, 2010 and also in failing to issue correctly worded forecasts (strictly in terms of WMO) that could have rightly communicated the severity of the weather and the urgency and importance of the forecast.

11.14. Chief Meteorologist, FFD (PMD) be placed under suspension till the final conclusion of the departmental disciplinary proceedings.

¹⁴² Mr. Hazrat Meer

¹⁴³ Dr. Qamar uz Zaman Ch.

11.15. The Federal Government should carry out an audit /assessment of PMD, particularly looking at the human resource as well as the infrastructural capacity of PMD and put the house in order before the next flood season. Four areas of concern are:

- i. Technological capacity- more QPM radars to cover the upper catchment of KPK and the Hill Torrents within Punjab.
- ii. International bench marking of the quality of Human Resource and weather models employed at PMD.
- iii. Upgrading the Research Division. PMD must lead cutting edge research in monsoons and climate change.
- iv. Ensure meaningful utilization of existing resources/ model/ equipment available with PMD and fixing responsibility / penalties in case of non-functioning of existing models acquired at heavy cost.

Reforms

11.16. Monsoon Research Centre to be set up under the auspices of PMD to develop more depth and understanding of Monsoons in Pakistan.

11.17. The human resource at PMD has to be upgraded and at the same time QPM Radar at Cherat has to be fixed and made functional. New and latest radars and other equipment to be installed for the catchment areas of Indus as well as the hill torrents.

11.18. We feel that PMD has to seriously buckle up if the extreme weather is to be predicted in future. On the whole, we feel that the PMD has failed in its responsibilities as the only forecaster in the country. As all the institutions have to react on the information disseminated by PMD, it takes a central role. It was also disturbing to note that inspite of the Research and Development Division within PMD, no material research has come out on monsoons or the climate change. PMD requires more internal coordination and more robust and dynamic approach towards weather and flood forecasting.

11.19. We recommend that Ministry of Defence must seriously revisit the structure as well as capacities of PMD specially FFD and stream line the same.

11.20. Better-qualified, trained, experienced and paid human resource is employed so that proper forecasts are generated at the right time. The infrastructure regarding purchase of new Radars and other equipments must be immediately attended to so that MET Office is always in the best state of preparedness at all times

11.21. According to the data supplied the human resource employed at the PMD has just one person at the FFD holding M.S. Meteorology while rest of the staff has degrees in

Physics and Mathematics.

11.22. PMD has to revisit its forecast terminology. The terms used by WMO must be incorporated. “Widespread rain or showers” must be replaced by “violent or exceptional rain” (where necessary) so that the sense of emergency can be properly conveyed.

FWC & I & P Department

11.23. I & P Department needs to revamp its flood warning centre (FWC). There is no coordination between the FWC and the Department.

11.24. The lag/travel time from Tarbela to Jinnah Barrage is 16 hours and from Tarbela to Chasma is 20 hours and from Tarbela to Taunsa is 36/37 hours. If the pre flood preparation is up to the mark, flood fighting plan can be set in motion in 16 hours at Jinnah and certainly in 36 hours at Taunsa. All the emergency cells ought to do is to keep a track of gauges at Tarbela and Khairabad as a second line of defence even if the PMD fails to deliver, as it partly did this year.



CHAPTER 4

In a land where it seldom rains, a river is as precious as gold¹.

TAUNSA BARRAGE



¹ Empires of the Indus-The Story of a River, Alice Albinia



1. INTRODUCTION

1.1. Taunsa Barrage is located across the River Indus at a distance of 18 K.M. from Kot Addu Town, District Muzaffargarh. Taunsa Barrage derives its name from a Town of Taunsa Sharif situated on the right bank of the River, 30 km upstream of the Barrage. The structure of the Barrage is one of the most important diversion structure for the arid zone of Southern Punjab².

1.2. The story of Taunsa Barrage dates back to 1936 when Mr. J.D. Bedford initiated the scheme to improve the lot of the backward Districts D.G. Khan and Muzaffargarh. At that time these two districts were served by a large number of inundation canals from River Indus. Since, supplies from these inundation canal were uncertain especially during the critical sowing and maturing period it was planned to complete these canals into weir control channels. In 1943 when a new circle known as “[Project Circle](#)” was opened in Punjab Irrigation Department to investigate new schemes for development of the Province, the idea was revived and work for preparation of Taunsa Barrage Project was initiated. In 1951,

¹ Empires of the Indus-The Story of a River, Alice Albinia

development of a hydel power project on the left flank was proposed i.e., by off taking a channel from Taunsa Barrage and dropping it into river Chenab near Muzaffargarh. It was decided by the government that scheme of Taunsa will be multipurpose scheme to include hydel power, Tube-well, roads and railway bridges, however, the project was revived and hydel power and tube-well were dropped. The construction of project started on 15.09.1953. On the completion of barrage the river was diverted through it on 11.4.1958 and the barrage was formally inaugurated by the President of Pakistan on 3.3.1959³.

1.3. According to the [Rules & Regulations for the Maintenance & Working of Taunsa Barrage \(1979\)](#)⁴, maximum discharge for which the Barrage is designed is **10,00,000 cusecs**, but it can take and pass super-flood of **12,60,000 cusecs** for short periods in an emergency. The Regulation points out that Sangar Hill Torrent on the banks of which Taunsa town is situated, meets the river about 12 miles upstream of the Barrage and may bring in discharge upto 50,000 cusecs, or even more, all of a sudden, and needs a careful regulation during rains.

1.4. Three canals off take from left and right side of the Barrage namely Muzaffargarh Canal (discharge 8,900 Cfs) and T.P. Link Canal (discharge 12,000 Cfs) from the left side and D.G. Khan Canal (14,000 Cfs) from the right side of the Barrage. Muzaffargarh Canal and D.G. Khan Canal provides irrigation to **838,000 acres** and **950,000 acres** of land, respectively.

1.5. Taunsa Barrage delivers the following benefits⁵ to the area:-

- i. It diverts 20,450 Cfs of irrigation water to **2.23 million acres** of fertile agriculture lands of Muzaffargarh, D.G. Khan & Rajanpur Districts;
- ii. It serves as an important / vital rail – cum – road link between Sindh and NWFP;
- iii. The barrage structure also houses a 16" dia high pressure pipe line of PARCO Linking Karachi with their up-country storage at Mehmood Kot Terminal, besides 16" dia gas pipe line from Dhodak oil & gas field;
- iv. A head regulator is under construction to feed the kachhi Canal which will irrigate **7,13,000 acres** of barren lands of kachhi plains in Balochistan besides meeting with the drinking water requirement in the brackish Zone.
- v. The barrage also provide 12,000 Cfs of water to the River Chenab through 38 miles long Taunsa – Panjnad Link Canal constructed in 1965-71 for supplementing the supplies required at Panjnad to feed Panjnad and Abasia Canals in Districts Rahim Yar Khan and Bahawalpur.

³ Appendix-2 of Operation and Maintenance of Taunsa Barrage, November, 2007 (Ex I.W. 7/6/1)

⁴ Ex I.W. 7/3

⁵ Ex I.W. 7/3

1.6. According to the Operation and Maintenance Manual for Taunsa Barrage⁶ the operation of barrage is very important and a sensitive process. A small mistake or irregularity can trigger many serious problems. The operation of the barrage should effectively achieve the following objectives:

- i. To maintain the approach of the dominant river channel in three distinct streams approaching the under sluices and the central part of the weir.
- ii. Control sedimentation in guide bank zone to eliminate or contain the deposits close to or in the pockets.
- iii. To ensure indented supplies in the off-taking canals.
- iv. To control silt entry in the canals within their carrying capacity.
- v. To ensure safe passage of flood discharges.
- vi. Manage the flood flows at flow intensities close to uniform over the whole Barrage [sic], or if there is need to vary the discharges through adjacent Bays, ensure to limit the variation to 10%.
- vii. See that the Barrage is not over strained in any section / component.
- viii. Maintain the pond level to designated limits
- ix. Limit head across the Barrage to the permissible value.

1.7. The said Barrage was rehabilitated and modernized during the years 2004-2008 not only to avert the risk of river but also to provide water supply to District D.G.Khan, Muzaffargarh and Rajanpur.

1.8. At Taunsa Barrage, the River Indus has three main channels i.e., the Puran Creek (western arm), the main river in the centre and the Hassan Wah Creek (eastern arm).

1.9. The important flood protection and training works for the purposes of this report are the Left Marginal Bund (R.D. 1500 – 134700), Tibba Tie Bund (8,900 ft) and Sanawan Bund (42,000 ft).

1.10. Histogram⁷ of the highest floods that passed the Barrage since its commissioning is as follows:-

⁶ Ex.I.W.7/5

⁷ Ex I.W.7/3

| Year | Date | Month | U/Stream Gauges | D/Stream Gauges | Up-Stream Discharge | D/Stream Discharge | Remarks |
|-------------------|------------------|-----------|-----------------|-----------------|----------------------|---------------------|--------------------------|
| 1958 | 21 | July | 441.80 | 441.60 | 760784 | 760784 | V.H. Flood |
| 1976 | 07 | August | 445.50 | 433.60 | 677105 | 675233 | V.H. Flood |
| 1992 | 14 | September | 446.00 | 434.70 | 655879 | 654579 | H. Flood |
| 1993 | 28 | July | 446.50 | 432.50 | 385302 | 381302 | M. Flood |
| 1994 | 19 | July | 444.00 | 436.70 | 574602 | 574602 | H. Flood |
| 1995 | 30 | July | 446.00 | 434.70 | 611937 | 611937 | H. Flood |
| 1996 | 20 | August | 448.00 | 432.30 | 521708 | 518208 | H. Flood |
| 1997 | 31 | August | 447.00 | 432.40 | 536199 | 534199 | H. Flood |
| 1998 | 18 | July | 447.00 | 431.50 | 528543 | 519881 | H. Flood |
| 1999 | 13 | August | 447.00 | 430.70 | 409720 | 387720 | M. Flood |
| 2000 | 05 | August | 447.40 | 429.40 | 227605 | 209405 | L. Flood |
| 2001 | 27 | July | 445.60 | 430.30 | 281873 | 281873 | L. Flood |
| 2002 | 17 | August | 447.00 | 430.80 | 335150 | 306150 | L. Flood |
| 2003 | 7 | August | 447.00 | 430.90 | 431277 | 421177 | M. Flood |
| 2004 | 21 | August | 447.60 | 428.65 | 206412 | 179157 | Normal |
| 2005 | 20 | August | 446.00 | 432.85 | 531177 | 531177 | H. Flood |
| 2006 | 11 | August | 446.80 | 432.70 | 612269 | 612269 | H. Flood |
| 2007 | 19 | August | 447.50 | 435.00 | 351820 | 333220 | L. Flood |
| 2008 | 08 | August | 447.00 | 430.70 | 279500 | 263177 | L. Flood |
| 2009 | 21 | August | 447.50 | 429.70 | 343369 | 312769 | L. Flood |
| 2010 ⁸ | 02 | August | | 438.10 | 959177 | 959177 ⁹ | Exceptionally High Flood |
| | | | 446.60 | | | | |
| 2010 | 12 ¹⁰ | August | 443 | 438 | 782698 ¹¹ | 782698 | Very High Flood |
| 2010 | 14 ¹² | August | 443 | 437 | 779227 | 779227 | Very High Flood |

⁸ Daily Log Book and Flood Register of Taunsa Barrage. The said registers have been duly stamped by the Tribunal and returned to the I & P Department.

⁹ At 2100 hrs on 2-8-2010 according to the Flood Register. Plus the alleged discharge of 1,25,000 Cfs through the LMB.

¹⁰ Time 1100 hrs.

¹¹ From 1100hrs till 1500 hrs on 12-8-2010 as per Flood Register.

¹² 1000hrs on 14-8-2010 as per Flood Register.

2. NATURE OF BREACHES¹³

| Sr.No. | Location | Date | Time | Nature | Duty Officer | Officers of other Deptt. Present at Site | Cause of Breach |
|--------|--|--------|----------|--------------------|---|--|---|
| LMB-B1 | RD 32-33 LMB Taunsa Barrage RD 34-40 LMB Taunsa Barrage | 2/8/10 | 4:00 PM | Spontaneous Breach | Inayat Ullah Cheema SE, Rana Muhammad Afzal SDO, Muhammad Afzal SDO, Muhammad Saleem Bhatti SBE | 1. Army Officers with Jawans 2. DDO(R) Kot Addu | At super flood, deep sheet flow took place and it was extraordinarily headed up due to pocketing effect of the four long spurs (RD 9,11,15,26) and convex nature of LMB. Heading up continued rapidly till the LMB breach due to foundation / HGL failure |
| SN-B2 | Sanawan Flood Bund | 2/8/10 | 8:00 PM | Spontaneous Breach | Munir Anjum SDO, Muhammad Saleem Bhatti SBE | N.A | Hitting of more than 1.25 Lac Cs discharge from breach at RD 32-33 of LMB. Bund was overtapped / breached at many sites. |
| TPL-B1 | RD 9-10 L/S TP Link Canal | 3/8/10 | 3:30 AM | Spontaneous Breach | Rana Muhammad Afzal SDO, Zafar Javed SBE | XEN & SDO Highway Kot Addu | Hitting of more than 1.25 Lac Cs discharge from breach at RD 32-33 of LMB caused overtopping |
| TPL-B2 | RD 15-16 R/S TP Link Canal | 3/8/10 | 7:30 AM | Spontaneous Breach | Rana Muhammad Afzal SDO, Zafar Javed SBE | N.A | Hitting of more than 1.25 Lac Cs discharge from breach at RD 32-33 of LMB caused overtopping |
| TPL-B3 | RD 19 L/S TP Link Canal | 3/8/10 | 7:00 AM | Spontaneous Breach | Zafar Javed SBE | N.A | Hitting of more than 1.25 Lac Cs discharge from breach at RD 32-33 of LMB caused overtopping |
| TPL-B4 | RD 23 L/S TP Link Canal | 3/8/10 | 6:30 AM | Spontaneous Breach | Zafar Javed SBE | N.A | Hitting of more than 1.25 Lac Cs discharge from breach at RD 32-33 of LMB caused overtopping |
| TPL-B5 | RD 28-29 L/S TP Link Canal | 3/8/10 | 7:00 AM | Spontaneous Breach | Zafar Javed SBE | N.A | Hitting of more than 1.25 Lac Cs discharge from breach at RD 32-33 of LMB caused overtopping |
| TPL-B6 | RD 35-36 L/S TP Link Canal | 3/8/10 | 10:00 AM | Spontaneous Breach | Muhammad Hafeez Leghari SBE | N.A | Hitting of more than 1.25 Lac Cs discharge from breach at RD 32-33 of LMB caused overtopping |
| TPL-B7 | RD 51 R/S TP Link Canal | 3/8/10 | 10:30 AM | Spontaneous Breach | Muhammad Hafeez Leghari SBE | N.A | Hitting of more than 1.25 Lac Cs discharge from breach at RD 32-33 of LMB caused overtopping |
| TPL-B8 | RD 176-177 R/S TP Link Canal | 3/8/10 | 11:30 AM | Spontaneous Breach | Zafar Javed SBE | N.A | Hitting of more than 1.25 Lac Cs discharge from breach at RD 32-33 of LMB caused overtopping |

3. SUBMISSIONS OF THE FLOOD AFFECTEES AND PRIVATE COMPLAINANTS¹⁴

1.1. **49** (forty nine) complainants came before the Tribunal and recorded their grievances at Muzzafargarh, Kot Addu, Taunsa Barrage and Lahore. The submissions made by the flood affectees and private complainants (in their own words¹⁵) were as follow:

i. There was head up due to the closure of side gates of Taunsa Barrage which resulted into the breach of LMB.¹ Out of the 64 gates 11 middle gates of the Barrage were closed prior to 2.08.2010 and in addition four gates on the right side and four

¹³ According to the Head PMO. Mark 151 (email received by the Tribunal)

¹⁴ see Schedule 5

¹⁵ Flood affectees deposed and submitted their complaints in Urdu. This is the closest translation.

¹⁶ I.W.24 and I.W.27.

¹⁷ I.W.71

gates on the left side were also closed, resulting in the raising of the pond level.¹⁸

ii. The area between the Spurs and the LMB was under unlawful cultivation resulting in development of private bunds. It is these bunds that did not allow water to flow into the pond area thereby developing a load on the LMB.¹⁹ The encroachment in Pond Area is in connivance with the officials of I & P Department and also reflects the corruption of the department.

iii. Right gates of the barrage were also closed and therefore the river flowed towards the left.

iv. There was seepage in the LMB which was pointed out by the local residents but no action was taken by the Department.

v. Seepage took place on the LMB starting from 26.07.2010. No flood protection work was carried out by the Irrigation & Power Department to protect the bund or plug the seepage taking place.

vi. The embankments have not been properly maintained over the years.

vii. The breaching section on the right side was not operated.

viii. Khosas have a chunk of land at Kala which falls within the water channel of regular breaching section of Link Bund. The right side of the barrage was not operated only to save the land and crops of Khosas.

ix. In order to save Spur No.5, six gates on the left side of the barrage were closed on 28.7.2010 and remained closed till the time of breach.²⁰ Inspite of reporting to the XEN about the seepage from LMB on 26.7.2010, the entire emphasis was upon Spur No.5 (on the right side of the Barrage) and efforts were made to protect the same.⁶ It is further pointed out that relief activities were carried out only at Spur No.5 on 1.08.2010.²¹

x. XEN Munir Anjum had the support of Khosa family. Pond level on 30.07.2010 was 447.80 RL which should have been reduced prior to the flood but this level was not reduced.²²

xi. In order to save forest in the Active Flood Plain, the gates of the barrage were closed in order to build a head up so that the velocity of water passing through the

¹⁸ I.W.25 and I.W.26.

¹⁹ I.W.28

²⁰ I.W.28.

²¹ I.W.65

²² I.W.28

said forests does not damage the said forests.²³

xii. There was nobody from the I&P Department addressing the situation, however, I saw four dumpers attending to some seepage upstream on the un-pitched portion of the embankment.^{23-A}

xiii. The breaching section was not operated and as a result of which breach took place on the left side at Abbaswala, LMB. The breaching section for such like eventuality is at RD-22 on the D.G. Khan Canal.^{23-B}

xiv. On 11.08.2010 Army demolished four spurs on the left side along LMB which reduced the pressure on the embankment. Had the department done this on 2.8.2010 heavy losses could have been avoided.^{23-C}

xv. Prior to the flood about 10 days before, the concerned staff at the barrage was transferred.^{23-D}

xvi. Influential families of Sultan Hanjra, Ahmed Yar Hanjra and Afzal Yar Hanjra on the left side and Khosa family on right side have cultivated the pond area which has resulted in the breach of LMB.^{23-E}

xvii. It is pointed out that seepage was going on in the LMB prior to its breach but the same was not noticed and no steps were taken for its protection.^{23-F}

xviii. The gates of the barrage were not opened in order to save the subsidiary weir downstream, which cost around Rs.11 billion to construct.^{23-G}

xix. In the right pond area Mian Muhammad Khan (contractor) had standing crops (sugarcane) in 16 squares of land and this was the reason the RMB was not breached.^{23-H}

xx. Had a relief cut made in the Muzaffargarh canal and T.P. Link Canal before Railway Line, Muzaffargarh could have been saved as the water would have traveled into the river. This was not allowed to be done by Khar family as the land under the said T.P. link Canal belongs to them.^{24-A}

²³ I.W.28

^{23-A} I.W.53 and I.W.58

^{23-B} I.W.70 and I.W.71

^{23-C} I.W.71

^{23-D} I.W.71

^{23-E} I.W.72

^{23-F} I.W.83

^{23-G} I.W.102

^{23-H} I.W.102

^{24-A} I.W.102

xxi. The reason for the breach of LMB is the flow of Tibba minor alongwith the toe of LMB²⁴.

xxii. Departmental negligence. If the Irrigation Department timely repaired the bunds the irreparable loss would have been avoided²⁵.

xxiii. Before the flood the silt was not ejected²⁶.

xxiv. Ashraf Rind, ex-Nazim did not allow to run water through Channel²⁷.

xxv. The breach of LMB at Abbas Wala was natural²⁸.

xxvi. There was departmental negligence. They did not open the gates of Barrage²⁹.

xxvii. Ashraf Rind, resisted to make a cut at 4148 Burji³⁰

xxviii. Ashraf Rind is responsible for the losses³¹.

xxix. Breach is a result of Heavy Floods³².

xxx. The Department tried its best to stop the erosion but in vain³³.

xxxi. Embankments were weakened due to pitching³⁴.

xxxii. The breach took place due to seepage³⁵;

xxxiii. In the Indus River there is a Shikargarh which is under the use of Malik Muhammad Afzal Hinjra and Malik Ahmad Yar Hinjra, MPA, where the said peoples go for hunting. To save the Shikargarh, these peoples did not allow the Irrigation Department's officers/officials to perform properly³⁶.

xxxiv. Had Shikargah known as Lashari Wala did not exist, the water pressure could not have been built on the embankments and the bund Abbas Wala would not have been breached³⁷.

²⁴ I.W.32

²⁵ I.W.32

²⁶ I.W.32

²⁷ I.W.32

²⁸ I.W.33

²⁹ I.W.33

³⁰ I.W.33

³¹ I.W.33

³² I.W.34

³³ I.W.34

³⁴ I.W.34

³⁵ I.W.36

³⁶ I.W.40

³⁷ I.W.40

xxxv. If the water flowed in its previous course of river on Western Side at Mauza Beet Wala, then there would have been no damage. Dost Muhammad Khosa is involved for not using this option. Damage of recent flood was due to connivance of local politicians and Irrigation Department³⁸.

xxxvi. Since the construction of Barrage the Department has not been properly maintained/repaired the Bunds/Embankments³⁹.

xxxvii. Trees on Bunds/embankments have been cut down⁴⁰.

xxxviii. During the rehabilitation/remodeling of Taunsa Barrage in 2007 –2008, the construction and repair by pitching the bunds/embankments of upstream, was defective and the soil was not properly dumped on the Bund to raise the length⁴¹.

xxxix. The influential of the area have leased out the land of pond area and they are receiving Rs. 10 to 40 thousand per acre⁴².

xl. In the Pond area on the Eastern Side of Barrage there is a bund known as “Noor” which was raised by Malik Muhammad Afzal Hinjra, ex-Chairman Zila Council Muzaffargarh. In this regard a Writ Petition was also filed against the Department⁴³.

xli. On the western side of Barrage at spur No.5 illegal bunds have been raised⁴⁴.

xlii. Illegal bund for cultivation on Spurs No.1,2 & 3 have been raised for safety of their crops. The Irrigation Department did not breach these bunds⁴⁵.

xlii. Lashari Wala Shikargarh have been occupied by influential politician i.e., Malik Muhammad Afzal Hinjra, where he does hunting. There is also a jeep in the bela and there exist houses⁴⁶.

xliv. The breach took place due to seepage⁴⁷.

xlv. The bund was very weak and water was percolating from various places. There were no safety arrangements⁴⁸.

³⁸ I.W.40

³⁹ I.W.41

⁴⁰ I.W.40

⁴¹ I.W.40

⁴² I.W.40

⁴³ I.W.40

⁴⁴ I.W.40

⁴⁵ I.W.40

⁴⁶ I.W.40

⁴⁷ I.W.40

⁴⁸ I.W.42

xlvi. The Department illegally attempted not allow water to flow to the pond area⁴⁹.

xlvii. There are two canals alongwith the Bank from where seepage started and the said seepage was not stopped and due to these canals the embankments became weak⁵⁰.

xlviii. LMB was in miserable condition⁵¹.

xlix. The flow of water was very high and the embankments were in weak condition and there was no proper arrangement for the protection of embankments⁵².

I. We have not seen any Baildar and Chowkidar, who should have been deployed for the protection of bunds⁵³.

li. No machinery was available for the stoppage of seepage⁵⁴.

lii. On 2.8.2010 I alongwith many other persons was present at LMB and the public was trying to plug the seepage by using sand bags but all of sudden the breach took place⁵⁵.

liii. This breach was due to Departmental Negligence⁵⁶.

liv. On the eastern side of LMB there was seepage at many places⁵⁷.

lv. No proper arrangements for the repair of bunds were seen at the spot⁵⁸;

lvi. On 2.8.2010 at about 4:00 p.m. I was present on Abbas Wala Bund. All of sudden seepage became into a spring and bund collapsed⁵⁹.

lvii. If the Officers of Irrigation Department timely opened the gates of Barrage and ejected the silt, there was no chance for the breach of LMB at Abbas Wala⁶⁰.

⁴⁹ I.W.43

⁵⁰ I.W.45

⁵¹ I.W.46

⁵² I.W.47

⁵³ I.W. 47

⁵⁴ I.W.47

⁵⁵ I.W.48

⁵⁶ I.W.48

⁵⁷ I.W.49

⁵⁸ I.W.50

⁵⁹ I.W. 51

⁶⁰ I.W.51

lviii. If the cut was made at 4148 Burji the whole Muzaffargarh District would not have been inundated, but Mr. Muhammad Ashraf Rind is responsible because he did not allow the Department to make cut at the said place⁶¹;

lix. The Department has not breached the private bunds raised in the spurs⁶²;

lx. It appears that it was a conspiracy to target Thermal Power Kot Addu, Lal Peer Thermal Power Muzaffargarh, Oil Depot Mahmood Kot and Pak Arab Refinery⁶³.

lxi. Due to heavy rainfall and intensity of water flow, the erosion started in the bund⁶⁴;

lxii. The Department had not made proper protection arrangements⁶⁵;

lxiii. I alongwith many people including Irrigation Departments' officials was present at LMB when all of sudden the bund collapsed⁶⁶.

lxiv. Due to resistance of Ashraf Rind the cut was not made at silt ejector which caused irreparable loss⁶⁷.

lxv. On 2.8.2010 at 03:45 p.m. I was present on the LMB at Abbas Wala and all of sudden bund collapsed⁶⁸;

lxvi. I am an eye witness that the bund was breached naturally. No one has breached the same⁶⁹.

lxvii. Due to resistance of Ashraf Rind the cut was not made at silt ejector which caused irreparable loss⁷⁰.

lxviii. On 2.8.2010 at 03:45 p.m. I was present on the LMB at Abbas Wala, all of sudden bund collapsed⁷¹;

lxix. I am eye witness that the bund was breached naturally. No one has breached the same⁷².

⁶¹ I.W.51

⁶² I.W.52

⁶³ I.W.52

⁶⁴ I.W.53

⁶⁵ I.W.53

⁶⁶ I.W.55

⁶⁷ I.W.55

⁶⁸ I.W.56

⁶⁹ I.W.56

⁷⁰ I.W.56

⁷¹ I.W.57

⁷² I.W.57

Ixx. Due to resistance of Ashraf Rind the cut was not made at silt ejector which caused irreparable loss⁷³.

Ixi. I request that the responsible officer and Ashraf Rind may be punished⁷⁴.

Ixii. Heavy rainfall and high flood⁷⁵;

Ixiii. Defective strategy of Irrigation Department⁷⁶;

Ixiv. The Irrigation Department concentrated only at Spur No.5⁷⁷;

Ixxv. Ex-Nazim alongwith his companions resisted and did not allow the Department to make cut at TP Link canal to flow water through silt ejector⁷⁸.

Ixxvi. Old riverbed known as the breaching section was not operated in time⁷⁹.

Ixxvii. The main causes of recent disaster are the Wadaira, Nawab, Hinjra, Khosa and politician of the area⁸⁰.

4. DEPARTMENTAL POSITION PRESENTED BY SECRETARY I & P⁸¹:

4.1. Other than the general submissions recorded in the chapter dealing with Jinnah Barrage (above), the Secretary I & P made the following submissions in the context of Taunsa Barrage:

4.2. Flood Peak reached Taunsa Barrage on 02-08-2010. Spur 5 came under direct attack and was saved by hectic efforts spread over five continuous days. Exceptionally high and very high flood persisted for 124 hours at Taunsa. LMB, however, could not sustain the pressure of flood waters and breached at RD 32-33 on 2-8-2010.

4.3. The Peak flood at Taunsa (1,085,000 Cusec) corresponds to 1 in 500 year flood event.

⁷³ I.W.57

⁷⁴ I.W.57

⁷⁵ I.W.61

⁷⁶ I.W.61

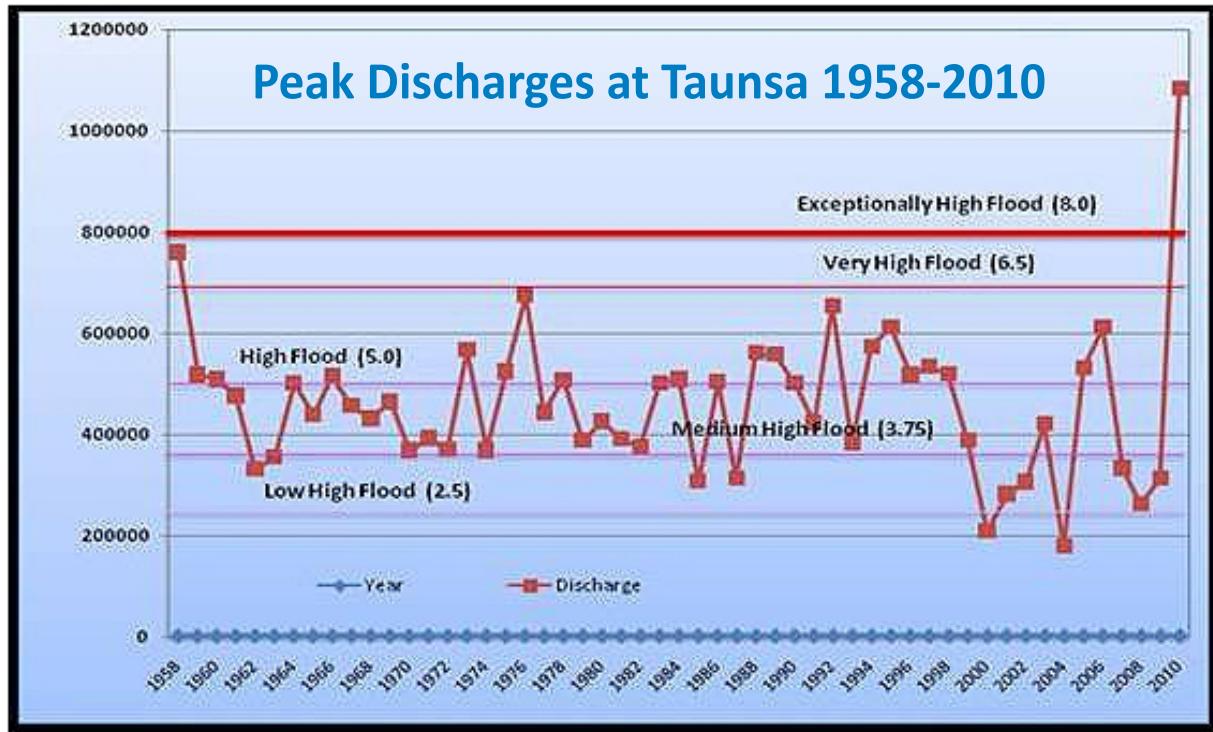
⁷⁷ I.W.51

⁷⁸ I.W.61

⁷⁹ I.W.65

⁸⁰ I.W.68

⁸¹ Ex I.W.6/1



4.4. The breach in LMB was the main cause of the extensive damages and inundations in Muzaffargarh District via TP link / Muzaffargarh canal.

4.5. A second wave of very high flood generated in river Indus in the second week of August 2010, which also aggravated the flood situation.

4.6. *Actions taken by the I & P Department:* Secretary I & P in his presentation / position paper⁸² stated that he took the following actions:

- a. On 29-07-2010 he directed Head PMO Barrages to reach Taunsa Barrage for taking appropriate action regarding safe passage of flood for the barrage. He was also directed to have a liaison with the district administration as well as with the military authority as prescribed in the SOP of Flood Fighting Plan.
- b. On 30-07-2010 Head PMO Barrages was issued instruction to call all the officers working in PMO Barrages at Taunsa Barrage for performing flood duties.
- c. The senior officers who had previously served at Taunsa Barrage were called at Taunsa Barrage to avail their services. They reached at Taunsa Barrage and worked there till the flood was over.

⁸² Ex I.W.6/1

STEPS TAKEN BY THE DEPARTMENT AFTER RECEIVING THE INFORMATION ABOUT SUPER FLOOD 2010



| Sr. No. | Name of Officers / Officials | Designation |
|---------|-----------------------------------|---|
| 1 | Inayat Ullah Cheema | Superintending Engineer, LCC West Circle, Faisalabad |
| 2 | Khalid Hussain Quershi | Superintending Engineer, Drainage Circle, Lahore |
| 3 | Sajid Razvi | Executive Engineer, Small Dam, Chakwal |
| 4 | Ijaz ul Hassan Kashif | Executive Engineer, Small Dam, Islamabad |
| 5 | Rana Muhammad Afzal Naseem | Sub Divisional Officer, Machinery Division, Multan |
| 6 | Muhammad Afzal | Sub Divisional Officer, Chakwal Sub Division |

Table : Source I & P department

d. The contractor along with the heavy machinery of the Department was deputed at site to face any eventually. The Detail of Departmental & contractual machinery is as follows:

| Name of Machinery | Quantity |
|---------------------------|----------|
| Front End Loader | 4 |
| Dumper | 21 |
| Tractor with Jack Trolley | 18 |
| Front blade Tractor | 4 |
| Water Bouzer | 1 |
| Excavator | 3 |
| Buldozer | 3 |

Table : Source: I & P Department⁸³

e. ***Ring Bund:*** According to the Secretary I & P⁸⁴ cost of closing breach of RD 32-40 of LMB Taunsa Barrage through a Ring Bund is **Rs 206.36 million** including contingency @ 1% (2.04 million). This activity was carried out by Head PMO Barrages, Punjab. Expected payment to the Third Party Monitoring (TPM) Consultant

⁸³ Ex IW-6/1 (Appendix-11 page 1044)⁸⁴ Mark 125

as reported by them comes out to be **Rs 1.0 million**. The Secretary submitted that this arrangement will be made out of normal M & R grant separately by the C.E., Lahore for the consultancy services of the aforementioned work.

5. POSITION OF HEAD PMO FOR PUNJAB BARRAGES⁸⁵:

5.1. During recent super flood 2010, River Indus at Taunsa Barrage raised from normal state of flow to low, medium, high, very high and exceptionally high floods as follows:

| Date | Discharge | Flood Category |
|-----------------|-------------------------|--------------------|
| July 28, 2010 | 270,441 | Low Flood |
| July 29, 2010 | 384,889 | Medium Flood |
| July 30, 2010 | 377,889 | Medium Flood |
| July 31, 2010 | 595,796 | High Flood |
| August 01, 2010 | 768,804 | Very High |
| August 02, 2010 | 1,085,000 ⁸⁶ | Exceptionally High |
| August 03, 2010 | 934,116 | Exceptionally High |
| August 04, 2010 | 790,021 | Very High |
| August 05, 2010 | 743,466 | Very High |
| August 06, 2010 | 692,981 | Very High |
| August 07, 2010 | 614,418 | High |
| August 08, 2010 | 580,013 | High |
| August 09, 2010 | 572,154 | High |

5.1.1. On receipt of information of torrential rainfall in the catchment area, the field staff was directed to be alert to handle the expected flood as per Flood Fighting Plan. The higher officers of I & P Department, District Administration and Public Representatives were informed accordingly.

5.1.2. **Flood fighting camps established at vulnerable reaches were equipped with materials during July 29, 2010 to August 02, 2010⁸⁷**. Protective works were taken in hand on July 29, 2010, on all left and right side training works.

⁸⁵ Ex I.W.7/3

⁸⁶ Incorrect- only a discharge of 9,59,991 Cfs passed through the Barrage and alleged discharge of 1,25,000 Cfs through the breach at LMB. Design capacity of Taunsa Barrage is 1.1 million Cfs.

⁸⁷ Emphasis supplied.

5.1.3. Head PMO and Director Technical reached Taunsa Barrage on July 29, 2010. Head PMO asked the following officers of I & P Department to reach Taunsa Barrage for flood emergency duty.

Regular Staff

| Sr. # | Name of Officer / Officials | Designation | Place of Duty |
|-------|------------------------------------|--|--|
| 1 | Ghulam Hussain Qadri ⁸⁸ | Head/PD, PMO Barrages | Taunsa Barrage |
| 2 | Rao Muhammad Riaz | Director Technical Taunsa | Taunsa Barrage |
| 3 | Ijaz-ul-Hassan Kashif | Executive Engineer | Shahwala Groyne and LMB RD 80-134+500 |
| 4 | Muhammad Munir Anjum | Sub Divisional Officer | Upstream Right side of Taunsa Barrage |
| 5 | Rana Muhammad Afzal Naseem | Sub Divisional Officer | Left Marginal Bund of Taunsa Barrage |
| 6 | Muhammad Afzal | Sub Divisional Officer | Left Marginal Bund of Taunsa Barrage |
| 7 | Tariq Aziz | Sub Divisional Officer | Shahwala Groyne LMB RD 80-134+500 |
| 8 | Muhammad Saleem Bhatti | Sub Engineer LMB-I Section | LMB (RD 8-80) + allied spurs |
| 9 | Ghulam Akbar | Sub Engineer H/Works | Barrage Site |
| 10 | Inayat Ullah Shah | Sub Engineer Hydraulics | Spur on D/S left side |
| 11 | Saeed Ahmad | Sub Engineer Mechanical | Barrage Site |
| 12 | Ghulam Shabeer Bhatti | Sub Engineer Lind Defence Section | Link Bund and Spur on U/S & D/S right of barrage |
| 13 | Muhammad Ajmal | Sub Engineer LMB-II Section | Shahwala Groyne + LMB- II (RD 80-134) |
| 14 | Muhammad Hafeez Leghari | Sub Engineer Tarkhana Section | During Flood on LMB + TP Link Canal |
| 15 | Zafar Javed | Sub Engineer Muhammad Wala Section | During Flood on LMB + TP Link Canal |
| 16. | Muhammad Farood | Sub Engineer Lashari Section | Right side river training works |

⁸⁸ Head PMO has mentioned his name also.

Staff especially Deputed

| Sr. # | Name of Officer / Officials | Designation | Place of Duty |
|-------|-----------------------------|---|--|
| 1 | Inayat Ullah Cheema | Superintending Engineer | Left Marginal Bund of Taunsa Barrage |
| 2 | Khalid Hussain Qureshi | Superintending Engineer | Headworks, Regulation and Supervision of Restoration works |
| 3 | Sajid Hussain Rizvi | Executive Engineer | Headworks & Regulation |
| 4 | Amjad Saeed | Ex-Director Technical | Upstream Right side of Taunsa Barrage |
| 5 | Shahid Saleem Ch. | Deputy Director Procurement, PMO Barrages | Upstream right side of Taunsa Barrage |
| 6 | Shafiq Ali | Deputy Director Electrical, PMO-Barrages | Upstream right side of Taunsa Barrage |
| 7 | Muhammad Aslam Randhawa | Deputy Director Mechanical, PMO Barrages | Upstream right side of Taunsa Barrage |
| 8 | Sajid Iftikhar | Design Engineer, PMO-Barrages | Upstream right side of Taunsa Barrage |

5.1.4. On August 01, 2010 Spur No.5 located on right bank came under direct hit of River Indus. Head PMO visited the site and allowed to engage resourceful contractor for protection of Spur No.5.

5.1.5. Secretary, Irrigation & Power Department reached Taunsa Barrage on August 01, 2010. Head PMO supervised the flood fighting operation on the training works.

5.1.6. LMB breached at **RD 32-33 at about 04:00 PM on August 02, 2010** due to 10.85 lac cfs discharge approaching the site which was one in 1000 years flood.

5.1.7. Sanawan Flood Bund overtopped / breached at many sites. **The people also made many cuts on Sanawan Bund⁸⁹.**

5.1.8. TP Link Canal at RD 9-10/L, RD 15-16/R, 19/L, RD 23/L, RD 28-29/L, RD 35-36/L, RD 51/R and RD 176-177/R breached on August 03, 2010 due to hitting of more than 1.25 lac Cfs discharge from breach at RD 32-33 of LMB.

5.1.9. Spur No.1 on U/S right side of Taunsa Barrage came under severe river attack on August 04, 2010. Spur no.1-A on U/S right side of Taunsa Barrage came under river attack on August 06, 2010 which were saved by the Department through tremendous flood fighting efforts.

⁸⁹ Emphasis supplied.

5.1.10. Spur No.2-A on U/S right side of Taunsa Barrage came under severe river attack on August 09, 2010, its head portion was damaged but at every inch flood fighting had to be done to slow down the rate of erosion to minimum possible extent. The spur was saved along with loop bund.

5.1.11. Two relief cuts at RD 4-5 (common bank of TP Link and Muzaffargarh Canals) and RD 4-5/R Muzaffagrah canal were made by I & P Department ordered by Head PMO-Barrages on August 12, 2010 with the help of Army authorities headed by Col. Kamran of Army unit to give relief to District Muzaffargarh as far as possible. Up to [25,000 cfs](#) water was diverted to the river by this cut.

5.1.12. Spur No.T-2 on U/S right side and Spur No.1 D/S left side of Taunsa Barrage came under river attack on August 17, 2010 and were saved by the Department through hectic flood fighting efforts.

5.1.13. Spur Bait Qaim Wala D/S left side Taunsa Barrage came under action on August 19, 2010.

5.1.14. The river then subsided. Operation for closing of LMB was immediately started on August 05, 2010 when discharge in the river was [7,43,000 cfs](#) i.e., exceptionally high flood. The breach was closed on August 24, 2010. Immediate start of closing of the breach provided tremendous relief to District Muzaffargarh because as the new embankment was advanced into the river the discharge through the breach went on reducing and within 10 days the discharge through the breach came down to 1/5th of the original discharge which was [1,25,000 cfs](#).

6. CAUSES OF BREACH

6.1. The Tribunal after considering the complaints, the evidence on the record, reports of the local commissions, local politicians and field survey proposes to discuss the breaches in the following manner:

1. PRE FLOOD PREPAREDNESS
2. FLOOD FORECASTING
3. FLOOD FIGHTING
4. TECHNICAL CAUSE OF BREACH
5. POLITICAL INTERVENTION
6. ENCROACHMENT OF POND AREA
7. ROLE OF PMO

7. PRE FLOOD PREPAREDNESS

7.1. According to the Flood Fighting Plan, 2010⁹⁰ of Tausna Barrage emergencies and disasters can be experienced by any infrastructure anywhere, anytime and it is therefore essential to have an emergency preparedness plan available to start corrective/supportive works immediately on occurrence, forestalling uncertainties and indecision to minimize the damaging effects of an emergency and to avoid irreparable losses through catastrophes generated by uncontrolled emergencies.

7.2. According to para 7.1 of the **Flood Fighting Plan, 2010**, flood watching material should be arranged in ample quantities. Particular care should be taken to ensure that adequate quantity of the required material is distributed and placed at all the watching huts especially at all critical sites. It further provides that Sub Engineers should inspect all the bunds under his charge. **They should walk along the river side, the toes of the bund on both side and locate the rat or porcupine holes on the slope and get these opened, refilled and compacted in his presence⁹¹.** (*emphasis supplied*)

7.3. **For flood bunds in the 2nd defence line the same pre-flood arrangements shall continue throughout the flood season⁹².** (*emphasis supplied*)

7.4. Similarly Sub Divisional Officer should inspect all the vulnerable reaches of the bunds and act in similar way. Executive Engineer is also expected to see certain reaches of the bunds to ensure that no rat/porcupine hole is left un-attended. The Sub Divisional Officers should personally check that:-

7.4.15 All lamps, patromax, actuator and torches, kassies and baskets etc. are in good working condition and lightening arrangements at important points of the Head works and at vulnerable reaches of the bunds are satisfactory.

7.4.16. Adequate arrangements are made for communication of urgent messages from any part of the bund or spur to the Executive Engineer in case of any emergency. If there is no telephonic, telegraphic or wireless link, special messenger should be kept ready at all time for this purpose. All members of the staff must keep their mobile phone open 24 hours.

7.4.17. All the watching establishment should be properly trained. **Dry rehearsals for flood fighting by the end of June should be carried out⁹³** and any shortcoming noticed should immediately be got rectified. It will be seen by the Senior Officer also. (*emphasis supplied*)

7.5. During pre-flood period, the watching staff should be engaged on the following works:-

⁹⁰ Ex.I.W.7/3

⁹¹ Emphasis supplied.

⁹² ibid

⁹³ ibid.

7.5.18. All jungle growth from the outer and inner toe of all bunds up to five feet width should be cleared.

7.5.19. Rats / porcupines, and other burrowing animals should be killed. Their holes after opening and puddling them thoroughly, should be closed.

7.5.20. Gul-Abassi should be grown in a width of 10 ft along the slope of the bunds for protection against wave wash action etc.

7.5.21. Repairing of temporary watching huts be done.

7.5.22. Any other work which is deemed necessary. In case of bunds of 1st Defence line, rolls of pilchi or “dib” will also be necessary in certain reaches. These rolls should be arranged and placed on the slopes of earthen embankments as per past year's experience to guard against wave wash. This work will however, be got done through extra labour i.e., other than pre-flood staff.

7.5.23. **Temporary watching huts are to be constructed for storing flood fighting material⁹⁴** and are normally to be located at the following important sites, if required:- *(emphasis supplied)*

| On Up-Stream left side works ⁹⁵ | |
|--|--|
| i) | Left Marginal Bunds At R.D. 5000, 11350, 15000, 19200, 26000, 32000, 40000, 47000, 55000, 65000, 75000, 79000, 85000, 92000 100000, 110000, 120000, 130000 = 18 Nos. |
| ii) | Sanawan Bund At R.D. 6000 and 15800 |
| iii) | Tibba Tie Bund At R.D. 4500 |

Figure : Location of temporary watching huts-source I & P Department

7.6. Pre flood arrangements for exceptionally high flood limits require 10 men per mile per shift for three shifts to be employed. **In addition, 500 additional “Razakaars” shall also be requisitioned from the Civil Authorities to cater to any emergency⁹⁶.** *(emphasis supplied)*

7.7. **In case where it is difficult to get labour at the time of high discharge, it will be arranged through the civil authorities⁹⁷.** The provision for this already exists in the District flood protection schemes of District Muzaffargarh. It is advisable to keep tractor with blades /trolleys and dozers as stand by for use in emergency during very high flood. *(emphasis supplied)*

⁹⁴ ibid.

⁹⁵ Ex.I.W.7/3

⁹⁶ ibid.

⁹⁷ ibid.

7.8. According to para 7.13 in case of extreme emergency, on request by Executive Engineer, the District Coordination Officer Muzaffargarh will be required to call the Army for immediate help and rescue. **It is also appropriate to ask for 100 Army men to station at the Barrage as and when discharge exceeds 7.5 lac cfs⁹⁸. (emphasis supplied)**

7.9. According to paragraph 8, inhabitants of the riverine area leave their houses and take shelter at the flood bunds along with their animals. This practice needs to be curbed as it creates law and order situation.

7.10. INQUIRY & FINDINGS

7.11. ***Flood Fighting Plan, 2010 & the Guidelines***⁹⁹: In addition to the instructions given in the Guidelines discussed above (Jinnah Barrage) the following pre flood preparation never took place as prescribed under the Flood Fighting Plan, 2010:

- flood watching material should be arranged in ample quantities.
- Particular care should be taken to ensure that adequate quantity of the required material is distributed and placed at all the watching huts.
- Sub Engineers should walk along the river side, the toes of the bund on both side and locate the rat or porcupine holes on the slope and get these opened, refilled and compacted in his presence.
- For flood bunds in the 2nd defence line the same pre-flood arrangements shall continue throughout the flood season.
- Dry rehearsals for flood fighting by the end of June should be carried out.
- Temporary watching huts were to be constructed for storing flood fighting material.
- In addition, 500 additional “Razakaars” shall also be requisitioned from the Civil Authorities to cater to any emergency
- In case where it is difficult to get labour at the time of high discharge, it will be arranged through the civil authorities
- It is also appropriate to ask for 100 Army men to station at the Barrage as and when discharge exceeds 7.5 lac cfs

7.12. The submissions made by the Secretary I & P as well as Head PMO lay emphasis on the steps taken on 29th July, 2010 onwards. The main concern and focus of this investigation is to check whether the Barrage Regulations and Flood Fighting Plans were duly followed and a proper pre flood preparation made. It matters less to this Tribunal how hurriedly, over zealously and extra efficiently the senior management reacted once the flood was on their head. Our concern is with the functionality of the systems set up by the institution and not with one off last minute individuals efforts, no matter how heroic and fruitful they were.

7.13. ***No pre-flood inspection report:*** The joint inspection report of flood embankments and river training works of Taunsa Barrage Division placed on the record vide letter dated

⁹⁸ ibid.

⁹⁹ Guidelines for Flood Preparedness/ Works during Flood Season, 2000 dated 10-3-2000 (Ex.I.W. 6/3)

18.03.2010¹⁰⁰ pertains to Shahwal Groyne (upstream Taunsa Barrage). There is no pre-inspection report relating to LMB. The only joint team comprising of the Army Officer and Executive Engineer inspected only Shahwal Groyne on 18-3-2010 and not the Taunsa Headworks. Letter dated 07.06.2010 is simply a compliance letter of the earlier inspection note pertaining to Shahwal Groyne. Head PMO¹⁰¹ deposed: "...pre inspection has to take place in the month of March every year, which is to be done by one S.E. and 1 or 2 XENs of another zone, however, no such pre flood inspection took place at Taunsa this year [2010]." (emphasis supplied)

7.14. Director Technical, PMO inspected the barrage five times before flood i.e, on May 27, June 11, June 22, July 6 – 7 and July 21-23, 2010. However, according to his note dated July 23, 2010,⁹⁸ he alongwith Executive Engineer, Taunsa Barrage Division, Kot Addu carried out the inspection of the Training Works as well as seepage drains on 22.07.2010. The general observations recorded during the inspection are as under:

TAUNSA BARRAGE SEEPAGE DRAIN.

The drain which has recently been re-aligned and rehabilitated to meet with the optimum performance but it was found that the drain has been blocked at some locations. The undersigned has directed to clear the blocked sites by employing work charge establishments at the earliest so that the drain may run at its maximum capacity to ensure relief to inhabitants of the area.

BARRAGE GATES

The undersigned inspected the barrage gates and found that the weir gates No.22,31-35, 37, 39, 41, 60, 63 are behaving malfunction. Sub Engineer (Mechanical) is directed to assess the missing parts of the gates and replace them immediately to ensure smooth operation of said gates.

INSPECTION OF LMB

The undersigned inspected the Left Marginal Bund, the condition of the embankment has been found satisfactory. The spill water touches the LMB from RD 28-70 and no serious threat reveals in this particular reach. The battery of spurs T-I, T-II, T-III and hockey spur off-takes from LMB at RD's 11350, 15000, 19200 and 26000. The slopes of hockey spur at RD 26000 found badly damaged due to wave wash action and require immediate attention. The undersigned directed to launch killa bushing and tree branches as temporary remedial measures, so that further advancement of erosion may be stopped.

7.15. The Inspection by Director Technical, PMO, does not pass for the pre-flood inspection provided under the Flood Fighting Plan. No departmental committee was constituted to carry out a joint pre-flood inspection with the civil administration and the army as provided above in the Guidelines for Flood Preparedness/ Works during Flood Season, 2000 dated 10-3-2000¹⁰². The so-called pre flood inspection carried out by the Director Technical, PMO Barrages is not provided under the Regulation. I & P Department and the PMO never conducted a pre-flood inspection and the above write up given by the Head PMO is to

¹⁰⁰ Ex I.W. 7/3

¹⁰¹ I.W.7

¹⁰² Ex I.W. 6/3

mislead the Tribunal. The PMO has tried to cover up the absence of pre flood inspection by presenting the inspection note of the Director Technical, who is part of the secretariat of the PMO, and has no role under the regulation in the management of the Barrage in the presence of the XEN. PMO is to work with the existing field formation of the Barrage (headed by the XEN) when it comes to management of the Barrage and not with the officers of the PMO who are there to assist the PMO in the Rehabilitation Project and form part of his secretariat. The date of the alleged pre-inspection of the LMB has also been intentionally withheld. Was it before the Flood Season as it should be ? There is nothing on the record to show the follow up of the above note. The malfunctioning of the weir gates and the “badly damaged” spurs have been mentioned but it is not clear if the same were rectified. No information regarding this has been provided to the Tribunal.

7.16. It is stated by the Head PMO that he himself inspected the Barrage on July 06, 2010, the Inspection Note¹⁰³ dated July 08, 2010 reads as follows:-

“Inspection Note dated July 06, 2010 by Head PMO-Barrages

Taunsa barrage was inspected in company of the Director Technical and Executive Engineer, Taunsa Barrage Division. It was found that the weir, sub-weir and the hoisting system is in excellent condition. Executive Engineer was directed to keep a watch personally on pitching of the guide bunds. In case of displacements, it should be repaired immediately. Left and right side training works were inspected and found in satisfactory condition. The Executive Engineer informed that 25.05 lac cft reserve stone is available against 35.37 Lac cft limit. He was directed to procure the balance quantity as early as possible. He was also directed to make flood fighting arrangement as per flood fighting plan. Director Technical is requested to ensure compliance.”

7.17. It is surprising to note that without any field inspection the Head PMO has reported that left and right side training works were found satisfactory. He also directed to make a flood fighting arrangement as per flood fighting plan and pointed out the shortage of reserve stone. There is nothing on the record to show that compliance of the said direction was carried out. The said inspection note is contradictory to the statement of Head PMO, who stated that he visited the Barrage for the first time on 30th July 2010. It is also surprising that the issues raised in the notes of the Director Technical prior to 6-7-2010 (above) did not find mention in the inspection note of Head PMO.

7.18. Mr Muneer Anjum, XEN, deposed that “ I carried out physical pre-flood inspection of LMB by walking through the entire length of LMB alongside toe of the riverside which took almost one-week. I did this physical pre-flood inspection in the month May, 2010. No hole was reported by me in the entire length of LMB while I inspected river side of LMB¹⁰⁴.” It is strange that after carrying out such a laborious exercise of walking on foot alongside the entire LMB, he failed to submit a written report. Even otherwise, under the Flood Fighting

¹⁰³ Ex I.W. 7/4

¹⁰⁴ I.W.105

Plan, it was the Sub Engineer who was supposed to perform this task. The statement of the XEN does not inspire confidence and has persuaded us to draw a negative inference against the XEN, who is supposedly the best of the lot¹⁰⁵ and therefore was handed over the prize post of XEN at the Barrage.

7.19. There is no report by the SDO or the XEN on the pre inspection of the embankments, in particular the LMB. The embankments as well as the retired bunds (2nd defense line) were not checked during the pre flood preparation.

7.20. No watching huts were set up on the LMB and as a consequence no flood fight material was supplied out in the field. In exceptionally high flood, 10 men per mile are supposed to observe the Barrage to spot possible seepage, leakages or boils. There is nothing on the record that establishes that such labour was actually on the LMB at the time of the breach.

7.21. Nothing has been placed on record that meetings were held with the civil administration or the army during the pre flood season or if any strategic flood management plan was developed.

7.22. *Flood Fighting Material*:-Head PMO submitted in his reply to the questions posed by this Tribunal that ex-Executive Engineer (Mr. Ijaz-ul-Hassan Kashif) informed him that sufficient flood fighting material was purchased last year (2009) which was still lying with the respective Sub-Engineer and therefore there was no need to buy new material. No such letter has been placed on the record, however, the list of material available with the Sub-Engineer has been placed on the record¹⁰⁶, which shows 15 items, however comparison with the flood fighting plan shows that 39 items were required. Therefore reliance of the Head PMO on the alleged statement of Ijaz-ul-Hassan Kashif is incorrect.

7.23. *Pre flood work force arrangement*: According to the record placed before the Tribunal, List of Work Charge Labourers¹⁰⁷ on the LMB (one section i.e., RD-0 to RD-80) was 16, engaged for the morning shift and 16 for the night shift. In addition three Chowkidars were also appointed. Other than the said workers, no list or muster roll has been placed on the record to show that as a part of pre-flood preparation, labourers were duly engaged for flood fighting. No firming up was done with the civil administration or the Army.

7.24. Inayat Ullah Cheema¹⁰⁸, Superintending Engineer¹⁰⁹ in his written statement has stated that arrangements of pre-flood preparedness were very nominal / meager against the requirement of super floods being received at the Barrage

7.25. *Operation & Maintenance*: Statement showing structure wise O&M expenditures

¹⁰⁵ I.W. 6

¹⁰⁶ Ex I.W. 7/4 (Annex-12A)

¹⁰⁷ Ex I.W.7/17

¹⁰⁸ Ex I.W.107/1

¹⁰⁹ Who was member of the team sent in by the Secretary I & P Department at the last hour.

incurred during 2005-2010 on Taunsa Barrage dated 12.08.2010¹¹⁰ reveals that there has been no expenditure on the operation and maintenance of the Tibba Tie Bund, Retired LMB and Sanawan Bund. However, surprisingly, in the year 2009-2010, the statement shows that [Rs.299168/-](#) were spent as an O&M expenditures on Sanawan Bund. Head PMO¹¹¹ submitted: "I admit that Sanawan Bund and Tibba Bund were not maintained. There is no expenditure regarding the maintenance of the same. Only in 2009-2010 [Rs 2,99,168/-](#) were spent on Sanawan Bund just to fix the drain cuts made in the bund, otherwise it is admitted position that there are road crossings in the Bund, as well as water course passing through. In fact it is not an embankment in the present form."

7.26. The Tribunal is curious that an amount of [Rs.299168/-](#) has been shown to have been spent on an abandoned bund that miserably failed to hold the onslaught of the flood that gushed through the breach of the LMB as a second defense line. The PMO also confirms that the said bund was unkempt and practically abandoned.

7.27. The statement of O & M expenditure also shows that regularly since 2005, expenditure is being incurred on the LMB and a total of [Rs.7,371,054/-](#) has been spent over the years. This once again is surprising because in the statement of PMO, as well as, the Secretary, Irrigation & Power Department, LMB was not properly maintained and no wetting channel has been provided. The above statement shows that there has been no allocation for Spur No.5 which according to the PMO fell prey to the recent floods.

7.28. It is most disturbing to note that letter dated 26.07.2010¹¹² bearing No.369-71/30-G(TSA) issued by the Executive Engineer, Taunsa Barrage Division, Kot Addu, in favour of Director Technical (Taunsa). The said letter seeks permission to take up works under para 2.89 during flood 2010. The said letter read as follows:

"The super flood in the River Indus is approaching Taunsa Barrage. Kindly allow me to undertake the following works under Para 2.89 of P.W.D. Code in anticipation of provision of funds and sanction estimates:- (*emphasis supplied*)

| Sr. # | Name of Work | Tentative Cost Rs. Million |
|-------|--|-------------------------------|
| 1 | Protection of Shahwala Groyne and its allied River Training works during flood 2010 | 4.00 |
| 2 | Protection of LMB from RD 80 to 134+500 in Workshop Sub Division during flood 2010 | 2.50 |
| 3 | Protection of LMB from RD 0 to 80 and its allied River Training works in Head Works Sub Division during flood 2010 | 1.50 |
| 4 | Supply of flood fighting materials and providing watching establishment in Workshop Sub Division during flood 2010 | 1.00 |

¹¹⁰ Ex I.W. 7/18

¹¹¹ I.W.7

¹¹² I.W.7/4

| Sr. # | Name of Work | Tentative Cost Rs. Million |
|-------|--|-------------------------------|
| 5 | Supply of flood fighting materials and providing watching establishment in Head Works Sub Division during flood 2010 | 1.00 |
| 6 | Supply of flood fighting materials and providing watching establishment in Bund Sub Division during flood 2010 | 1.00 |

7.29. It is surprising and important to note that on 26.07.2010 when the said letter was issued there was no warning of flood what to say of “super flood” as recorded in the said letter. Secondly, the funds are being sought for the supply of flood fighting materials in the end of July, 2010 when the same should have been done before the flood season. More surprisingly the permission is granted to carry out the above mentioned works under para 2.89 of the PWD Code on the same day i.e., 26.07.2010 vide letter No.188/HPMO/PMO dated 26.07.2010¹¹³.

7.30. Vide another letter No.372-74/30 G¹¹⁴ dated 26.07.2010 approval was sought by the same XEN to call gallup tenders for the above mentioned works as “super floods” were anticipated in the next few days. As pointed out above no such forecast is on the record of the PMD for 26th of July 2010. Approval of the gallup tender was granted by Director Technical (Taunsa) PMO for Punjab Barrages on the same day. The tenders were accepted vide letter dated 30.07.2010 bearing No.30/DT/PMO, tenders of M/s A.M. Associates¹¹⁵ were accepted for protection of LMB from RD 0 to 80 as well as of Malik Brothers¹¹⁶ for supply of flood fighting materials and providing watching establishment in the aforementioned Sub Divisions. No record has been placed before us to show that the said tenders were advertised and the lowest rates offered by S.A. Associates were rightly accepted. The statement as well as record placed before us does not show the quantity of the material supplied for flood fighting. The authenticity of the said letters is doubtful as they refer to the super floods when there was no such indication of “super floods” on 26.07.2010. Further, no embankment protection requirement has been pointed out earlier during the pre flood preparation period.

7.31. The Executive Engineer has also placed on record a Pre-Flood Inspection Report¹¹⁷ of Flood Bunds and River Training Works of Taunsa Barrage dated 23.04.2010 bearing No.234/30G. Perusal of the same reveals that it is about the same joint inspection carried out of Shahwala Groyne in District Layyah and there is no a word regarding LMB at the Taunsa Barrage.

7.32. According to the Report issued by Mr. Muhammad Muneer Anjum, ex-Executive Engineer, Taunsa Barrage Division, Kot Addu dated 28.10.2010¹¹⁸ titled Pre-Flood

¹¹³ Ex I.W. 7/4 (Annex 12B and 12-C)

¹¹⁴ Ex I.W.105/1

¹¹⁵ Ex I.W. 1051/1

¹¹⁶ Ex I.W. 105/1

¹¹⁷ Ex I.W. 105/1

¹¹⁸ Annex-12D - Ex.IW.7/4

arrangements on LMB:-

“As per flood fighting plan, following pre-flood arrangements were made on LMB:

1. A total of fifteen watching huts were established with flood fighting material at RD 11350, 15000, 19200, 26000, 32000, 40000, 47000, 55000, 79000, 85000, 92000, 100000 & 120000.
2. It was ensured that one Sub Divisional Officer alongwith three Sub Engineers (Saleem Bhatti, Hafeez Leghari, Zafar Javed) to check the Bund thoroughly.
3. I myself inspected the Bund many times.
4. On 29-07-2010, due to expectation of exceptionally high flood, additional flood fighting material was arranged under para 2.89 of PWD Code, as no funds were available Additional 150 work charge beldars were employed through contractor. Two excavators, two front end loaders, seven dumpers, twelve tractors with jack trolleys and one water sprinkler were arranged.
5. The establishment and machinery worked day and night to protect the Bund. On 31-07-2010, a boiling opposite RD 34-35 of LMB was observed in Tibba Minor bed, which was controlled by filling earth in the bed of the minor. I inspected the Bund many times also along with Director Technical and Head PMO Barrages and kept the situation completely under control.

7.33. As per statement¹¹⁹ of Mr. Muhammad Muneer Anjum no pre-inspection report has been filed. During our physical inspection of the LMB (till the RD 32) we did not see watching huts or were not shown any watching huts, on the LMB, as claimed by the XEN. In his deposition before the Tribunal the XEN did not mention the setting up of watching huts especially at RD 32000.

7.34. **LMB had to be pitched till RD 40, however, pitching was done till 34+500 and the rest (RD 5.5) was left unpitched with a slope of 2:1. Head PMO admitted that this aspect went unnoticed during pre flood preparation. (emphasis supplied)**

7.35. The Tribunal is of the view that no pre-flood preparedness took place at Taunsa Barrage under the PMO. No pre-flood inspection took place according to the Flood Fighting Plan or the Guidelines. Tribunal has also noticed that the Head PMO and the XEN have tried to mislead the Tribunal by placing on record documents that appear to be fabricated and paint an incorrect picture of compliance of pre flood preparedness. This has seriously undermined the position of the PMO and the XEN and has tarnished the confidence and trust of the Tribunal in the said officers.

7.36. The following documents are prepared at the end of every flood season according to the Flood Fighting Plan, 2010 and are a starting point for any pre flood preparedness. No such material was available with the PMO except the Survey Map.

¹¹⁹ Ex.IW.105/1 (Statement of Muhammad Muneer Anjum, Executive Engineer, Taunsa Barrage Division)

7.36.24. *Survey of Riverine area* (River Survey)¹²⁰ 15 miles upstream and 10 miles downstream of the barrage along the river and high bank or defence bund to high bank across the river should be carried out every year as soon as the river subsides after the floods and must be completed by November¹²¹.

7.36.25. *Annual Headworks Report* is based on preliminary survey of river 15 miles upstream and about 10 miles downstream of the barrage. It carried out soon after the floods and it describes marked changes in the River course that occurred after the last survey, behavior of its major creeks and their likely future effects, other data including statistical record about monsoon, rainfall, River supplies and Canal discharges. River behaviour during the floods i.e. river approach on the upstream and downstream of the barrage action sustained by various training works. This report is prepared by Executive Engineer and submitted to higher authorities by middle of November¹²².

7.36.26. *Annual River Survey Report* should also be completed by November-December every year. Report describes likely effect of changes in river course and contains recommendations for any additional training works so that the same (after necessary approval of estimates etc) may be executed before next flood season. This report be submitted by Executive Engineer to his higher officers by end of December.

7.36.27. *Annual Closure Report* is to be prepared by the Executive Engineer and submitted at the end of each closure period. This report describes the background, detail of various repairs carried out and the method adopted for the same as well as the repairs that could not be carried out but were either planned or approved along with their likely effects.

7.37. **[SIND] BUND MANUAL**¹²³ is enlightening and instructive for the flood manager especially in the context of pre flood preparedness. It is an accepted position that Sind Bund

¹²⁰ I. Examine the new emerging river pattern to study the river approach towards the Barrage and the training / protection works on the basis of Annual Headworks Report.

ii. Observe sounding and probing in all parts of the Barrage and its appurtenances to ascertain extent and nature of damage if any. (S.No.(i) & (ii) will form part of Annual Headworks report).

iii. Chalk out a program for repairs to restore the health of the Barrage to enable it to face the high flows and floods of the next season.

iv. All the above exercise including execution of the works has to be gone through in a very limited period of a few winter months and in any case the Barrage has to be made fit for facing the next high flow period. To meet these objectives in a systematic manner, a number of reports have been prescribed.

¹²¹ Paragraph No.6.4.2.

¹²² Paragraph No.6.4.2 (1).

¹²³ Mark 38- Government of Sind, Public Works Department, Central Designs Division, Mechanical & Research Circle, Karachi Printed at the Sind Government Press 1954. Following the breach in the Sukkur Begari Bund and the consequent floods of 1942, there was constituted by the Sind Government a Court of Inquiry into matters connected with the floods, under the Public Inquiries Act, 1940. There was, also, a Technical Inquiry into the causes of breaches in River Bunds in Sind and steps required to minimize the danger of a recurrence.

The Court of Inquiry remarked that though now regarded as a complete guide in all matters pertaining to the construction and maintenance of bunds, the Bund Manual manifestly required revision. It considered there were doubtless matters in which the Manual can be improved and that it required re-editing and keeping upto date.

3. The recommendation to revise the Bund Manual, made both by the Court of Inquiry and the Technical Inquiry, was accepted by the Indus River Commission at their meeting on 26th October, 1943. They suggested that an officer on Special Duty may be appointed to revise the Bund Manual.

The present edition of the Bund Manual is the result of that decision.

Manual is used as a guidebook by the I & P Department. However, most disappointingly its wisdom has fallen on deaf ears. Some of the important instructions of the Manual, which went unnoticed, are reproduced hereunder:

7.37.28. *Proposals for Wetting Bunds (PARA 28):* Adequate arrangements for soaking are an essential pre-requisite of a safe bund, for the consolidation or compaction of a bund depends on the soaking, which helps settlement and discloses faults which can be made good or leaks which can be filled before the main rise of the river. Therefore, every proposal for a new bund or a loop bund is incomplete without the attendant proposals for sufficient arrangements for early wetting and consolidation of a bund, unless the bund is likely to get automatically soaked with the early levels obtaining in the river on account of low-lying and near the bund on the river side.

7.37.29. In case of existing bunds, too, wherever arrangements do not already exist, proposals should immediately be made for their efficient wetting wherever necessary. The two principal ways of wetting bunds in Sind are:-

- (a) Wetting channels, and
- (b) Flooding of a compartment through a bund sluice in the front bund.

7.37.30. While (a), wetting channels, can be used for soaking both front and loop bunds, method (b) is available only for wetting the loop or retired bund. In other words, while the loop bunds can be wetted by either method, the only arrangement possible for wetting front bunds is by means of wetting channel.

7.37.31. *Wetting channels are of two kinds:-*

7.37.31.1. Gravity channels excavated from the river lip (which is generally higher than the other ground) to the bund along the lowest contours, to lead flow water early against the bund, in advance of the sudden over-topping of the higher ground near the river edge causing a rush of flow against the bund.

7.37.31.2. High level artificial wetting channels, made by adding a trench bund to a main bund (see Chapter IX para.99). In rare cases, it may be possible to get flow water in these channels with the river levels obtaining at the beginning of the season; but generally, water is lifted into the wetting channels by means of pumps. A centrifugal pump worked by a suitable engine is placed on some canal, or special channel from the river and water pumped thence into the wetting channel.

7.37.32. The Indus River Commission have, therefore, enjoined that:- "In all cases of front bunds the river water should be brought to the bunds sufficiently early

through leading channels. Where, in case of important bunds this is not possible wetting trench bunds should be provided¹²⁴.”

7.37.33. *Presence of Maintenance Establishment Required on Bunds (PARA 103):* The principal maintenance of bunds comes during high water when the safety of the bund is threatened. Frequent inspections, particularly in case of new bunds or dangerous sections of old bunds, and constant attendance on the bunds, within their charge, by everybody from the humblest beldar to the Executive Engineer are essential.

7.37.34. Patrolling by beldar commences as soon as water comes against a bund. From that time onwards, until water has finally left the bund, all the establishment engaged on the maintenance of bunds, from the beldar upto the Sub-Divisional Officer, must be present on the bunds within their jurisdiction.^{124-A}

7.37.35. *Unremitting Patrolling During High Abkalani Essential (PARA 105): The first line of defence, when the river is in floods, requires close and constant patrol and unremitting supervision, both by day and night, by adequate, trained staff*¹²⁵. A stitch in time saves nine: timely warning and timely action, which efficient, unremitting patrolling alone can provide, will save a dangerous situation while complacency born of a false sense of security following a series of low rivers, may lead to disaster. Continuous vigilance in patrolling everywhere is, therefore, enjoined on all the staff, particularly during the night and in the early hours of morning when breaches most frequently occur with the slackening of supervision. (*emphasis supplied*)

7.37.36. The temporary headquarters of the Overseer, Sub-Divisional Officer and Executive Engineer should, as far as possible, be in the centre of the active bund line in their charge. Katcha landhis should be constructed for the overseer in the center of his section, if no pucca landhi exists. The Executive Engineer and the Sub-Divisional Officer should, whenever necessary and as far as possible, patrol frequently at night^{125-A}.

7.37.37. *Wetting of Front Bunds and Loop Bunds with Wetting Channels (PARA 110):* The wetting of the bund is an essential process in the maintenance and in the safety of a bund, particularly in the excessively dry climate of Sind. However carefully the bund may have been constructed, with thorough clod-breaking, ramming, and rolling, perfect compaction, so that there will be not cavities or no settlement, however small, cannot be expected, unless the soil is also ideal for bund

¹²⁴ Bund Manual, Government of Sind, Public Works Department, Central Designs Division, Mechanical & Research Circle, Karachi Printed at the Sind Government Press, 1954

^{124-A} Bund Manual, Government of Sind, Public Works Department, Central Designs Division, Mechanical & Research Circle, Karachi Printed at the Sind Government Press, 1954

¹²⁵ *emphasis supplied*

^{125-A} Bund Manual, Government of Sind, Public Works Department, Central Designs Division, Mechanical & Research Circle, Karachi Printed at the Sind Government Press, 1954

construction, since the clayey soils ordinarily met with in Sind are liable to expand and slide when wet and to shrink and crack when dry. The kalarish soils are even more treacherous, leading to hollows in the bund as the salts in the soil dissolve. The conditions to which bunds in Sind are exposed, alternating between excessive and sudden soaking by the river in the flood months and complete dryness during the rest of the year, make the gradual wetting of the bund in advance of the river floods impinging upon a dry and unprepared bund a vital necessity.

7.37.38. The purpose of wetting a bund is to consolidate the bund and render it watertight by enabling leaks to be closed, as the contact of water with the bund during the progress of wetting reveals them, so that they may not develop into breaches¹²⁶. (*emphasis supplied*)

7.37.39. The relative merits of different methods of wetting of bunds have been set out, while dealing with proposals for wetting of bunds (para.29 Chapter IV). During maintenance, whatever artifice is available at hand has to be made use of to the fullest advantage.

7.37.40. A bund has to be wetted throughout its entire length if the wetting is to serve its designed purpose, *since a bund is only as strong as its weakest portion*. The plan for wetting should be carefully thought out so that the wetting of the whole length of bund is completed before the rise of the river.

7.37.41. First of all, water is to be led to the front bund. If the katcha and pucca foreshore on the river side of the bund slopes towards the bund, all that may be necessary is to give cuts to the lip at the river edge, which is generally somewhat higher. If there is low-lying land near the bund on the river side but there is high land between the river and the bund, low level gravity channels have to be constructed along the lowest contours from the high river edge to the bund. If wetting by flow water is not possible, sufficiently in advance of the rise of the river, artificial wetting is possible by lifting water into previously constructed wetting channels (see Chapter IV para.28) by means of pumps; a centrifugal pump worked by a suitable oil engine is placed on some canal or special channel from the river and water pumped into the wetting channel. About 1 cusec per mile of wetting channel is required and more while the bund is new.

7.37.42. Wetting engines should begin to operate about the beginning of May or in sufficient time to enable the water to get to the end of the reach concerned before the water touches the bund and not later than the end of May. As, however, the canals are not generally opened till the beginning of May, in the case of water being taken from a canal, a pipe of sufficient capacity in the bunds, at the heads of the canals, will be required and/or a trench about 3 or 4 feet wide in the center of the canal, with bed level corresponding to suitable river level.

¹²⁶ emphasis supplied

7.37.43. At any rate, pumping should be commenced as soon as water can be obtained from canals or through connecting channels from the river so that the bund may be soaked gradually and the establishment may have sufficient time to consolidate the surface of the slopes of the main and trenching bunds by sprinkling or splashing water over them and also to close any leaks which may develop. As there may be a considerable depth of water in the trench and as it is constructed in made-earth, leaks from the slopes or from the bed are likely to occur. Unless there is some arrangement to arrest it, the whole of the water contained in the trench may then be washed down through the leak and cause much damage. The wetting channel should therefore be provided with temporary bundas at short intervals, say every two furlongs or less, so that if a big leak occurs and the establishment is unable to detect or close it at once while the pumping engine is working, the water in the channel can be held up at the bunda next above the site of the leak. After water is held up at the bunda, the leak can be properly opened and repaired.

7.37.44. The pumps should work throughout the period of rising river. The ideal condition would be that the water level in the trench should always be about 1 foot higher than river water level against the bund while the river is rising and the bund must be wetted artificially at least 6 inches higher than the D.H.F.L. to meet any possible rise in the D.H.F.L. Gauges are provided in the wetting channel opposite every gauge in the front line, with their zeroes at 4 $\frac{1}{2}$ feet below D.H.F.L. (vide para. 48)^{126-A}

7.38. CONCLUSION

7.39. There was no pre flood arrangement in place at Taunsa Barrage. No pre flood inspection as per Regulation and Guideline took place. Pre flood inspection should have identified RD 32-RD 40 along which Tibba Minor runs to be a sensitive area. *A bund is only as strong as its weakest portion.* Special watching hut should have been set up there with proper watching staff. All these strategies would have been possible had the Head PMO, XEN and the SDO took pre flood preparation seriously. On the other hand the head PMO and the XEN has come up with a position which appears to be a cock and bull story on how diligently and carefully they carried out pre flood preparation. The information supplied by them appears to be concocted and does not inspire confidence. It is also noticed that documents including maps and surveys which are to be prepared annually after every flood season were not prepared. The Head PMO and his field formation practically slept through the flood season. The wisdom given in Sind Bund Manual goes unread and untouched.

^{126-A} Bund Manual, Government of Sind, Public Works Department, Central Designs Division, Mechanical & Research Circle, Karachi Printed at the Sind Government Press, 1954

8. FLOOD FORECASTING

8.1. Flood Forecasting has been discussed in detail in the earlier chapter.

8.2. In the context of Taunsa Barrage, I & P department was informed on 28th July, 2010 and a departmental warning was sent out on 29th July, 2010. The flood manager at Taunsa Barrage therefore had ample time to get prepared to combat the exceptional flood heading their way.

8.3. There is no doubt that PMD should have sent coloured alerts on 24th of July, 2010 leading to a more quantitative forecast by 26th July, 2010 had there been QPM radar available covering the upper catchment of Indus and PMD had the capacity to generate hydro-meteorological forecast more efficiently and timely.

8.4. Role of FWC is most disappointing. In case of Taunsa Barrage, FWC issued its first forecast on 2-8-2010 at 0900 hrs.

At Taunsa Barrage

| Sr. No. | Location | Flood level | Discharge | Date | Time | Rising/ Falling. |
|---------|----------------|--------------------------|------------|------------|------------|------------------|
| 1. | Taunsa Barrage | Exceptionally high flood | 841399 Cfs | 2.8.2010 | 0900 hours | Rising |
| 2. | Taunsa Barrage | High flood | 608205 Cfs | 10.8.2010 | 0600 hours | Falling |
| 3. | Taunsa Barrage | Very high flood | 652017 Cfs | 10.08.2010 | 1600 hours | Rising |

9. FLOOD FIGHTING

9.1. *Regulation:* According to the [Operation and Maintenance Manual for Taunsa Barrage \(November, 2007\)](#)¹²⁷ prepared under Taunsa Barrage, Emergency Rehabilitation & Modernization Project provides that the pond level should generally be kept at the lowest needed. When warning of flood exceeding 450,000Cfs discharge is received from Chashma or Kalabagh, the pond on upstream should be lowered gradually in advance by about 2 feet to accommodate impact of high flood discharge. Various categories of flood should better be passed on the following levels:

Low flood (250,000 to 375,000 Cusecs) at existing pond level.

Medium flood (375,000 to 500,000 Cusecs) at a reduced level of RL 444.00 (Canal Closed)

High flood (over 500,000 Cusecs) at a pond level up to RL 447.00 (Canal closed)

¹²⁷ Ex I.W. 7/5

9.2. The above Manual further provides that it is not possible that the Pond Level on the upstream of the entire barrage can be kept at the same level. Due to presence of very active eddies and cross currents, the Pond Levels upstream in the right pocket and the left pocket may differ considerably. Therefore, the gauge and Pond Level on the left flank is considered as representative/reference gauge of the pond for all practical purposes¹²⁸.

9.3. Operation and Maintenance Manual states that the XEN Taunsa Barrage Division is the officer in overall control of the barrage. SDO Headworks is the officer in direct control of the Headworks. He shall be responsible inter-alia to issue flood warnings to all concerned. To immediately communicate with the XEN regarding high flood discharge and all events of significant importance like any damage to Headworks, etc. He will not be away from Headquarters during high flood season from July to September, both months inclusive without written permission of the XEN; to stay at all time at the Headworks and to arrange regulation of the barrage and regulators gates under his direct supervision as and when flood discharge is in the high flood or higher limits and to continue till the flood drops below the aforesaid limit. Sub Engineer Headworks is the official incharge of day-to-day management of Headworks and shall work under the SDO Headworks. Other officials at the barrage are Sub Engineer Hydraulic, Sub Engineer Mechanical, Head Jamadar, Naib Jamadar, Head boatman, Headworks Mistrī¹³⁰.

9.4. The Manual further provides that on the left side a double system of bunds exists. The left marginal bund (27 miles long) has a much longer system of second defense line bunds at some distance on the countryside to act as second defense. However, the second defense line if not kept under proper vigilance (neglected) can prove to be a false line of safety¹³¹.

9.5. The Manual also indicates high risk exposure areas when it states: Resultantly, seepage from any breach in left side embankment moves on to river Chenab damaging all the infrastructure (public and private) like canals, drains, roads, rail roads rehabilitation and all crops on the way. The structures suffering heavy damages are: Muzaffargarh canal and its system, T.P. Link canal, all roads from Taunsa Barrage to Alipur, the rail roads and allied structures of D.G. Khan, Kot Adu and Layyah Muzaffargarh railway lines, towns of Kot Adu, Muzaffargarh and Mehmood Kot and all village abadies except those located in high mounds¹³².

9.6. This is the area where dedicated and dynamic relief efforts will be required in full. **These losses can be avoided if the instructions contained in the “Flood Fighting Protection / Watching Plan” for protection of flood bunds are implemented in letter and spirit both on LMB and the second defence line system¹³³.**

¹²⁸ Volume.1 Main Text para 3.5 of the Operation and Maintenance Manual for Taunsa Barrage, 2007. (Ex I.W. 7/5)

¹²⁹ Operation and Maintenance Manual for Taunsa Barrage (November, 2007) (Ex I.W. 7/5)

¹³⁰ According to Operation and Maintenance Manual for Taunsa Barrage Volume.1 November, 2007. (Ex I.W. 7/5)

¹³¹ Emergency Preparedness Plan Appendix 9, Operation and Maintenance Manual for Taunsa Barrage.

¹³² Emergency Preparedness Plan Appendix 9, Operation and Maintenance Manual for Taunsa Barrage.

¹³³ Ex I.W. 7/6/2

9.7. In the epilogue to the emergency preparedness plan, it is stated: “**however, one thing should always be remembered that the plans how so ever good become useless if not followed properly and sincerely**¹³⁴.**”** It is hoped that this plan will be followed in letter and spirit¹³⁵.

9.8. It is mandatory according to this Manual that no Subordinate Staff is allowed to alter or deviate from these principles without the prior written approval of the Executive Engineer Incharge.

9.9. Executive Engineer, Taunsa Barrage Division is the Officer Incharge for the overall control of flood watching arrangement. The Sub Divisional Officers, Headworks Sub Division, Bund Sub Division, Workshop Sub Division and other subordinate staff of the three Sub Divisions, have to work under his guidance and instructions. They are primarily responsible for the flood fighting protective and preventive measures for the safety of the structure.

9.10. *INQUIRY & FINDINGS*

9.11. According to Mr. Muhammad Munir Anjum¹³⁶, XEN, Taunsa Barrage; “the contractor for the labour force for LMB was Malik Brothers who were directed to arrange 300 labourers while the contractor for Machinery for LMB was A.M. Associates. I directed them to arrange 2 Loaders, One Bulldozers, one Excavator, seven Dumpers and 12 Trolleys. 150 labourers were deployed on the LMB on 31.07.2010 and the above machinery was also deployed on the 31st July, 2010.” He continued to submit: “I visited Abbas Wala on the LMB alongwith Head PMO Barrages in the evening of 31.07.2010. The reason for the visit was that Mr. Muhammad Saleem Bhatti, Sub-Engineer informed us over telephone that there was **seepage in Tibba Minor at RD 35 – 36**. We immediately deployed workers, as well as, **Machinery and filled the Tibba Minor with earth and the boiling / seepage was contained in front of us**¹³⁷.**”** (*emphasis supplied*)

9.12. “Ch. Muhammad Afzal, Sub Divisional Officer was visiting Taunsa Barrage because his family resides in the vicinity. I requested Head PMO to appoint Mr. Afzal on the LMB as we were short on staff. **He reported some boiling in Tibba Minor at RD 32 – 33** to Mr. Kashif, the new Executive Engineer, at 03:00 p.m. on 2.8.2010. On 2.8.2010 (at about 03:30) the breach on LMB took place”¹³⁸.

9.13. “On 28th and 29th of July, 2010 I being XEN **lowered the pond level from RL 447 to RL 446 in order to wash away the silt deposit in front of barrage**. I was following the rules and regulations for the Maintenance, Working and Operation of Taunsa Barrage, however, I did not follow the latest manual of Taunsa Barrage issued by Punjab Barrages Consultants in

¹³⁴ Ex I.W. 7/6/2

¹³⁵ Emergency Preparedness Plan Appendix 9, Operation and Maintenance Manual for Taunsa Barrage. Ex I.W. 7/6/2

¹³⁶ I.W.105

¹³⁷ I.W.105

¹³⁸ I.W.105

November 2007”¹³⁹.

9.14. According to Ch. Muhammad Afzal, SDO, “I reached Taunsa Barrage at midnight on 31.07.2010. Immediately, I visited LMB at RD 34-35. Mr. Muhammad Saleem Bhatti, Sub-Engineer alongwith other staff was present. Boiling had been spotted at RD 34-35, which were closed on 1.8.2010. On 2.8.2010 another boiling was discovered at RD 33-34, which was also closed. At 03:45 p.m. on 2.8.2010 I noticed a small boil in Tibba Minor at RD 32. In no time this boiling turned into a spring and within 10 minutes the breach took place and the embankment collapsed at RD-32. In my professional opinion it was a foundational failure because there was old river creek on which the LMB has been constructed and this could have been the reason for the collapse¹⁴⁰.”

9.15. According to the Head PMO all training works came under unprecedeted severe river attack including Spurt No.5. It is however pointed out that inspite of flood fighting at Spur No.5, PMO ensured the constitution of dedicated teams to be deputed on the LMB, right side training works and Shahwala Groyne

9.16. According to the written statement filed by Mr. Ijaz ul Hassan Kashif¹⁴¹, Executive Engineer, Small Dams Division, Islamabad he was looking after the condition of Shahwala Groyne and he remained their for watching till noon of 03.08.2010.

9.17. Head PMO admitted in his statement before the Tribunal that “As per regulation 3.4 (Pond Level Limits) of the Operation and Maintenance Manual for Taunsa Barrage the Pond Level was not actually reduced by about 2 ft to accommodate the flow of high discharge when the warning of flood exceeding 4,50,000 Cusecs discharge was received from Chashma and Kalabagh.” He further deposed that on reaching Taunsa Barrage on 31-7-2010 he found out that the Pond Level was 446.20 and he decided to maintain the same. This according to him was necessary to reduce pressure on the training works. The Pond Level was gradually reduced to RL 444.00 on August 05, 2010 and to RL 443.00 on August 06, 2010 to give as much relief as possible to breach site RD 32 – 33 of LMB. While Mr. Munir Anjum, XEN deposed that “On 28th and 29th of July, 2010 I being XEN lowered the pond level from RL 447 to 446 in order to wash the silt deposit in front of barrage.” As per record the Pond Level was not reduced as the Regulation provided. It appears that neither the Head PMO nor the XEN had read the Regulations or were aware what to do with the Pond Level.

9.18. The Daily Log Book of Taunsa Barrage paints a different picture. The extract of the Log Book below shows different pond levels than stated by the Head PMO and the XEN. The Log Book shows that the Pond Level on the right side of the Barrage was reduced to RL 440 on 1-8-2010 and was RL 444.4 on 2-8-2010, while the Pond Area of the left side was maintained around RL 446. The Regulation which requires that the Pond Level should be reduced by 2 ft before the flood approaches the Barrage was violated. Pond Level to be

¹³⁹ I.W.105

¹⁴⁰ I.W. 108

¹⁴¹ Ex. IW.106/1 (Statement of Mr. Ijaz ul Hassan Kashif, Executive Engineer, Small Dams Division, Islamabad)

maintained in flood above 500,000 Cfs is RL 447, which was not the case at Taunsa. The Pond Level during the highest peak on 2-8-2010 was 446.20 on the Left Side and 444.4 on the Right Side. Regulation also mandates that the Pond Level upstream must be kept at the same level. Further, XEN deposed that he reduced the pond level on 28th July, 2010- which is not borne out from the Log Book besides there was no flood warning available with the Department on the said date. The inconsistent information of the two most important persons at the Barrage i.e., Head PMO and XEN is most worrying. The credibility of these senior officers as well as the Log Book become suspect and undoubtedly leads to the conclusion that the Barrage was being poorly managed with no strategy or preparedness whatsoever to face the “super floods.”

9.19. Extract of the Daily Log Book of Taunsa Barrage is as follows:

| Sr.# | Date | D/S Discharge at Taunsa | U/S Discharge at Chashma | Pond Level at Taunsa 06:00 a.m. | |
|------|-----------|-------------------------|--------------------------|---------------------------------|--------|
| | | | | Left | Right |
| 1 | | 25.7.2010 | 323749 | 281308 | 447.50 |
| 2 | | 26.7.2010 | 283914 | 281297 | 447.50 |
| 3 | | 27.7.2010 | 256029 | 255736 | 447.50 |
| 4 | | 28.7.2010 | 225570 | 234762 | 447.50 |
| 5 | | 29.7.2010 | 258941 | 507904 | 447.50 |
| 6 | | 30.7.2010 | 288502 | 743548 | 447.50 |
| 7 | | 31.7.2010 | 424391 | 974214 | 447.50 |
| 8 | 01.8.2010 | | 617602 | 1000972 | 446 |
| | | | | | 445.50 |
| | | | | | 446 |
| | | | | | 445 |
| | | | | | 440 |

| Sr.# | Date | D/S Discharge at Taunsa | U/S Discharge at Chashma | Pond Level at Taunsa 06:00 a.m. | |
|------|-----------|-------------------------|--------------------------|---------------------------------|--------|
| | | | | Left | Right |
| 9 | 02.8.2010 | 798601 | 736403 | 446.2 | 444.4 |
| 10 | 03.8.2010 | 767351 | 644476 | 446 | 442 |
| 11 | 04.8.2010 | 790021 | 601038 | 446 | 443.8 |
| 12 | 05.8.2010 | 721494 | 525737 | 444 | 441.60 |
| 13 | 06.8.2010 | 692681 | 468360 | 443.50 | 441.10 |
| 14 | 07.8.2010 | 614418 | 457035 | 443 | 440.6 |

9.20. According to the work charge register placed on the record 16 persons were employed on work charge basis as Baildars from 1st till 31st July 2010 in the morning and similarly 16 in the night duty. No record showing the muster roll for the month of August, 2010 has been placed before us. No mention of the said workers has been made by any of the officers present on the LMB to depose that the said Baildars were present at the time of breach. The statement of Munir Anjum, XEN that “150 labourers were deployed on the LMB on 31.07.2010” is therefore incorrect according to the record and inconsistent with the statement of the head PMO.

9.21. Secretary I & P Department¹⁴² submitted before the Tribunal that “as far as Flood fighting plan in exceptional high flood is concerned 10 persons are required to be deployed every mile, however, I am not aware if 270 people were deployed on the LMB (length 27 miles).”

9.22. According to the Head PMO¹⁴³ there was no machinery available at the Barrage for flood fighting prior to 28.07.2010. The machinery mobilized from the Machinery Circle of

¹⁴² I.W.6

¹⁴³ Mark-82

Development Zone of the Department on 3rd August, 2010 i.e., after the breach of the LMB. The details of machinery procured vide Job Order No.2/49-W/TSA dated 03.08.2010 is as follows:-

| | | |
|-------|------------------|---------|
| (i) | Front End loader | = 2 No. |
| (ii) | Dozer | = 3 No. |
| (iii) | Excavator | = 1 No. |

9.23. While four Dozers were mobilized vide Job Order No.107-09/81-WC/TSA dated 10.08.2010. However, according to the Head PMO, Machinery mobilized from the private contractor namely M/s. AM Associates for LMB RD0-80 on 31.07.2010 and have the following details:-

| | | |
|-------|------------------|---------|
| (i) | Loader | = 1 No. |
| (ii) | Dumper (Truck) | = 4 No. |
| (iii) | Dumper (Trolley) | = 4 No. |
| (iv) | Excavator | = 1 No. |
| (v) | Tractor Trolley | = 1 No. |
| (vi) | Water Sprinkler | = 1 No. |

9.24. For RD 80-134+500, machinery mobilized from the private contractor namely M/s SA Associates on 31.07.2010 details of which are as under:-

| | | |
|-------|------------------|---------|
| (i) | Loader | = 1 No. |
| (ii) | Dumper (Truck) | = 3 No. |
| (iii) | Dumper (Trolley) | = 3 No. |
| (iv) | Excavator | = 1 No |
| (v) | Tractor Trolley | = 1 No. |

9.25. However, it is submitted that Mr. Muhammad Athar Contractor was engaged on 1st of August, 2010 for the right side Spur (Spur 5), who provided the following machinery:-

| | | |
|-------|---------------------------|----------|
| (i) | Loader | = 5 No. |
| (ii) | Dumper (Truck) | = 21 No. |
| (iii) | Excavator | = 5 No. |
| (iv) | Tractor with Jack Trolley | = 16 No. |
| (v) | Water sprinkler | = 2 No. |

9.26. The total cost of the machinery for Job Order No.2/49-W/TSA dated 3.8.2010 is Rs.2.80 Million while for Job Order No.107-09 dated 10.08.2010 is Rs.1.20 Million while the cost of M/s A.M. Associates for LMB is Rs.1.00 Million. [The above shows that no machinery](#)

[was available at the Barrage on 28th till 30th July, 2010](#). The machinery obtained from M/s A.M. Associates (Rs.1 Million) and M/s S.A. Associates (Rs.0.84 Million) on 31.07.2010 was at a total cost of Rs.1.84 million. It is clear that the emphasis of the flood fighting was on spur No.5 on the right side. More machinery was also deployed on that side. The cost of the machinery paid to Mr. Muhammad Athar Contractor is Rs.6.01 Million as opposed to Rs.1.84 million paid to the two contractors supplying machinery at the LMB. It also shows that the machinery mobilized from the Machinery Circle of Development Zone was totally ineffective. The Secretary¹⁴⁴ I & P Department submitted: "Concerted effort was diverted on Spur no. 5, on 1-8-2010 because according to head PMO the water flow had a scouring down effect on the said spur and therefore my technical team thought it is best to fight the erosion at Spur no. 5...being a non technical person I had to trust my technical team." This reaffirms that concentration was on Spur no. 5 and not on the LMB.

9.27. According to the Secretary I & P Department: " I am also not aware of the number of machinery deployed on LMB on 1st August, 2010." It is important that requisite machinery for each Barrage is either available with the Development Zone or then the Contractors are arranged in the beginning of the flood season at the nominal rates after complying with the requirement of public tender. At the eleventh hour, engagement of contractors, results in heavy loss.

9.28. Secretary I & P Department¹⁴⁵ deposed before us that: "Ijaz Hussain Kashif was posted as XEN for the last 2 ½ years at Taunsa Barrage, however, due to his request based on family reasons he was transferred in June, 2010 and in his place Mr. Munir Anjum was appointed on 10-6-2010 as XEN on current charge basis. At this stage, Mr. Munir Anjum also held the charge of SDO Bunds and SDO Headworks. Munir Anjum has eight years experience at Taunsa Barrage. He has M.Sc. Hydrology from Malaysia. As Secretary, I & P Department, I felt the importance of the post XEN at Taunsa Barrage, especially at the start of a flood season, therefore, I interviewed candidates for the said post and found Mr. Munir Anjum to be the most competent person available for the said post within the Department. There was no political or bureaucratic interference or influence in the transfer of Ijaz Hussain Kashif or in the appointment of Munir Anjum which was purely done on merit." Head PMO submitted that appointment of Munir Ajnum on lookafter charge "was a serious lapse but there was no body in the Department who could have replaced Mr. Ijaz Hussain Kashif. There was acute shortage of XENs."

9.29. Mr. Muhammad Muneer Anjum, was posted as Executive Engineer, Taunsa Barrage Division on 10.06.2010 on "**Look after basis**" was suspended by the order of the Chief Minister, Punjab on a complaint of one Mehr Ijaz for not attending to Shahwala Groyne on August 01, 2010. Thereafter, Mr. Ijaz-ul-Hassan Kashif was posted as Executive Engineer [on the same date](#). Secretary I & P submitted that "the Chief Minister on the complaint of Ajaz Ahmed Achalana MPA, suspended Munir Anjum on 1-8-2010. Faced with this situation, I immediately handed over the charge to Ijaz Hussain Kashif who happened to be on the

¹⁴⁴ I.W.6

¹⁴⁵ I.W.6

Barrage as an additional support to PMO.” It is astonishing to note that the Chief Minister, Punjab, who was aware of the super flood and had himself visited Jinnah Barrage a day earlier suspended the man Incharge of the Barrage in the midst of super flood which was almost on the gates of Taunsa Barrage. Mr. Ijaz ul Hassan has deposed that he was on the Shahwala Groyne till noon of 3-8-2010¹⁴⁶ therefore the statement of Munir Ajum that he immediately handed over the charge to Ijaz ul Hassan is incorrect. Therefore, there was no XEN on the Barrage on 2-8-2010. It is important to remind that XEN under the Regulations is the head of the Barrage.

9.30. As both Mr. Muhammad Muneer Ajum, as well as, Mr. Ijaz-ul-Hassan Kashif have deposed that they were not Incharge of the Barrage on 2.8.2010 as Mr. Muhammad Muneer Anjum left the control of the Barrage on 1.8.2010 while Mr. Ijaz-ul-Hassan Kashif stated¹⁴⁷ that “due to dangerous condition of Shahwala Groyne I remained there for watching till noon of 3-9-2010. Then I received a phone call from I & P Department Lahore that day to day look after of Executive Engineer Taunsa Barrage Division has been given to me due to suspension of Executive Engineer concerned, therefore, I reached Taunsa Barrage on same day and reported Head PMO Punjab Barrages for duty...” We feel that such like political intervention by the political leadership in such technical matters during super floods reflects poor governance and should have been resisted tooth and nail by the Secretary, Irrigation & Power Department.

9.31. The professional competence of XEN (Muhammed Munir Anjum) is seriously doubtful. When boils were resurfacing repeatedly in the bed of Tibba Minor at RD 35 and 36 and the said boils were being closed, the XEN should have ensured covering the stretch of Tibba minor that flowed along the LMB i.e., RD 32 to 40. No such effort was made. The XEN failed to understand the pattern behind the developing boils. Had he remembered that the LMB sits on an old creek and had he read the Sind Bund Manual he might have adopted a more robust strategy and probably saved the tragedy that took place.

9.32. The bevy of officers dispatched to the Barrage by the Secretary I & P a night before could not suddenly grasp the situation and the recurring pattern of boils surfacing from Tibba Minor in the selected portion of the LMB where Tibba Minor flows alongside the LMB. Therefore good flood fighting requires good pre-flood preparedness and a good sense of the barrage and its training works. Any such preparation or planning would have quickly revealed to the XEN that the entire bed of Tibba Minor alongside LMB had to be reinforced and carefully observed. The XEN should have also known that LMB sits on an old creek and should have been put on notice on the resurfacing of boils within this portion of the Tibba Minor. Lack of preparation, lack of understanding coupled with poor professional competence resulted in missing out on this important aspect. Had the entire stretch of the bed of Tibba Minor was reinforced on time, the breach could have been avoided. This required solid pre-flood assessment of the area, watching staff familiar with the area, requisite machinery and labour alongwith the flood fighting material. There is little doubt in

¹⁴⁶ Ex I.W.106

¹⁴⁷ Ex I.W.106/1

our mind that it is the sheer incompetence of the officers of the I & P department and their failure to abide by the Regulations that resulted in the tragic breach.

9.33. According to PRO¹⁴⁸, IRI, the importance of Spur no. 5 when compared to the LMB is negligible. Effort on Spur no.5 on the right side according to PRO, IRI was unnecessary. The XEN has deposed that there was sheet piling done in front of Spur no.5 (used for the diversion of the old river) still Head PMO diverted his entire effort on Spur no.5. There is an additional disconnect. The flow of the river was on the left side as no water entered the pond area on the right side as deposed by the Head PMO himself, therefore likelihood of a threatening river action on Spur no. 5 does not look probable. In any case, LMB required more attention of the Head PMO especially after the surfacing of the first boil at RD 35-36.

9.34. CONCLUSION

9.35. Proper flood fighting is not possible without strict observance of the Regulation. The XEN has admitted that the new Regulations were not read by him. In any case, without proper preparation i.e., without adequate labour, flood fighting material, machinery, watching huts and staff and more importantly without having meticulously studied the headworks, identified its high risk area, no flood fighting can even begin to be put in place. Last minute deployment of the ablest flood manager in the Province to the Barrage cannot equal the expertise and understanding of the officers posted on the barrage before the flood season. It is wishful thinking that officers arriving in the nick of time, in harsh weather and pitched darkness can take charge and fight a river already in exceptionally high flood. The message is loud and clear. Department failed to fight the flood as per its Regulations. The regulations have to be followed which were not at Taunsa Barrage.

9.36. The Secretary, Irrigation & Power Department should have appointed a confirmed and a full time XEN at the Barrage. An SDO already holding a dual charge was given an additional "lookafter" charge as an XEN of a Barrage – this is not acceptable. Further, the Secretary should have opposed the suspension of the XEN on 1-8-2010 by the Chief Minister or else should have ensured that the replacing XEN should take charge immediately. The new XEN took charge after the breach had taken place on 2-8-2010.

10. TECHNICAL REASONS OF BREACH OF LMB

10.1. POSITION OF SECRETARY I & P DEPARTMENT¹⁴⁹

10.2. The Left Marginal Bund of Taunsa Barrage has been constructed along the left bank of River Indus to contain the ponded water. The top width of LMB is 25 feet with 3:1 side slope on the river side in un-pitched reach and 2:1 side slope in the pitched portion – the land side slope throughout the length. The salient features of LMB are given below:

¹⁴⁸ Ex I.W. 139/2

¹⁴⁹ Ex I.W.6/1

| | | |
|----------------------|---|----------------------|
| Total Length | : | RD 134+000 |
| Stone Pitched Length | : | RD 0 to 34+000 |
| Un-pitched Length | : | RD 34+000 to 134+000 |
| Design Capacity | : | 1.0 Million Cusecs |
| Free Board | : | 6 feet above HFL |

10.3. The Left Marginal Bund of Taunsa Barrage breached at RD 32-33 around 4 PM on 2.8.2010, when the discharge in the River Indus was approaching 10.85 lac cusecs i.e., at the breach point which is 1 in 1000 years flood by some estimates. 3-Hourly hydrograph from 1 to 5 August, 2010 has been prepared which depicts intensities and long duration of the discharges ever seen. A Superintending Engineer Inayat Ullah Cheema and a Sub Divisional Officer, Mohammad Afzal, was deputed especially on LMB for intense watching of the bund along with staff and earth moving machinery. Army Jawans, which were requisitioned by the Executive Engineer in accordance with the Flood Fighting Plan on 1.8.2010, were also there right on the Bund. The breach speedily developed to 1000 ft and 1.25 lac cusec discharge diverted, which after breaching banks of Taunsa Panjnad Link Canal and Muzaffargarh Canal, flooded a vast area in District Muzaffargarh.

10.4. POSITION OF HEAD PMO

10.5. The causes of the breach as reported by the Head PMO / Project Director, Punjab Barrages¹⁵⁰ are summarized below:

- (i) The earthen embankment did not leak or fail anywhere. So much so that no seepage at toe was seen on earthen un-armoured bund though freeboard was badly encroached. Leakage did take place only in stone pitched armoured portion (RD 0-34+500). The bund failed in stone pitched armoured portion by sudden collapse.
- (ii) It has been determined that failure of LMB was due to seepage. The embankment was not overtopped and there was a freeboard of 4.5 ft when it breached. Similarly no slope collapsed anywhere and structural failure is also ruled out.
- (iii) At about 4 PM on 2.8.2010, the water level speedily rose and the freeboard, which was kept originally 6.0' above highest flood level of 1992 (RL 457.25'), reduced to 4.5'. Suddenly intense bubbling started on right prism side of the adjacent channel (Tibba Minor). A dumper was present at RD 32 of the bank. SDO immediately directed the dumper to reach the site, but it took a few minutes that the whole bank collapsed in a width of about 40 ft. The breach then developed speedily.

¹⁵⁰ Ex I.W. 7/3



(iv) When the discharge in the river reached 10.85 lac cusecs, the hydraulic gradient still remained covered all along and there would have been no chance of breach, as also experienced in un-pitched reaches of the bund. **But due to cutting of slope to 2:1, the hydraulic grade line at this mighty unprecedented discharge, went uncovered at toe in prism of the adjacent minor, which runs adjacent to the toe from RD 32 to 44 LMB.** Piping started here as evidenced by the SDO in charge. The bank thus failed. Had there been no pitching with 2:1 slope in this reach, that situation could have not arisen.



(v) The cause of the breach is thus providing stone pitching on inner side by cutting down the slope from 3:1 to 2:1, making upstream interface of the embankment with water virtually naked and the highest ever water level attained due to unprecedented, unpredictable flood of the order of 10.85 lac cusec.

10.6. FINDINGS OF THE DEPARTMENTAL ENQUIRY COMMITTEE¹⁵¹

10.7. An Enquiry Committee was constituted to probe into the causes of breaches at LMB of Taunsa Barrage. The findings of the Inquiry Committee regarding causes of breach in the LMB of Taunsa Barrage, as brought out in their Report are summarized below:

- i. The perusal of technical sanction for the work of raising and strengthening of Left Marginal Bund and allied components of Taunsa Barrage reveals that x-sections do not show existence of Tibba Minor & the drain running parallel along outer toe of the Left Marginal Bund. Therefore, the hydraulic gradient of 1:6 was not covered and seepage started on the countryside and bubbling was noticed in the prism of the Tibba Minor. This seepage was further increased with the rise in floodwater on riverside when the free board was reduced from 6 ft to 4.5 ft .
- ii. Other reasons given by the Committee are: No adequate and timely arrangements were made for procurement of flood fighting material, employment of work charged establishment, earth moving machinery, establishment of flood fighting camps, availability of reserve stock of stone and deployment of proper staff to fight the flood. Therefore at the time of occurrence of emergency, the situation could not be saved and ultimately resulted in to the failure of Left Marginal Bund.
- iii. Had the previous slope of 3:1 maintained on river side between RD 0+000 to 34+500, the hydraulic conditions would have been much favorable whereas the desired result could not be achieved even after providing stone pitching with side slope as 2:1 in this reach.
- iv. 18 No. flood camps were to be established on Left Marginal Bund as per provisions indicated in the flood fighting plan. Practically till 01.08.10, there were only 4 flood camps established at site with deficient flood fighting material as the arrangements to procure flood fighting material or earth moving machinery were started on 02.08.2010.
- v. The maintenance of Sanawan Flood Bund, being the second defence line was totally ignored due to which, the flood water after occurrence of breach in Left Marginal Bund immediately rushed towards Sanawan Bund which could not withstand against the hydro static pressure and was washed away / breached.
- vi. It is pertinent to note that inspections of bunds which were required to be done before the on set of flood season were not carried out at any level by the Departmental concerned officer.
- vii. Maintenance and upkeep of Sanawan Bund having its position as second defence line of Left Marginal Bund was totally ignored for the last many years other

¹⁵¹ Annex P of Ex I.W. 6/1 - comprising: i) Mr. Murtaza Khursheed (Convener), Addl Secretary (Tech), I&P Dept. ii) Mr. Shafqat Hussain Bhatti (Member), SE Lower Jhelum Canal Circle & iii) Mr. Zahid Bashir (Member), SE Faisalabad Drainage Circle

wise after the failure of Left Marginal Bund the damages could have still been contained. This negligence caused havoc alongwith irreparable huge loss to the vast area, damage to the standing crops, collapsing of houses, and loss of valuable lives in addition to tremendous loss to private and public property.

10.8. *SUBMISSION OF PRO, IRI, I & P DEPARTMENT*¹⁵².

10.8.45. It is apprehended that the breach of the LMB of Taunsa Barrage occurred owing to the hole under stone pitching, which remained un-attended. The inspection of such important structures is carried out after 15th June of each year for catering of any alarming situation and is tackled before commencement of flood season.

10.9. *INQUIRY & FINDINGS*

10.10. The Tribunal constituted a local commission¹⁵³ on 15-10-2010 to carry out survey/investigation regarding the composition and design of the Left and Right Marginal Bunds of Taunsa Barrage with particular emphasis to investigate the cause of breach that occurred in Left Marginal Bund (LMB). The said commission is referred hereunder as the UET COMMISSION.

10.11. The UET Commission visited Taunsa Barrage (both the left and right bunds) on October 20, 2010 to collect the field observations in general and the measurements/collection of soil samples from the breach site on LMB in particular to formulate its findings regarding the matter. Based on field observations, cross sectional measurements, laboratory testing of soil samples and seepage analysis of LMB, following are the findings of the UET Commission:

a) *LMB Site Visit Observations*

i. The total length of Left Marginal Bund is up to RD 134+700 ft out of which the bund is stone pitched up to RD 34+500. Two breaches occurred in LMB, one in stone pitched portion at RD 33+000 which extends to RD 34+000. As per information of the staff on duty, the first breach was triggered at 4 PM on August 02, 2010 which caused a parallel flow to the LMB resulting in an other breach in the un-pitched portion at 10 PM on the same day between RD 34+500 and 39+000. Maximum flood level established at the breached section reported by staff on duty at the time of breaching was about 459 ft above mean sea level, whereas, the RL of top of the stone pitching is 463.21 ft which means a free board of approximately 4 ft was available at the time of the breach. In order to plug the two breaches, an inside ring bund is being

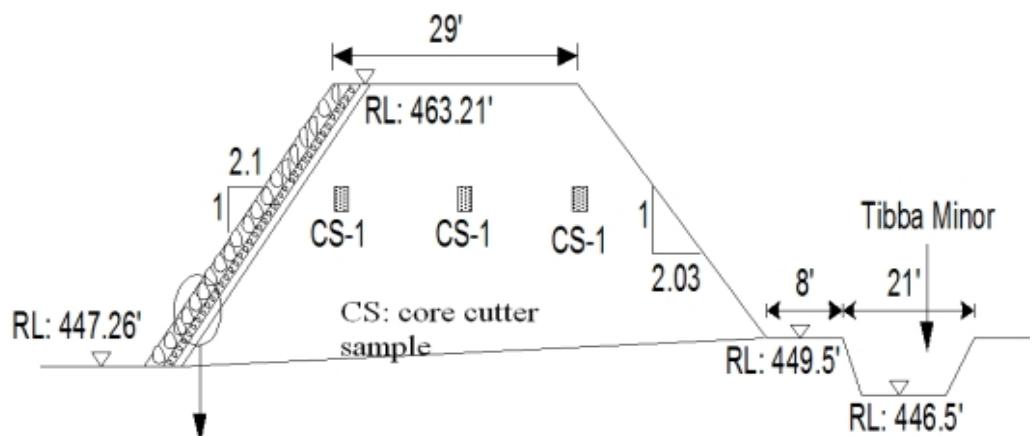
¹⁵² Mark 43

¹⁵³ The Commission comprised the following (i) Engr. Khayyam Qaiser, Chief Engineer, C & W Department, Govt of Punjab & (ii) Prof. Dr. Khalid Farooq, Department of Civil Engineering, UET Lahore, (iii) Mr. Imran Shahbaz, Civil Judge, Kot Adu (Report at Ex.I.W 110/1)

constructed between RD 32+500 and RD 39+700.

b) *X-Section of LMB at RD 33+000 (Stone Pitched Portion)*

i. Figure 2 shows the cross section of LMB at the breached section. The x-section is drawn as per measurements made at the time of the visit. Three core cutter samples were procured from the face of the breached section (RD 33+000) in order to characterize the material of the bund. The samples were approximately taken from mid height, one sample from central portion, one from river side and one from the opposite side, the approximate location of the samples recovered is indicated in Figure 1. Plate-1 shows the view of the breached section at RD 34+000. **It is worth mentioning here that an irrigation channel named as Tibba Minor is flowing in close proximity of the LMB at the breached portion as shown in Figure-1 and can also be seen in Plate-1.** Plate-2 shows the close view of the face of breached section at RD 33+000 in which it can be observed that tree roots have penetrated in to the bank which might have contributed in seeping the water through the bank leading to initiation of piping process.



Stone Pitching (from top to bottom)

1 ft Stone Layer: 12 inch dia stone

6" layer of coarse filter : 1.5" - 0.5" gravel

6" layer of fine filter: 0.5" - 1/8" gravel

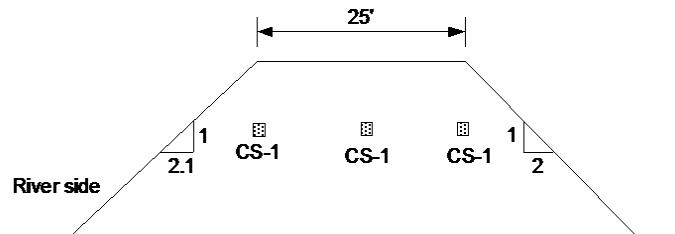




Photo showing view of face of pitched breached section (RD 34+000)



Close view of face of pitched breached section at RD 33+000

c) *Construction of Ring Bund*

i. As mentioned earlier, an inside ring bund is being constructed between RD 32+500 and RD 39+700 to plug the two breaches. It has been observed during the visit that the construction of the ring bund is being made by loose dumping of borrow material with out any proper compaction. This observation is very serious from engineering point of view as construction of a water retaining earth structure with out performing proper compaction is not acceptable by any standard of civil engineering. The central part of the bund is being constructed by using clayey soil which has lot of lumps; its loose dumping will definitely constitute a highly porous structure favoring seepage of water through the body of the bank. The other material which is being used in construction of shoulders of the bund is sandy soil which is being borrowed from the down stream area of the breached section where lot of sandy material is deposited. This material is also being dumped without any compaction resulting in a very loose earth embankment.

d) *X-Section of LMB at RD 39+000 (Un-pitched Portion)*

i. Figure 2 shows the cross section of LMB at RD 39+000 (Un-pitched portion). The side slope on the river side is 1V:2.1H, whereas the side slope of the opposite side is 1V:2H. The core cutter samples to determine the in-situ density of the bank material were procured at the locations shown in the Figure 2. Plate-4 shows the photograph of the breached section.



Photo showing face of un-pitched breach section at RD 39+000

e) **Laboratory Tests and Results**

i. Following laboratory tests were conducted at Geotech Lab of UET Lahore on core cutter samples taken from both the breached sections in order to classify the bank material and to determine its relative compaction and permeability characteristics.

- Sieve analysis
- Hydrometer analysis
- Atterberg limits
- Standard Proctor test
- Falling head permeability test.

ii. Based on grain size analysis and atterberg limits, the soil samples taken from both the x-sections are classified as silt (ML) with about 10 % sand. As far as the type of the material used in the construction of bund is concerned, usually clay or silt is used for the construction of river dikes which may be dredged from the river or transported from adjacent lands. However, the material used in such construction must be highly compacted. The relative compaction required for the construction of such earth banks is specified in the range of 93~95% of standard Proctor density (Ref: Earth Manual, US Dept of the Interior, 2nd Edition, page 257). In order to ascertain the relative compaction of the bank material, standard Proctor test on both the material was conducted in the laboratory. Based on the results of core cutter and laboratory compaction test, relative compaction of both the section was determined¹⁵⁴. The relative compaction of bank material at both the sections is between 82% and 88%. These values are on lower side showing poor or no compaction during the construction of the bank. **As mentioned earlier that no compaction is being performed in the construction of ring bund and this was confessed by the engineer at site that in constructing such banks, there is no provision of compaction in the prevalent specifications of I & P department. This is a serious flaw in the construction on the part of concerned department.**

iii. In order to assess the permeability of the bank material, falling head permeability test was performed on the soil samples taken from both the sections¹⁵⁵. The permeability value for both the samples lies between 5.41×10^{-6} and 8.38×10^{-6} cm/sec. These values are typical for silt and sandy silt material, which has been used in the construction of LMB.

f) **Seepage Analysis**

i. The seepage analysis was performed for both the sections using computer software seep/w. In order to perform the analysis, the embankment was modeled using the actual geometry of the x-section and the soil

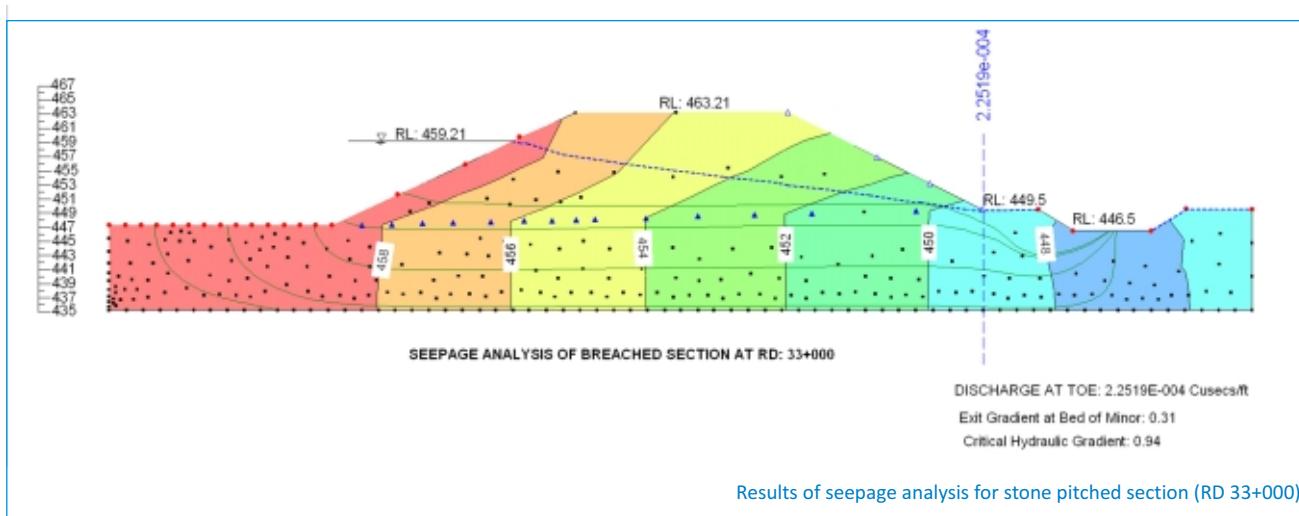
¹⁵⁴ See Table 1 of the UET Report (Appendix 3)

¹⁵⁵ see Table 2 of the UET Report (Appendix 3)

properties determined through field and laboratory testing. Figures 3 and 4 shows the results of seep/w for stone pitched and unpitched section, respectively. It is to be pointed out that the permeability value of bed soil below the bank is assumed to be 1×10^{-4} cm/sec which is typical value for silty sand/sand.

ii. In case of stone pitched section, due to the proximity of Tibba minor to the toe of the LMB, the flow lines tend to emerge from the bed of the minor. The exit gradient at the bed of the minor is maximum and its value is 0.31. The critical hydraulic gradient of the bed material is approximated to be 0.94 (considering in-situ density of bed material as 94pcf), which gives a safety factor (see equation 1 below for safety factor) of 3 against piping of the bed material. To be safe against piping action on downstream side of an earth structure usually safety factor of 4 is considered adequate (Ref: Book by BM Das, Advanced Soil Mechanics, pp 131-137)¹⁵⁶.

iii. The results of the seepage analysis indicate the probability of piping action to be started in the bed of the Tibba minor. This has also been confirmed by the Engineer (Ch. Afzal, SDO Taunsa Barrage) on duty at the time of the breach that sand boiling was observed in the bed of the Tibba minor few minutes before the actual breach started.



¹⁵⁶ The factor of safety against piping can be calculated by using the following equation.

i. $i_s = FS \text{ against piping} = i_{cr}/i_{exit}$ ----- (1)

ii. Where, i_{cr} = critical hydraulic gradient and is a function of specific gravity and void ratio or compacted density of the soil in the field. For a particular soil type compacted in the field, its value remains constant. The critical hydraulic gradient is calculated by the following equation.

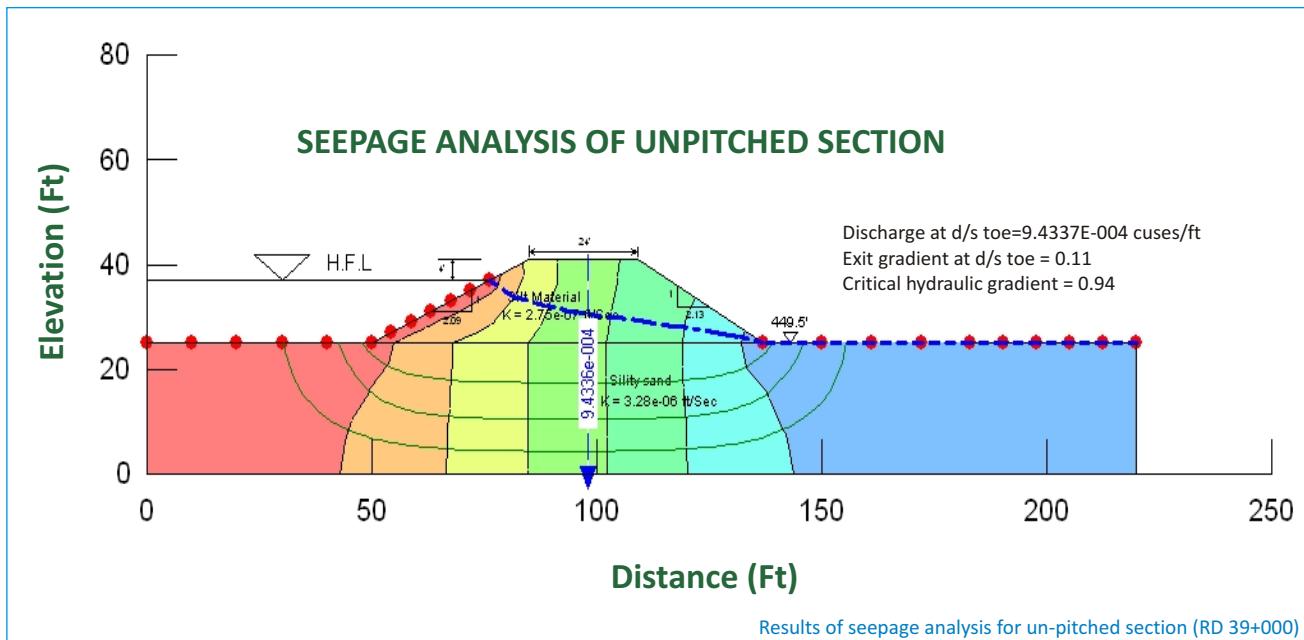
iii. $i_{cr} = (Gs-1)/(1+e)$

iv. Where Gs is specific gravity of soil and e is void ratio of the soil and depends of compacted density of soil. The void ratio can be calculated as: $e = (G_{sg}/g_0) - 1$

v. i_{exit} = is the gradient of flowing water at exit point on the down stream side of the embankment. It is defined as the ratio of maximum head on up stream side to length of flow path ($i_{exit} = h/L$).

vi. To ensure no piping condition on down stream side of hydraulic structure, a factor of safety of 4 is commonly recommended.

iv. The seepage analysis on unpitched section (RD 39+000) shows almost stable condition as far as piping action is concerned as exit gradient at d/s toe is very low (0.11). **It appears that after the first breach, parallel flow started to the river side of the bank which might have eroded the bank leading to final collapse.** As told by staff on duty that breaching of unpitched portion occurred about 5-6 hours later the first breach of pitched portion.



g) *Evaluation of LMB based on Federal Flood Commission (FFC) Design Criteria for Flood Protection Structures*

- i. Section 5 of FFC Second Flood Protection Sector Project-Package B describes the types, specifications and design criteria for various flood protection structures. In this section, the sub-section 5.2.4 is about Marginal Bunds.
- ii. The cross-section of LMB at pitch portion (RD 33+000) is in line with FFC standard, whereas in case of un-pitch section at RD 39+000, the riverside slope should be 1V:3H, whereas it is 1V:2.1H, i.e., steeper than the FFC standard.
- iii. According to FFC standards, the x-section of the bund should satisfy the hydraulic gradient of 6:1 drawn from the design flood level. Further, the hydraulic gradient (6:1) from design flood level should exist a minimum of two ft below NSL at landside toe of the embankment. The section of LMB fulfills this requirement. This requirement is to ensure that pheratic line (top seepage line) should not intersect with landside slope face so as to avoid piping of the slope material.

iv. Section 5.4.3 describes the design requirement to ensure the stability of foundation soil due to piping phenomenon.

v. According to Section 5.4.3 of FFC standards, detailed subsurface investigation will be needed for proper foundation evaluation. If required, the particular foundation will be treated to enhance its stability against piping. These specific designs may include:

- Reworking of the foundation soil
- Grouting of the armoured river bed to the required extent
- Where required, provision of a suitable cutoff.
- Inverted filter layer at the foundation.

vi. The foundation investigations shall (should) be planned to provide information about type and nature of the materials in the river bed. These investigations are carried out through boreholes, test pits, trenches and field and laboratory testing.

vii. As a general rule, the depth of subsurface investigation should be at least equal to the height of the embankment. The investigation will essentially provide the following information:

- Type of subsoil
- Permeability of river bed material
- In-situ density

viii. Based on foundation investigations, the safety of foundation against possible piping on the landside toe must be evaluated. **This aspect of foundation evaluation against piping seems to be ignored during the revamping/rehabilitation phase of LMB in 2007-2008.**

h) *Right Marginal Bund Visit Observations*

i. During the visit of RMB, it was observed that flood water did not enter in to the pond area surrounded by Spur # 1-A and T head Spur-5 and the pond area surrounded by Spur # 1-A and Spur # 2-A due to the construction of illegal bund near the usual path of the river¹⁵⁷. Plate-5 and 6 shows the presence of illegal bund which precluded the entry of water in the pond area as mentioned above. However the pond area between Spur # 2-A and Shank of Spur # 2 was inundated to about 7 to 8 ft depth. The Plates-7 and 8 show the photos of the area and the water mark on the slope and the water gauge.

¹⁵⁷ see Index Plan attached in the UET Report – Appendix 3 (Ex.I.W. 110/1)

ii. Another painful observation made during the visit of RMB was that a number of trees from the bank have been illegally cut by local people showing looting of national property with out any fear.



Photo showing presence of illegal bund between Spur # 1-A and T head Spur-5



Photo showing presence of illegal bund between Spur # 1-A and Spur # 2-A



Photo showing presence of flood water in area between Spur # 2-A and Shank of Spur # 2 and water mark on the bank

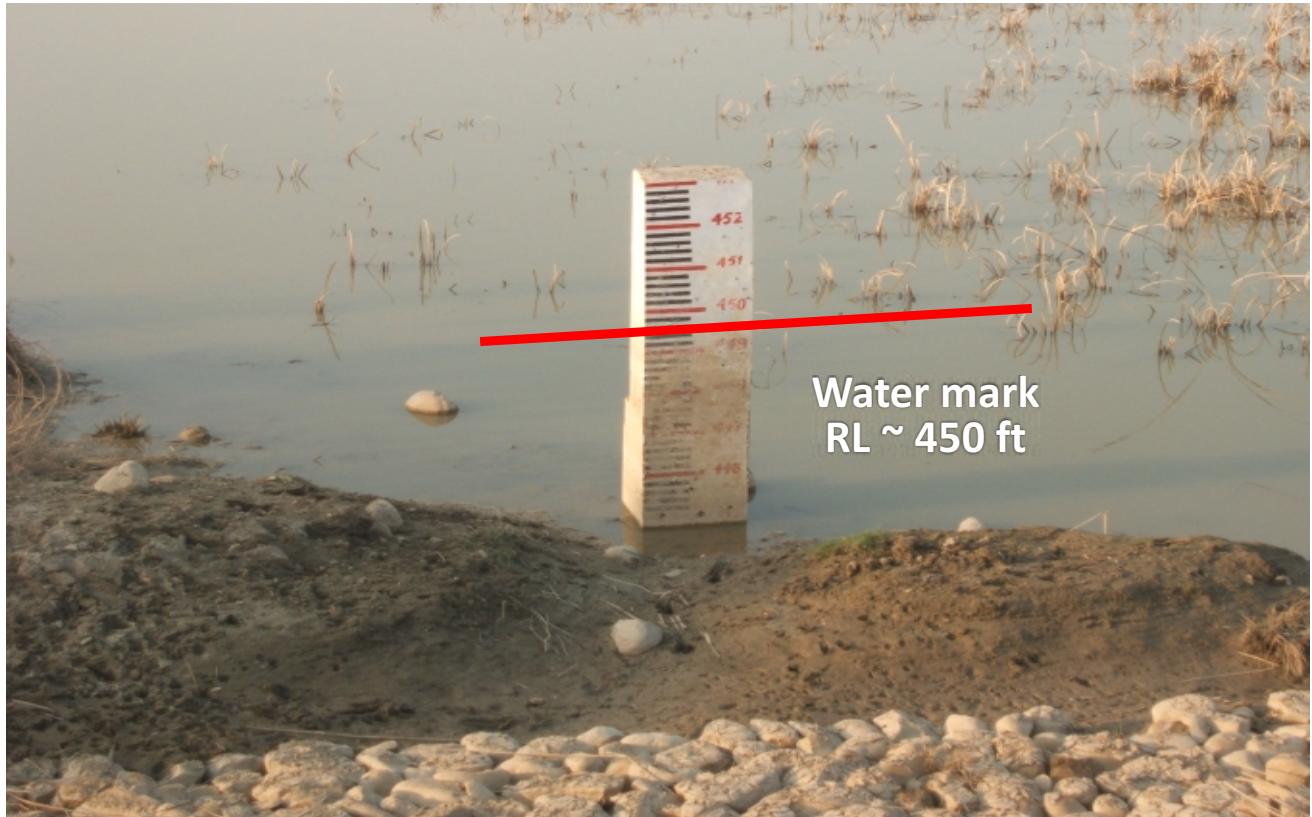


Photo showing water mark on a gauge area between Spur # 2-A and Shank of Spur # 2



i) **Summary**

- i. The results of the seepage analysis on stone pitched portion indicate the probability of piping action started in the bed of the Tibba minor. The field observation of sand boiling at the bed of the minor prior to the breach substantiates the results of the seepage analysis. However, the seepage analysis of section without considering the presence of Tibba minor shows stable foundation condition which implies that major cause of LMB breach at RD 33+000 (pitched section) was the initiation of piping in the bed of Tibba minor leading to complete collapse of LMB.
- ii. Evaluation of LMB based on Federal Flood Commission (FFC) Design Criteria for Flood Protection Structures shows that as far as the geometric design of LMB is concerned, it is according to the FFC standards, whereas the evaluation of foundation stability against piping as laid in FFC standards seems to be ignored during revamping/rehabilitation phase of LMB in 2007-2008.
- iii. The side slope of LMB at pitched section (RD 33+000) on both sides is 1V:2H, whereas the side slope of un-pitched portion (RD 39+000) on the

riverside is 1V:2.1H against specified value of 1V:3H, and on the natural landside the slope is 1V:2H.

iv. The soil used in the construction of LMB at both the sections is classified as Silt (ML) which is acceptable material for the construction of river banks/dikes.

v. The relative compaction of LMB material at both the section varies between 82 and 88%. This value is lesser than the acceptable value which is 93~95% of standard Proctor method.

vi. The construction of ring bund is being made with out proper compaction control which is a serious construction flaw.

vii. During the visit of Right Marginal Bund (RMB) and associated Spurs, it was observed that flood water did not enter in to the pond area surrounded by Spur # 1-A and T head Spur-5 and the pond area surrounded by Spur # 1-A and Spur # 2-A due to the construction of illegal bunds near the usual path of the river. These illegal bunds must be removed.

viii. The pond area between Spur # 2-A and Shank of Spur # 2 was inundated to about 7 to 8 ft depth. The water gauge installed in this pond area shows the water mark at RL of about 450 ft

ix. Lot of KIKAR trees along the RMB have been cut illegally by the local people.

10.12. Head PMO conceded in his statement¹⁵⁸ that the design of the LMB was faulty. He further stated that Irrigation Department for the purposes of embankments do not consider the underground flow or exit gradient. The practise of the department consistently has been to work out the hydraulic gradient and as long as it is under the toe of the outer slope the design of the embankment is considered to be correct. According to Head PMO, the flow of Tibba Minor where the breach took place was not considered while designing the LMB, in fact the Consultant Ch Abdul Majeed was not given the correct map, which reflected the flow of Tibba Minor alongside LMB in RD 26-50. Head PMO¹⁵⁹ made a categorical statement: " I admit that the presence of Tibba Minor was not considered in the actual design this is one of the major reasons for the collapse of the LMB." This was not PMO's position in the written statement filed before us.

10.13. Design of LMB prepared by Ch Abdul Majeed.

¹⁵⁸ I.W. 7

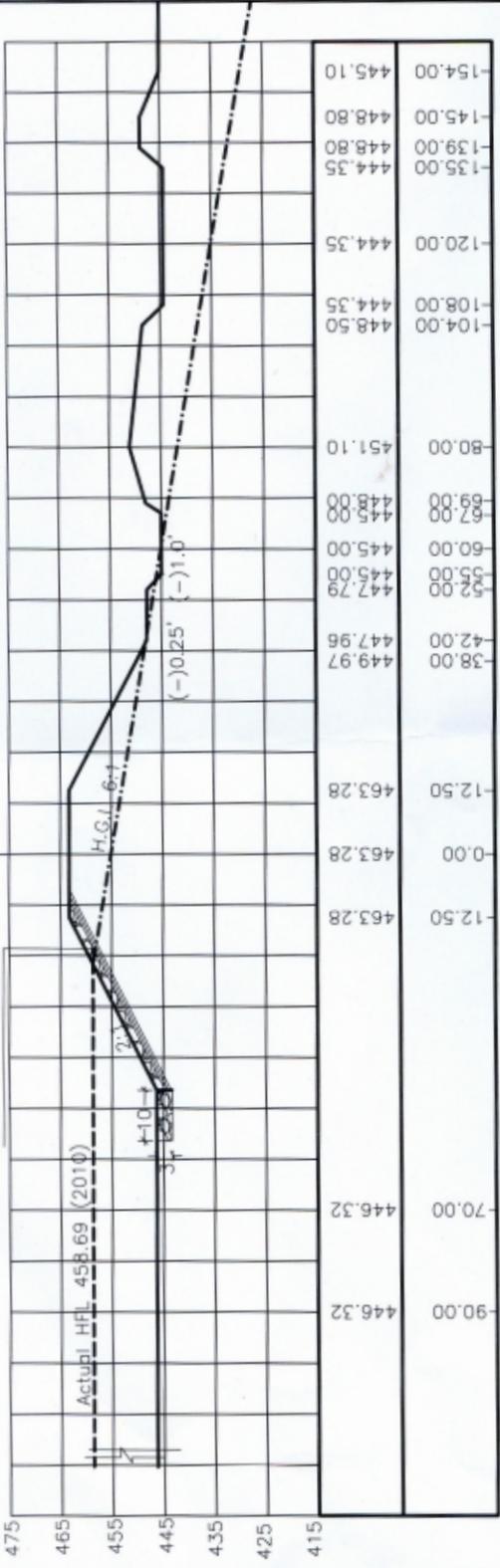
¹⁵⁹ I.W.7

EXHIBIT 145-146/q

Chairman
Flood Inquiry Tribunal

42/10 - Q3/10

X-SECTION AT RD:33+000 LMB OF TAUNSA BARRAGE WITH STONE PITCHING SHEET # 02

1.5 THICK STONE PITCHING
0.5 THICK SPAWL
0.5 THICK FILTER MATERIAL

Khalid 29/10/10

10.14. FEDERAL FLOOD COMMISSION'S DESIGN CRITERIA AND METHODOLOGY (referred to as FFC Manual¹⁶⁰)

10.15. FFC's Design Criteria and Methodology provides the complete design for setting up an embankment. The UET Report shows that the I & P Department has failed to follow the design criteria. Reference is made to para 5.4.3 of the FFC's Manual.

10.16. **PARA 5.4.3. of the FFC's Manual - FOUNDATION STABILITY:** The stable side slopes of embankment depends upon the strength of the fill material and foundation characteristics. The foundation soil determines the rate of under seepage, formation of boils on the landside natural surface, the settlement of the embankment and stability of side slopes.

10.17. **SIND BUND MANUAL¹⁶¹:** is instructive on the cause of breach of the LMB. Para 118 of the Manual gives the Common *Causes of Failures of Bunds*:

“... the main causes of breaches in the past are:-

- erosion of main and loop bunds by the river;
- failure of bund sluices, resulting from the undercutting of sluice foundations, etc.
- **development of leaks into breaches due to inefficient patrolling.**

10.18. Development of leaks into breaches, may itself be due to one or other of the following reasons:-

- Each of these causes and the necessary remedial measures to counteract them are considered, *seriatim*, below¹⁶²:
 - a. inadequate freeboard;
 - b. inadequate cover over the saturation line with consequent heavy percolation;
 - c. unequal settlement due to lack of wetting arrangements, such as wetting trenches or failure to lead water from the river through cuts in the lip of the river banks to wet the bunds before the river rises;
 - d. **lack of arrangements to arrest the development of leaks, e.g., sandcores or diaphragm walls, in bad soils;**
 - e. inadequate supervision and materials on site.

10.19. **Leaks PARA 127;** Leaks may become serious, leading to their development into breaches, either owing to lack of arrangements arresting their development, such as sandcores and diaphragm walls and pre-wetting measures, or due to inadequate supervision and materials on site. Here, prevention is better than cure; but, no matter how much money

¹⁶⁰ Ex I.W 103/2

¹⁶¹ Bund Manual, Government of Sind, Public Works Department, Central Designs Division, Mechanical & Research Circle, Karachi Printed at the Sind Government Press, 1954- at Mark 38

¹⁶² ibid.

is spent on the strengthening and perfection of the bund line, it will still always be at the mercy of the combination of a rat, a dark night, and a careless patrol beldar. A rat hole, if not closed at once and thus allowed to develop, will ensure the failure of the bund, however perfect it may be. In other words, no bund line can be considered safe against all possible conditions to which it may be subjected.

10.20. Causes of Leaks. Leaks are caused by:-

- treacherous character of the soil used, viz. kalar, hard clay or cracked soil, in the body of the bund;
- cracks in the bund or ground and cavities on account of excessive drying or lack of pre-wetting and compaction;
- faulty construction of bund, i.e., clods not having been properly broken and ramming and rolling insufficiently done;
- the presence of rat or snake holes in the bund section;
- the roots of big or small trees under the seat of the bund not having been properly removed during construction;
- **the seepage through bund not having been perfectly controlled in time.**

10.21. Underground Leaks or “Blow-Outs”. PARA 128

- Even with properly designed and constructed bunds and careful patrolling, water may leak through a sand stratum under the bund and break through the ground surface downstream of the bund in the form of a bubbling spring. When such underground leaks occur, a stream of water gushes through the ground like a fountain, carrying with it a quantity of sand which is mainly deposited around the edge of the hole, and because of their appearance, these leaks are called “blow-outs”. The blow-out may be as large as 3 or 4 feet in diameter, and it may occur at a considerable distance away (say 50 feet to 200 feet, sometimes even more) from the downstream toe of the bund.
- The danger of such “blow-outs” is maximum, where the bund crosses the dry bed of a *dhoro* and there is an underlying layer of sand below the seat of the bund, which outcrops to the surface, downstream of the bund. Underground leaks also occur where deep borrow pits are too near the line of the bund, particularly when such pits exist on its land side or on both sides.
- One such leak, leading to a breach, occurred at mile 13/4 of the Left Bank Bund near Moro in 1942, resulting from cracks developing where the bund crossed the dry bed of a “dhoro”. A whirlpool developed on the riverside some distance from the bund and water flowed from the bed downstream of the bund which quickly collapsed.
- If the water flowing from an underground leak is clear, there is no danger of

the bund failing immediately, but when the water is muddy it indicates that the bund is being undermined and that failure by subsidence is imminent. The nearer the downstream face of the “blow-out” is to the toe of the bund the greater the danger of an early collapse of the bund.^{162-A}

10.22. How to Close an Underground Leak PARA 129

- Since underground leaks are caused by the fact that the soil particles cannot offer the necessary resistance to the static pressure due to the head of the water against the bund, **the method of stopping them is to build a “ring bund” of earth-filled gunny bags around them and allow the water to pond up, creating a head on the land side sufficient to stop the flow of silt.** When the seeping water is altogether stopped there may be danger of blow-outs taking place outside the ring bund. **It is, therefore, necessary to be on the look out for similar underground leaks in the vicinity.** The same method is useful in case of leaks whose upstream face cannot be traced. The subsequent treatment is similar to that for leaks whose upstream face can be detected. As soon as the river levels subside, longitudinal “nallis” have to be constructed to trace the course of the leak. Having done so, “nallis” have to be constructed, right across the embankment, with bed lower than the bottom level of the leak, and the leak filled up with selected sand or earth, duly watered and rammed. In case of important or dangerous bunds, where such blow-outs are found to occur frequently, at high water, the areas subject to such underground leaks should have permanent “ring bunds” constructed around them.

10.23. NATIONAL FLOOD PROTECTION PLAN¹⁶³

10.24. The National flood Protection Plan, 1978 provides that it is desirable to explore the foundation to ascertain the soil type of strength to detect permeable soil layers. Strength of the foundation must be established to assure that the foundation will support the superstructure without excessive differential settlement. **Permeable sand layers may permit considerable under seepage and lead to sand boils and excess water accumulation on the landside of the bund.**

10.25. FFC REASONS FOR CAUSES OF BREACH OF LMB.

10.26. According to Chairman, FFC, “the prime reason for breach at LMB at Abbaswala was poor maintenance. Infact Lala Creek passes through the toe of LMB which resulted in cavitations leading to eventual settlement of Bund.”

^{162-A} Bund Manual, Government of Sind, Public Works Department, Central Designs Division, Mechanical & Research Circle, Karachi Printed at the Sind Government Press, 1954

¹⁶³ Mark 60/2 (National Flood Protection Plan 1978 Main Report)

10.27. GATE OPENINGS OF TAUNSA BARRAGE

10.28. Complaints had been received by the Tribunal that the gates were not properly opened by the officers in charge of the barrage when the first peak reached Taunsa.

10.29. We called for the Daily Log Book and the Flood Register from the Barrage and examined it in detail. The extract below is the data picked from the Daily Log Book and the Flood Register. The statements of Head PMO and the XEN (reproduced above in this report) have also been matched with the Daily Log Book.

| Sr.# | Date | D/S Discharge | U/S Discharge at Chashma | Daily Log Book | | | | | | | | Flood Register | | | |
|------|-----------|--------------------|--------------------------|---------------------------------|--------|----------------------|------------|----------|--------------|-------|-------|-------------------|------------------|--------|---------------|
| | | | | Pond Level at Taunsa 06:00 a.m. | | Average Gate Opening | | | Canals | | | Rain Fall | State of Weather | XEN | U/S Discharge |
| Left | Right | Right Under Sluice | Main Weir | Left Under Sluice | M.C | D.G. | T.P. | | | | | | | | |
| 1 | 25.7.2010 | 323749 | 231308 | 447.50 | 447.50 | 1.5 to 3.5 | 2 to 5 | 1.5 to 3 | Open | Open | Open | Cloudy | Mr. Munir Anjum | 343549 | 447.50 |
| 2 | 26.7.2010 | 283914 | 281297 | 447.50 | 447.50 | 2 to 2.5 | 3 to 4 | 1.5 to 3 | Open | Open | Open | Clear and Hot Day | Mr. Munir Anjum | 303714 | 447.50 |
| 3 | 27.7.2010 | 256029 | 255736 | 447.50 | 447.50 | 2 to 2.5 | 2.5 to 3.5 | 1.5 to 3 | Open | Open | Open | Cloudy | Mr. Munir Anjum | 272529 | 447.40 |
| 4 | 28.7.2010 | 225570 | 234762 | 447.50 | 447.50 | 2 to 2.5 | 2.5 to 3.5 | 1.5 to 3 | Close (1200) | Open | Open | Cloudy | Mr. Munir Anjum | 242070 | 447.50 |
| 5 | 29.7.2010 | 258941 | 507904 | 447.50 | 447.50 | 2 to 3 | 2.5 to 3.5 | 1.5 to 3 | Open | Open | Open | Cloudy | Mr. Munir Anjum | 270441 | 447.50 |
| 6 | 30.7.2010 | 288502 | 743548 | 446 | 446 | 2.5 to 3 | 3 to 6 | 1.5 to 5 | Open | Close | Close | Cloudy | Mr. Munir Anjum | 299502 | 446 |
| 7 | 31.7.2010 | 424391 | 974214 | 445.50 | 445 | 3 to 5 | 5 to 10 | 1.5 to 7 | Close | Close | Close | Clear | Mr. Munir Anjum | 424391 | 445.50 |
| 8 | 01.8.2010 | 617602 | 1000972 | 446 | 446 | 3 to 7 | 6 to 13.5 | 3 to 7 | Close | Close | Close | Clear | Mr. Munir Anjum | 617602 | 446 |
| 9 | 02.8.2010 | 798601 | 736403 | 446.2 | 446.4 | 5 to 9 | 8 - F | 3 to 8 | Close | Close | Close | Cloudy | Mr. Munir Anjum | 798601 | 446.2 |
| 10 | 03.8.2010 | 767351 | 644476 | 446 | 442 | 5 to 9 | 9 to 14 | 3 to 8 | Close | Close | Close | Cloudy | Mr. Munir Anjum | 767351 | 446 |

| Sr.# | Date | D/S Discharge | U/S Discharge at Chashma | Daily Log Book | | | | | | | Flood Register | | | | | | |
|------|-----------|---------------|--------------------------|---------------------------------|-------|--------------------|----------------------|-------------------|-----------|----------|----------------|-------|-----------|------------------|---------------------------|---------------|------------|
| | | | | Pond Level at Taunsa 06:00 a.m. | | | Average Gate Opening | | | Canals | | | Rain Fall | State of Weather | XEN | U/S Discharge | Pond Level |
| | | | | Left | Right | Right Under Sluice | Main Weir | Left Under Sluice | M.C | D.G. | T.P. | | | | | | |
| 11 | 04.8.2010 | 790021 | 601038 | 446 | | 443.8 | | 5 to 8 | 9 to 13.5 | 3 to 8 | Close | Close | Close | Cloudy | Mr. Munir Anjum | - | - |
| 12 | 08.8.2010 | 721494 | 525737 | 444 | | 441.60 | | 5 to 8 | 9 to 13.5 | 2 to 7.5 | Close | Close | Close | Cloudy | Mr. Munir Anjum | - | - |
| 13 | 06.8.2010 | 692981 | 468360 | 443.50 | | 441.10 | | 5 to 8 | 9 to 13 | 2 to 7.5 | Close | Close | Close | Clear | Nil | - | - |
| 14 | 07.8.2010 | 614418 | 457035 | 443 | | 440.6 | | 3 to 8 | 7 to 12 | 2 to 4 | Close | Close | Close | Cloudy | Nil | - | - |
| 15 | | | | | | | | | | | | | | | | | |
| 16 | 10.8.2010 | 614015 | 755744 | 442.50 | | 441 | | 3 to 8 | 9 to F | 4 to 9 | Close | Close | Close | Clear | Mr. Ijaz-ul-Hassan Kashif | 614015 | 442.50 |
| 17 | 11.8.2010 | 741614 | 776512 | 443 | | 440.4 | | 6 to 9 | 10 to F | 6 to 9 | Close | Close | Close | Clear | Mr. Ijaz-ul-Hassan Kashif | - | - |
| 18 | 12.8.2010 | 761574 | 795356 | 443 | | 441 | | 6 to 9 | 10 to F | 7 to 11 | Close | Close | Close | Clear | Mr. Ijaz-ul-Hassan Kashif | 761574 | 443 |
| 19 | 13.8.2010 | 773612 | 679571 | 443 | | 441 | | 6 to 9 | F | 7 to 9.5 | Close | Close | Close | Cloudy | Mr. Ijaz-ul-Hassan Kashif | 773612 | 443 |
| 20 | 14.8.2010 | 769110 | 579126 | 443 | | 441 | | 6 to 7 | 8 to F | 7 to 9.5 | Close | Close | Close | Cloudy | Mr. Ijaz-ul-Hassan Kashif | 769110 | 443 |
| 21 | 20.8.2010 | 475309 | 433402 | 440 | | 435 | | 7 to 8 | 5 to 9 | 2 to 5 | Nil | Nil | Nil | Clear | Mr. Ijaz-ul-Hassan Kashif | 747446 | 437.40 |

10.30. The data above reveals that :-

21.5.1 The pond level was not reduced prior to coming of the flood as

21.5.2 The weir gates and the under sluice gates were not opened fully or as per regulation inspite of fact that the canals were closed. The Daily Log Book shows that the gates were opened in full when the second peak hit Taunsa. The flood managers at Taunsa were not prepared and failed to regulate the gates when the highest first

peak hit the Barrage and after learning the lesson at the expense of the breach in the LMB opened the gates when the second peak reached Taunsa. The flood managers failed to regulate the gates as per regulation.

21.5.3 On the critical dates i.e., 2.8.2010 upstream discharge at 06:00 a.m. was **7,98,601 Cfs** which rose to **8,98,414 Cfs**¹⁶⁴ at 12 noon and continued to be the same till 1900 hrs and then suddenly at 2000 hrs a discharge of **9,59,177 Cfs** is recorded in the Flood Register. According to the Flood Register the breach took place at RD-32 on the LMB at 1600 hours and records a discharge of **1,25,000 cfs** from the said breach. The discharge from the breach has no effect on the discharge from the Barrage which remains intact at **8,98,414 Cfs**. The Flood Register also shows that as upstream discharge rose from **8,98,414 Cfs** to **9,59,177 Cfs** at 2000 hours till 2300 hours and was finally reduced at 2400 hrs to **9,34,116 Cfs**. The pond level, however, is recorded to have remained static at RL 446.80 from 0900 hrs till 1900 hrs and from 2000hrs till 2300 hrs the Pond Level was reduced to RL 446.60 and at 2400 hrs it was recorded as RL 446.40. Therefore, it is not clear how the discharge at the breach was calculated to be **1,25,000 Cfs** and how come the same had no effect on the upstream discharge at the Barrage. The figure of **1,25,000 Cfs** does not inspire confidence.

21.5.4 The overwriting in the flood register, as well as, the discharge recorded in the Daily Log Book on 2.8.2010 is **7,98,601 Cfs** while the discharge on 3.8.2010 is **7,67,351 Cfs**, therefore, we are of the view that the discharge recorded as **9,59,177 Cfs** at 2000 hours on 2-8-2010 is not credible and appears to have been inflated just to match with the design capacity of the Barrage ($959177 + 1,25,000 = 1,084,177$). Even if **1,084,177 Cfs** is correct the flood was within the design capacity of **11 lac Cfs**.

21.5.5 In his written submission, Mr. Muhammad Muneer Anjum, Executive Engineer stated that he was suspended on 1.8.2010, however, the Daily Log Book shows signatures till 4.8.2010, while the signatures of his replacement i.e., Mr. Ijaz ul Hassan Kashif appear on the Daily Log Book on 7.8.2010 when according to the statement of Mr. Ijaz ul Hassan Kashif, he was at Shahwala Groyne till noon of 3-8-2010. It appears that there was no duly appointed XEN at the Barrage on 2-8-2010. Master of the ship was missing when exceptional high flood was passing through the Barrage. Such like lapses at one of the most critical Barrages during the most critical times is criminal.

10.31. *INQUIRY & FINDINGS*

10.32. The technical report as well as the depositions made before us by the officers incharge have pointed out that boiling was noticed in the bed of Tibba Minor. Boiling noticed at two places earlier in the bed of Tibba Minor was closed by the field staff.

10.33. The Departmental Inquiry committee mentions the importance of Tibba Minor but

¹⁶⁴ Flood Register of Taunsa Barrage

does not explain the technical reasoning as given by the UET Commission i.e., the seepage was from right under the embankment and it was the exit gradient rather than the hydraulic gradient, which became the cause of the breach. One of the causes of breach of an embankment is sub-surface failure or Piping accompanied by levee boils. Undersurface seepage resurfaces on the landside in a volcano like cone of sand. This results in erosion of the levee toe or foundation resulting in the sinking of the levee/embankment. As the upward pressure of water is more than the downward pressure from the weight of the soil. Facts recorded at RD 32 of the LMB show that the breach was a result of under-seepage which resulted in the boils that surfaced in the bed of Tibba Minor. An able flood manager should have covered the entire bed of Tibba Minor which alongside the LMB (i.e, RD 32-44).

10.34. Tribunal is also of the view that the boiling at RD 32 could have been checked had the pre flood preparation pointed out the vulnerability of the LMB from RD 32-44 which flows along the Tibba Minor. This makes this part of the LMB more exposed and vulnerable. The pre flood strategy should have identified Abbaswala to be the portion of the LMB that required a constant watch.

10.35. Once boils were witnessed, steps should have been taken to cover the entire stretch of Tibba's bed. Had the officers been trained and aware of the Sind Bund Manual and the FFC Manual, the developing pattern of boils or blow outs at RD 35-36 should have been understood and appropriate remedy taken.

10.36. Poor flood fighting arrangements added to the above and resulted in the breach.

10.37. We are of the view that had there been trained flood managers equipped with the proper flood manuals, the boils at Tibba Minor could have been attended to in time and the breach could have been avoided.

10.38. **CONCLUSION**

10.39. A portion of LMB runs alongside Tibba Minor (RD 32-44) While designing or rehabilitating LMB this aspect and the fact that LMB sits on an old creek was not factored in. The design criteria of the FFC has been followed to the extent of Hydraulic Gradient being in the ratio of 1:6 and must be under the countryside of the embankment. The department has miserably failed to comply with the other design requirement given in the FFC design criteria manual as well as in the National Flood Protection Plan, 1978. This aspect has been totally ignored. The officers who deposed before us were not aware of the foundational failure and restricted their submissions to the hydraulic gradient. The boils evidenced close to RD 32 in the bed of Tibba Minor made out a case of foundational failure. The Staff on duty should have immediately covered their entire bed of the Tibba Minor in the reach that runs alongside the LMB. This would have been the first reaction. However, this would have been possible only if during the pre flood inspection the sensitivity of this portion of the LMB was discussed or if the XEN and SDO had chalked out a strategy for the flood season identifying critical areas. The dream team of the best officers sent a night before, even though some of

them patrolled the LMB a night before and also were aware of the boils coming out the bed of Tibba Minor did not suggest a strategy. It might not be expected of an outside officer to tell the connection between a boil, the old creek passing under the LMB and the proximity of Tibba minor in pitched darkness.

10.40. Under the rehabilitation work of Taunsa Barrage, the PMO failed to provide the relevant data to Abdul Majeed who designed the LMB without factoring in Tibba Minor and the fact that an old creek passed under the LMB. Needless to say that it was also the responsibility of Abdul Majeed to have conducted a field survey to assess for himself the surrounding of the LMB, which he failed to do. All these lapses have added up and culminated into the breach of LMB.

11. ENCROACHMENT IN POND AREA

11.1. *I & P DEPARTMENT'S POSITION*¹⁶⁵: Pond area is located on upstream side of the barrages to accommodate the ponded water within the Marginal bunds in order to feed the off-taking canals. The extent of inundation of the pond area depends upon the pond level, river morphology and flood discharges. The required pond area in case of each barrage is acquired by the Government.

11.2. The main function of a barrage or a weir is to raise the water level (head up) so that it can be easily diverted into canals for the purposes of irrigation. Barrage can also provide storage and can therefore be used for flood mitigation. Once the water is raised upstream it requires room to spread out and retain its pond level. This area or space is called the POND AREA. It has no other technical function but to absorb the raised water as per barrage regulation. The Pond Area has to be empty at all times and it mostly used as a wildlife sanctuary.

11.3. For the construction of Taunsa Barrage and its training works, an area of **11,559 Acres 18 Marlas** of land was acquired in District Muzaffargarh and **11,316 Acres 4 Kanals and 9 Marlas** of land was acquired in Dera Ghazi Khan District in the year, 1957 by Irrigation and Power Department. The acquisition proceedings were completed in the year, 1963.

1.3. Zamindars of pond area in Dera Ghazi Khan District did not accept compensation of their land acquired by Irrigation and Power Department. They also did not collect the compensation instead approached the Government for release of their land. In a meeting of Council of Ministers held on 28.09.1963, it was decided by the Governor that only such areas may be acquired which remain under water throughout the year and the remaining area should be released. Resultantly **9,707 Acres 1 Kanal and 3 Marlas** of land of Dera Ghazi Khan District was released to the original land owners under the following conditions:-

- i. The landowners would not make any claim against Government for loss of

¹⁶⁵ EX I.W.6/1

crops, etc. due to inundation.

ii. The landowners would allow Irrigation and Power Department to excavate earth, etc. whenever necessary for construction and maintenance of the Barrage/Training works.

11.5. In this way the total pond area that remained with Irrigation Department was **13168 Acres 4 Kanals and 4 Marlas** of land.

11.6. During the year 1978 the pond area mentioned above alongwith state land/other land measuring **3,057 Acres 3 Kanals 14 Marlas** i.e. total **16,225 Acres 7 Kanals and 18 Marla** was declared as Game Sanctuary vide Forestry and Wildlife Department's Notification No.SO.FT(Ext.)/XII-8/72 dated 15.06.1978, initially for a period of 5 years. This period was further extended for another 5 years and this process is continuing till today with similar extension. The Forestry and Wildlife Department asserted that no cultivation should be allowed in the Game Sanctuary and instead wild Jungle and Sarcanda growth be allowed to provide good habitat to the wildlife, like food, grazing and shelter, etc.

11.7. Later, on the representation of the original land owners, case was re-examined and the Secretary (Colonies) Board of Revenue, Punjab vide his letter No.4015-98/3028-CLV dated 19.10.1998 after approval of the then Chief Minister issued policy letter in which it was instructed that land may be leased out to its original owners on 15 years lease scheme. It was also directed that in the meanwhile it would be seen that if the land can be reverted back to the original owners which is no longer required by the acquiring agency i.e., Irrigation and Power Department. After issuance of this policy letter from the Board of Revenue, Punjab Lahore the proceedings for leasing out the land were initiated by the Irrigation and Power Department with the assistance of Revenue Department. **The land measuring 9,225 Acres was leased out to its original owners out of 16,225 Acres. Rest of land is still under the control of I & P Department and this land is not cultivable.**

11.8. In the year, 1999 the Secretary Wildlife denotified the above land measuring **9,225 Acres** from the area of Game Sanctuary vide his Notification dated 24.03.1999 on the request of Irrigation and Power Department.

11.9. Vide notification dated 4-7-2008 of the Forest, Wildlife and Fisheries department the land owned by the I & P Dept adjacent to the Pond Areas of the head works and barrages was handed over to the Wildlife & Parks Department for conservation of wildlife through the establishment of private game reserves. I & P Department vide notification dated 6-11-2002 has already stopped the leasing of the pond areas and banned the cultivation in the wildlife potential areas/headwork's/barrages. Therefore, the lease right of the pond areas associated with the wildlife potential areas/headwork's/barrages is transferred to the Punjab Wildlife and Parks Department for the conservation of wildlife through the establishment of private game reserve under section 20 of the Punjab Wildlife (Protection, Preservation, Conservation and Management) (Amendment) Act, 2007.

11.10. According to Mr. Muhammad Nawaz, Supervisor¹⁶⁶: “ in 2002 once again 16,225 acres were declared to be pond area and wildlife sanctuary, however, after, the said notification no effective action was taken to clear the pond area/declared wildlife sanctuary from the illegal cultivators/encroachers. In fact only 7,000 acres area is with the Wildlife Department. We have written to the Director General, Wildlife Department, but there is no progress in this regard.”

11.11. Secretary I & P Department¹⁶⁷ deposed that: “As far as the illegal possession and agriculture in the Pond Area is concerned, I am afraid the Government approach regarding this has been oscillating like a pendulum. However, since 2009 the Pond Area has been handed over to the Wildlife Department to be treated as a wildlife sanctuary. It is correct that even today the Pond Area is in the possession of illegal encroachers and I frankly admit that the said encroachers might be holding possession in collusion with the I & P department. I admit that there are standing crops in the said Pond Area and the area has good soil for agriculture.”

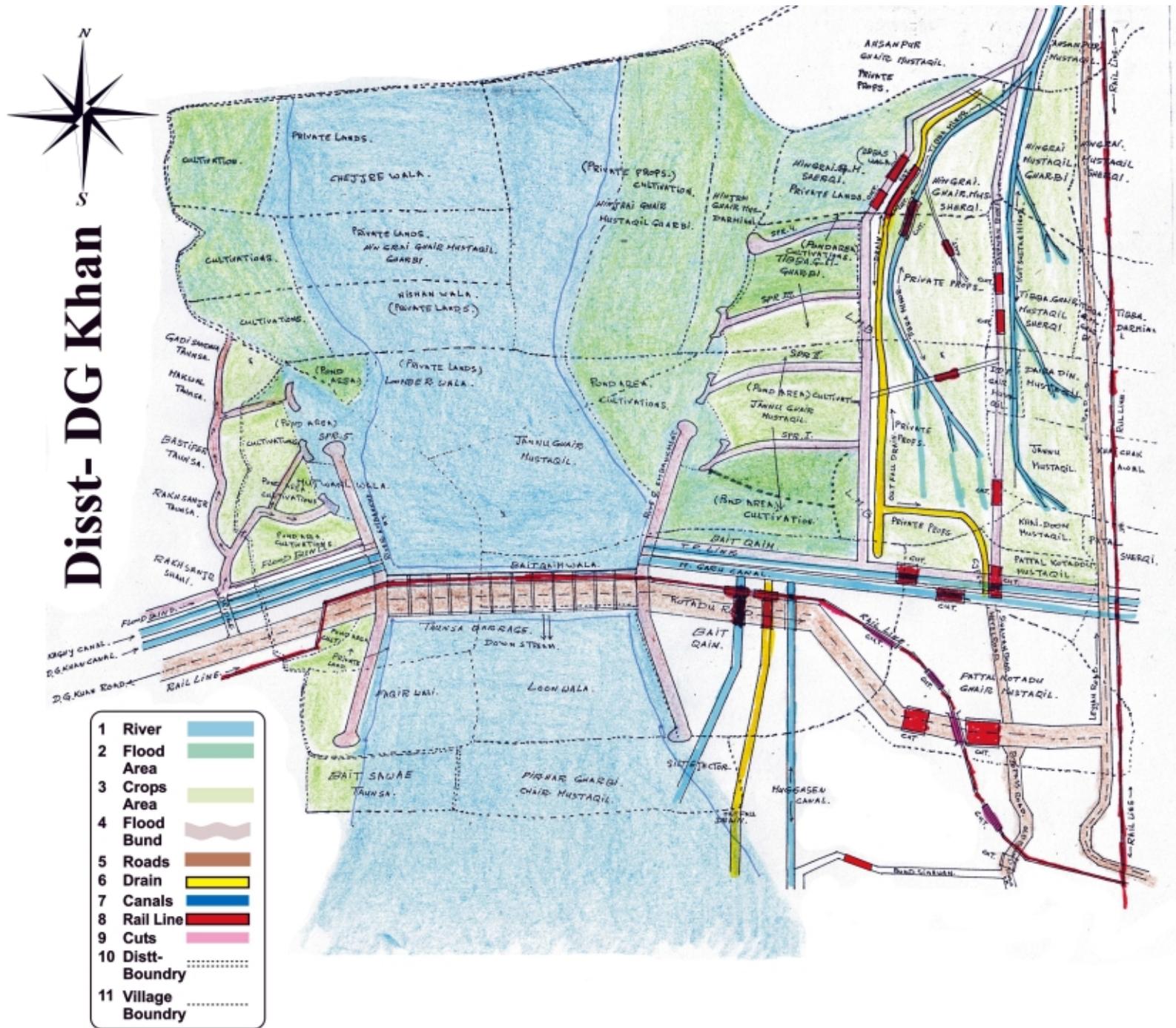
11.12. According to the DOR¹⁶⁸, District Muzaffargarh extends into the pond area on the right side of the Taunsa Barrage and falls within the Mauza Matwani. The pond area on the right side is under the ownership of the I & P Department, however, the Pond Area has been unlawfully cultivated by Syeds and Baloch Sihanis, who are shown as encroachers in the revenue record. This is because they are not lawful lessees of the area as per revenue record. Similarly the Pond Area on the left side along LMB also belongs to the I & P Department and is being cultivated by Hinjras, Gadies and Baryars, who are shown as lessees/encroachers in the revenue record. The map below clearly shows the illegal cultivation in the pond area:

¹⁶⁶ I.W. 67

¹⁶⁷ I.W. 6

¹⁶⁸ I.W.87

Structure Network of Taunsa Barrage In District-Muzaffargarh



11.13. **JINNAH BARRAGE:** Total pond area of Jinnah Barrage is 3,893 Acres which was acquired by Irrigation and Power Department at the time of construction of said Barrage. However it has been handed over to Wildlife and Fisheries Department vide No. SOP(WL)12-1/2002-III for upkeep now as game sanctuary.

11.14. Malik Ghulam Mustafa Khar¹⁶⁹ stated: "The joint holding of the Khar Family is around 3,000 to 4,000 acres, which is situated on both sides of Magasson Canal downstream Taunsa Barrage. As far as the Pond Area is concerned both sides are being illegally cultivated primarily by the Hinjra Family who enjoy a strong political position in the area. They have control over 16,000 acres of pond area.

11.15. According to the statement of Malik Ahmed Yar¹⁷⁰ of the Hanjra family:

"We are cultivating 1 to 2 squares of land between Spur No.2 and Hockey Spur. I know that the said land has now been handed over to the Wild Life Department, Government of the Punjab. I am aware of the notification of the Government of the Punjab whereby the said land has been handed over to the Wild Life Department, however, our contention is that this land has been leased out to us and . . . there is litigation pending before the Hon'ble Lahore High Court. As a sitting MPA, I **undertake that once this matter is decided in the Court, we shall immediately vacate this land.**

In the Bela, government maintains a *Shikargah* and my family uses this *Shikargah* once in a while like other members of the public. The other families cultivating within the Pond Area (on the left side) are the following:-

- Gadies
- Baryar
- Chandia
- Nutkani

We are cultivating sugarcane, cotton, wheat and sesame in the above mentioned land. Our total family holding in the area is 30 to 40 squares of land."

11.16. Answering questions posed by the Tribunal, Malik Ahmed Yar deposed:

Q.No.1: The memo of parties in W.P. No.4919/09 shows that you are not a party to the litigation before the Lahore High Court and, therefore, the interim relief does not extend to Hanjra family?

Ans-1 It was my impression that the above mentioned litigation (Writ Petition No.4919/09) has been filed on behalf of all the families in the Pond Area, however, according to the memo of parties it is only the Baryar family who are the petitioners of the said petition. Now I understand that the stay order does not extend to the Hanjra family. **I shall peruse the notification in this regard and will try to vacate the Pond Area as soon as possible.**

¹⁶⁹ I.W.127 (ex Governor, Punjab)

¹⁷⁰ I.W. 128 (s/o Malik Muhammad Ajmal, Caste Hajnra, r/o Hanjra House, Daira Deen Panah)

11.17. According to Muhammad Mansoor Ashraf Barar,¹⁷¹

“I am cultivating three squares of land in the Pond Area on the left side of the Taunsa Barrage. My entitlement is based on the Memorandum dated 24.02.1999 whereby the said land has been leased out to me for a period of 15 years. I also have litigation pending in the Lahore High Court, Lahore. In the pond area we have cultivated sugarcane, cotton crops and sesame. Cotton crop has been totally damaged, sugarcane and seismic are still existing.

The so called private bunds between spurs have not been constructed by me or my family. These bunds were constructed by the Department with the help of NESPAK. **We have no use of these embankments and have no objection if these bunds are removed.** We deposit Rs.100/- per acre (which started @ Rs.6/- per acre). We deposited the annual lease amount with the Irrigation & Power Department at the Barrage Headquarters with the concerned XEN/SDO. For the last two years the Department is not collecting the said fee because they informed us that the said land has been transferred to the Wildlife Department.

I understand the legal position and shall vacate three squares of land in the Pond Area, which I am cultivating after harvesting the standing crops within two months from today.

11.18. According to Statement of Syed Saleem Ahmed Gillani¹⁷²

“The entire area on which the barrage was built was owned by the Syed family. From the right river bank till Indus Highway and enclosed by D.G. Khan/Kachi canal belongs to Syed family. Syed family is the Syed Gillani family. This land and Pond Area was acquired by the Irrigation Department because under the Agreement said land has been leased out to us for 15 years. We are entitled to hold the same till 2010. We alongwith Baryar family have taken this matter to the Hon'ble Lahore High Court. The total Pond Area, which is now the ownership of Irrigation Department and cultivated by Syed family, is between 2000 to 2500 kanals. We grow cotton in the said area....From 1985 to 1997 Ghulam Mustafa Khar (the then Honorary Warden), as well as, Ghulam Maladi Khar took possession of this land, however, it was returned to us in 1997. The private Bunds were set up by “Khar family” during the above said period. **The Bunds have no importance to us and can be removed at any time.** We sow Rabi crops and, therefore, we have no utility of these Bunds. I undertake that whatever is the final legal position after the litigation **we shall abide by that and vacate the land if the said litigation is decided against us.** The remaining area behind the Pond Area is approximately 1,000 acres cultivated by our family and we have cultivated sugarcane and cotton in the said land.

¹⁷¹ I.W. 129 (son of, Muhammad Ashraf Barar r/o Mustiqal Janoo, Daira Deen Panah, Tehsil Kot Addu).

¹⁷² I.W. 131 (s/o Syed Muhammad Akbar Gillani, Caste Syed r/o Sanjar Syedan, Tehsil Taunsa, District D.G. Khan).

I am of the view that Pond Area should be utilized for Rabi crops because the said cultivation does not require setting up of Bunds and does not stand in the way of the floods. On the other hand, such agriculture adds to national economy and is beneficial for the country. Since 1997 the water has not come into the Pond Area of the right side of embankment. In my non-technical view, flow of the river has shifted on to the left side.

11.19. Mr. Irfan Saeed, Additional District Judge and Registrar of the Tribunal was appointed as Local Commission to report on the status of Pond Area by carrying out detailed physical examination of the area covering the following terms of reference. The summary of his Report¹⁷³ is as under:

| Sr. No. | Mandate/TOR given to Commission | Report/Status |
|---------|--|---|
| 1 | To inspect the "Pond Area" on left and right sides of the Barrage. | <p>On 05.10.2010, inspected LMB including Abbaswala Cut (the breach) comprising two breaches there, one measuring 4800-ft and other measuring 1000-ft having intervening 700-ft LMB intact. Observed privately constructed bunds (illegally) covering the pond area, linking the Spurs at LMB. Also observed cultivation there.</p> <p>Almost similar position at the right side of the Barrage.</p> <p>Details are available in the report duly supported with the photographs and on some occasions, with the movies.</p> |
| 2 | To inspect the Baila in the middle of the river. | <p>Observed human habitat, ranches, grazing livestock. Interviewed locals and also noticed an illegally installed fishing net. A concrete bridge (commonly known as Hockeywala Pull) and a metalled road leading towards Daira Deen Panah in the Baila, allegedly constructed by the District Government under the instructions and guidance of Malik Sultan Hanjra who was District Nazim of Muzaffargarh.</p> |

¹⁷³ Full Report at Mark 78- Appendix 4

| Sr. No. | Mandate/TOR given to Commission | Report/Status |
|---------|--|---|
| 3 | To report on the status of possession of the pond area by local residents. | The Commission also observed the cultivation in the Pond Area on both sides of the Barrage. On the right side, mostly Syed whereas on the left side, the Hanjras, Gurmanis, Nutqanis, Baryars are in possession of the Pond Area. |
| 4 | To inspect whether the said local residents/encroachers have set up private bunds in the area. | Almost between each Spur on both sides of the Barrage, the local residents have set up private bunds in the area. Details have already been given in the instant report, duly supported with the photographs and the movies. |
| 5 | To inspect T.P. Link. | The Commission also inspected the Taunsa Punjab (TP) Link and met the locals who informed that the same was breached on three points which were rehabilitated by the department. The right embankment of the TP Link was the common embankment of TP Link and Mozaffargarh Canal. |

11.20. Pond Area has never been a source of flood mitigation and cannot be considered as a storage area for the purpose of flood. According to an estimate, total Pond Area at Taunsa Barrage is around 16,000 acres, which cannot hold more than 16000 Cfs of water which is inconsequential during super floods¹⁷⁴.

11.21. **POND AREA LITIGATION:** Malik Ahmed Yar¹⁷⁵ (Hanjra) deposed that W.P. no. 4919/2009¹⁷⁶ is pending before the Multan Bench of the Hon'ble Lahore High Court. Perusal of the petition and the memo of parties reveal that the petition has been filed by the Baryar family.

11.22. According to the memo of parties, all the petitioners are Baryars. The interim relief granted in the above writ petition on 18-6-2009 was: "No adverse action shall be taken to the extent of petitioners in the meanwhile." This relief pertains to the petitioners i.e., Baryars only and does not extend to the other families occupying the POND AREA.

11.23. Information sought¹⁷⁷ from the Additional Registrar, Multan Bench of the Lahore High Court revealed that a similar petition W.P. 1833/2003 titled *Bashir Ahmed vs Government of Punjab* was dismissed for non-prosecution on 3-3-2005 and that there is no other identical petition on the record except [W.P. no. 4919/2009](#) filed by the Baryar family.

¹⁷⁴ I.W.6

¹⁷⁵ I.W. 128

¹⁷⁶ Ex I.W. 128/1 & 129/2

¹⁷⁷ This information was procured over Telephone by the Staff Officer of the Tribunal.

11.24. CONCLUSION

11.25. We are of the view that the Pond area has been illegally encroached upon by the local influential's who carry out agriculture in the said area and have also built zamindara bunds for the protection of their crops. I & P department has failed to make any concerted effort to remove the said encroachers. Some members¹⁷⁸ of the I & P Department maintain active interest in the agriculture in the POND AREA.

11.26. Wildlife and Fishers Department has also failed to get the POND AREA cleared.

11.27. POND AREA at Taunsa Barrage is therefore not an empty space that can fully absorb and pocket the excess water due to heading up at the Barrage or due to floods. Even though POND AREA is not designed for storage, still it has to be clear at all times. We do not envisage the POND AREA encroachments to be an immediate cause of breach of LMB during the recent exceptionally high floods, however, the impact and effect of an encroached pond area on the current breach or the hydrological dynamics of the river cannot be ruled out.

12. MISMANAGEMENT & ROLE OF PMO

12.1. According to the Head PMO¹⁷⁹ for Punjab Barrages, Irrigation & Power Department, Lahore, Project Management Office ("PMO") was created by the Government of the Punjab vide Notification No.SO(E-I)2-1/2001, dated May 04, 2005. Most of the Barrages have outlived their useful lives and exhibit technical and operational deficiencies and considering their strategic importance in the irrigation system, they need to be rehabilitated / remodeled on priority basis be taken up by Irrigation & Power Department. A comprehensive project by the name of "[Punjab Barrages Rehabilitation and Modernization Project](#)" was approved by ECNEC to rehabilitate the following six barrages namely:

- i. Jinnah;
- ii. Taunsa;
- iii. Khanki;
- iv. Balloki;
- v. Sulemanki;
- vi. Islam;

12.2. Taunsa Barrage was the most problematic and sick barrage and its safety was at stake as determined in the detailed study carried out by the Consultants Joint Venture of M/s NDC and NESPAK. The World Bank was approached and in the aide memoire, the Bank required that a dedicated PMO should execute this project, which was then created by the Punjab Government. The Government also directed that the PMO would subsequently be responsible for rehabilitation of the remaining five barrages also. The following are the

¹⁷⁸ I.W. 59 & I.W. 60

¹⁷⁹ I.W.7 & Ex I.W.7/4

functions of the PMO:

- a. Preparation of Terms of References (TORs), Request for Proposals (RFPs) and procurement of consultants;
- b. Review of feasibility studies, detailed design, PC-Is, Prequalification (PQ) and bidding documents for barrage projects;
- c. Assigning finances;
- d. Procurement of contractors;
- e. To oversee the construction supervision consultants during implementation of barrage projects;
- f. Environmental and social impact mitigation measures;
- g. Monitoring and reporting project implementation progress;
- h. To act as client for contract management;
- i. Financial management i.e., disbursement and re-imbursement from financiers; and
- j. Coordination with Public Sector Development Programme (PSDP) for emergent repairs on barrages

13. INQUIRY & FINDINGS

13.1. According to the written submission Chairman P & D Department¹⁸⁰, rehabilitation and modernization of Punjab Barrages under the phased programme was planned as an outcome of a detailed appraisal undertaken by Irrigation & Power Department, Government of the Punjab and consultants in 1998. In the first phase rehabilitation and modernization of six barrages has been envisaged in following order of priority:

- i. Taunsa
- ii. Jinnah
- iii. Islam
- iv. Balloki
- v. Khanki
- vi. Sulemanki

¹⁸⁰ Ex I.W. 137/1

13.2. Credit implementation for Taunsa Barrage Emergency Rehabilitation and Modernization (TBERM) project costs Rs.11.232 billion through World Bank and JICA financing in April, 2005. The project was effectively completed by December, 2009. In view of the vital importance of barrages as strategic assets, establishment of an adequately staffed Project Management Office (PMO), to be transitioned eventually into the Punjab Barrages Management Organization (BMO) for long term institutional strengthening of the I&P Department, was covenanted in the Project Agreement as part of the Loan Agreement signed with the World Bank.

13.3. The skeletal PMO existing at the stage of project preparation was later on expanded to have adequate number of qualified professionals headed by a project Director. The PMO, by virtue of its Taunsa Barrage implementation experience, has gained the rare and invaluable experience of executing civil and electro mechanical construction works besides acquiring training in operation and management of barrages and gaining valuable expertise in handling social environmental and resettlement issues on large scale. I&P Department aided by PMO has also prepared a post completion O&M plan for Taunsa Barrage and has devised a barrage specific yardstick for taking up maintenance requirements.

13.4. Prior to the Taunsa Barrage rehabilitation project the Barrage was being operated and maintained by Taunsa Barrage Irrigation Division under Chief Engineer, D.G. Khan Zone. To ensure smooth implementation of construction operations, the Taunsa Barrage Division was transferred en-block to PMO, Punjab Barrages. The Division, since the afore-cited arrangement, is handling all functional issues of barrages operation.

13.5. The Chairman, P&D in response to a question raised by the Tribunal responded in the following manner:¹⁸¹

| Question | Response |
|--|--|
| On the conceptual background of success and failure of PMO Barrages as an institution in the context of Barrage Management and what future role does PMO have considering the experience of the recent floods? | <p>1. PMO-Punjab Barrages was established as part of the 'Project Agreement' of Taunsa Barrage Emergency rehabilitation & Modernization (TBERM) Project on the requirement of financing agency (i.e. World Bank) at the time of Appraisal of TBERM Project in 2004.</p> <p>2. The basic concept was to create a dedicated unit to manage the "Taunsa Barrage Rehabilitation and Modernization Project" in an efficient way because the existing zone-wise execution and O&M activities were overstressed and often experienced as sub-optimal as the zonal Chief Engineers usually remain overburdened with routine tasks/ schemes and normally do not have enough expertise to handle the mega and complex barrage rehabilitation & modernization projects in the desired</p> |

¹⁸¹ Ex I.W 137/1

| Question | Response |
|----------|---|
| | <p>efficient manner. In addition, available staffing and working capacity of Irrigation Zones is generally inadequate. It was, therefore, considered vital to create a dedicated modern management unit i.e. PMO with adequately staffed, engineering, financial, management and environmental sub units to run the project in accordance with the scheduled phasing and project execution requirements under the Credit Agreement. The PMO is responsible for overall project coordination, management and monitoring, procurement and financial management, work programme preparation, progress reporting environmental monitoring and evaluation and other project related activities.</p> <p>3. The PMO worked well on TBERM Project and most of the civil works of the project were completed a year ahead of schedule. World Bank Mission in its Aide-Memoire (March 25-April 1, 2008) commended the GO Punjab, particularly PMO / IPD for the timely completion of majority of project activities and achievement of the project development objectives ahead of time.</p> <p>4. The role of PMO for passing the flood 2010 at Taunsa Barrage, however, remained constrained mainly due to:</p> <ul style="list-style-type: none"> i. Intermittent and distant monitoring of flood situation. ii. Depletion of PMO's engineering and support staff over time. iii. Delays/shortfalls in efficient mobilizing of manpower as per SOPs at the critical hour of subsidence of Left Marginal Bund (LMB) <p>5. With a view to realize benefits from the competence and substantial experience gained by PMO during TBERM Project, World Bank in their Project Appraisal Document for Jinnah Barrage maintains that the PMO setup for Taunsa Barrage Project shall be continued for execution of Jinnah Barrage Project for its eventual transformation into the Barrage Management Organization (BMO) during the implementation period of PBIP-II Project.</p> <p>6. P&D Department supports continuation of present role of PMO as the project execution/ implementation and management organization for all future barrages rehabilitation projects in Punjab. Failures such as indicated in Para 4 above, however, need to be thoroughly analyzed by I&P Department to reframe the role of PMO Barrages in barrages operation and flood mitigation, particularly in passing high/ very high floods. Hazards of the recent floods demand developing a fail-safe and well-knit organizational structure comprising a robust linkage between PMO / future BMO and the Chief Engineers of respective Irrigation Zones.</p> |

13.6. According to Naseer Ahmad Gillani¹⁸², Chief (Water) Planning Commission, Government of Pakistan, Islamabad: As far as PMO is concerned, the view of Planning Commission is that PMO was to act as a capacity building arm of the Department and over the years would develop expertise in the rehabilitation of the Barrages, so that it can be useful for rehabilitation of other Barrages. However, it was not the understanding of the Commission that the PMO would also take over the management of the Barrages and if this has happened it is a matter of the provincial governance.

13.7. *MAJOR FUNCTIONS OF THE PMO:*¹⁸³

- Development of Project Management Information System.
- Monitoring of Selected Mega Projects using Modern Project Management Techniques
- Facilitation in Procurement Processes
- Facilitation and Co-ordination between Executing Field Zones and Supervisory Consultants.
 - Federal PSDP Funded Mega Irrigation Projects
 - Irrigation System Rehab. Project.
- Lining of Channels in Punjab
- Provincial ADP Projects (>Rs.100 M) ADP
- Special Assignments.

13.8. *DEPARTMENTAL ENQUIRY COMMITTEE*¹⁸⁴ submitted that Taunsa Barrage is located at about 500 Km from Lahore. As far as the undertaking of rehabilitation project of Taunsa Barrage through PMO was concerned, it was the right decision of the department due to which the project was completed successfully and every one involved in the project was fully committed and made responsible to undertake the frequent visits to the site. The extended period of the project expired on 30-04-2010. Thereafter the administrative control of Taunsa Barrage was required to be reverted to D.G. Khan Zone for the better command and control over the performance of the Barrage but unfortunately it was not done so till today. The head quarter of PMO Barrages being at a distance it lost proper control over Taunsa Barrage Division which is also one of the reason for mismanagement experienced during Flood, 2010.

13.9. Secretary I & P Department¹⁸⁵ deposed that: "Project Management Office (PMO) was an outcome of an agreement arrived at between the Government of the Punjab and World Bank in the year 2004. The thought at that time was that the proposed rehabilitation work at the Barrage should be handled by a separate unit. This view existed because at that time the department was of the view that the zonal formation headed by Chief Engineer was concentrating more on a canal regulation and not much attention was being paid to the Barrages. PMO was established in the year, 2004 in this background. Incidentally first

¹⁸² I.W. 143

¹⁸³ Ex.I.W.140/1

¹⁸⁴ Annex P – Ex I.W. 6/1

¹⁸⁵ I.W.6

project handed over to the PMO was Taunsa Barrage. As per Agreement, once Barrage had undergone rehabilitation work, it was handed over to the PMO and it was to stay with the PMO for all times even after the completion of the rehabilitation work. Administratively, PMO has its Head office in Lahore with its own secretariat comprising directors, etc. As far as filed formation is concerned, existing formation at the barrage headed by XEN comes under the control of the PMO. In my view, the primary concentration and responsibility of the PMO has been the supervision of the feasibility works at the Barrage. In addition to the Taunsa Barrage, Head PMO also looks after the rehabilitation work at eight other barrages. Therefore, time of the Head PMO is spread over nine barrages. As a consequence, I feel that day to day management gets automatically sidelined as has been noticed in the recent floods. The weak management of Head PMO was visible when I saw the level of Barrage security. Oil and gas pipelines pass over the Barrage but there is neither effective security at the Barrage nor are there any plans for the same. Secondly, I noticed that the Barrage has an open public access including the control room. This aspect of the matter has not been attended to by the PMO. The location of the Head Office of the PMO is in Lahore. Distance of office of PMO and the Barrage weakens his control and level of vigilance over the Barrage. All these weaknesses were not brought on the table within the department previously but have now clearly surfaced after the recent floods and require serious deliberation. The performance of PMO has not been institutionally monitored by the department, however, this aspect also requires a revisit. Regarding the recent floods, Head PMO visited Taunsa Barrage for the first time on my direction just a day before the recent flood reached Taunsa Barrage."

13.10. CONCLUSION

13.11. It can be safely concluded that Head PMO failed in managing the Barrage. The lack of interest, poor management, lack of strategy and poor flood management is abundantly clear from the evidence discussed in this chapter. We are of the view that had the PMO focused on barrage management and had ensured proper pre flood inspection and had chalked out a robust flood fighting plan, LMB and District Muzaffargarh could have been saved.

13.12. What has been more disturbing is that instead of accepting failure of governance and poor management, Head PMO in collusion with the XEN, Muhammed Munir Anjum has concocted stories to establish that pre flood inspection was properly carried out at Taunsa Barrage and all was well. This has badly tarnished the credibility of Head PMO besides attracting criminal liability for misleading the Tribunal.

14. CONTROL ROOM

14.1. During investigating at the Taunsa Barrage regarding the record of the gate openings of the Barrage we sent for the record of the control room. We were informed that after the Rehabilitation, a new control room has been installed and the barrage gates can be opened electronically through the control room and the entire record is duly logged. However, when we sent for the record, we were told that the control room is not functioning and therefore

print out of the data is not possible.

14.2. We were surprised that a newly installed control room was not functional. We dug deeper.

14.3. INQUIRY & FINDINGS

14.4. According to Mr. Ghulam Akbar¹⁸⁶, Sub Engineer Head Works: "Electronic system [of maintaining the gates of the Barrage] was in operation on 01.08.2010, when I left the control room at 01:00 p.m. to attend to emergency operation on Spur no.5 . . . I returned to the Control Room the next day on 2-9-2010 when I found that electronic system had stopped working due to some fault in the system."

14.5. It is surprising to note that report called for by Mr. Ghulam Akbar Sub Engineer from Mr. Amjad Masood on 2.8.2010¹⁸⁷, has been placed on record and is dated 24.07.2010. Amjad Masood (late) pointed out that the following accessories are required to be placed for the system to continue. The accessories are as follows:

3 voltage controllar [sic] Device 380-440 v 50/60 HZ AC 15:3A/250v DC 13:2A/24V
 0.1A/250v MAX 8A/250V MoDE No- RM4TR32 Telemecanique-1 No,
 Megnatic [sic] Relay, IEC/EN 60947-5-1 le AC 12:10 A U1:690v Siemens-3 No,
 Signal Telecom cable falted [sic] at DAP 11 to DAP 12
 Megnatic Relay, IEC 60947-5-1, JSC 8201-5-10 AC 15 110 v 6A 220 v 5A DC 13 110v
 0.2A LH 16A Un-AX4 MJTSUBTSI-30No.

14.6. According to Mr. Muhammad Mumtaz Khan¹⁸⁸, Gate Operator, Taunsa Barrage "I was brought in by Consortium of Kurimoto Ltd. & Taisei Corporation (Japanese Company) who were engaged to install 28 gates on the left side of the Barrage as well as provide electronic opening system. After the Japanese left this year in March, I was retained by the I & P Department as there was no trained gate operator with the Department. The electronic gate opening system for the remaining gates was provided by the Chinese Company namely China National Electric Wire & Cable Import/Export Corporation (CCC), therefore, in the control room there are two different gate opening systems, one is provided by Consortium of Kurimoto Ltd. & Taisei Corporation and the other by China National Electric Wire & Cable Import/Export Corporation (CCC). I am in a position to operate both these operating systems. After the Japanese left the project I joined the Department on 17.07.2010 at the Barrage. **The electronic gate opening system was not working when I joined on 17.07.2010 and the control room was non-functional on 17.07.2010 and the gates were operated physically from the Deck of the Barrage.**"

14.7. According to Rai Hamid Mehmood¹⁸⁹, Executive Engineer, Taunsa Barrage "I took

¹⁸⁶ I.W. 73

¹⁸⁷ Ex.I.W.73/1

¹⁸⁸ I.W. 74

¹⁸⁹ I.W. 75

charge as Executive Engineer Taunsa Barrage on 3.9.2010. I have no knowledge when the control room stopped functioning. After taking charge, I informed Project Director, but there has been no development regarding the same.

14.8. According to Shafiq Ali¹⁹⁰, Deputy Director Electrical, PMO, "I was appointed on contract basis as Deputy Director Electrical with PMO on 02.05.2009. My assignment was to look after the electrical part of the rehabilitation work being carried out at the Taunsa Barrage which was supposed to have been completed in December, 2009. When I joined in May, 2009 the control room alongwith remote service of opening the gateways was operative. That after February, 2010, I visited the barrage once or twice, however, I was given other specific tasks and did not visit the Control Room. I, however, visited the control room on 01.08.2010 when I visited the barrage due to heavy flood. While at the barrage, I was asked to inspect the Control Room by the Head PMO and I found out on 01.08.2010 that the Control Room was not working. With the help of available staff by using UPS, we started the system, however, it was found that remote operation system in Control Room was not working due to some defect in the power relays in LCP (Local Control Panel) caused by voltage problems. After my inspection, I communicated my observations to Rao Muhammad Riaz, Director Mechanical PMO. The Director Mechanical then called Mr. Song of China National Electric Wire & Cable Import/Export Corporation (CCC) on the same day i.e. 01.08.2010 and informed him of the problem being faced in the Control Room. When the Control Room was taken over from Chinese by XEN (Barrage) even at that time it did not print out the data history stored in the memory of the system due to some bugs in the software. The Punjab Barrages Consultant (PBC) was also duly informed of this. Director Mechanical, PMO has taken up the matter with the Chinese company in writing. Roughly cost of the control room is **30/40 million.**"

14.9. **REPORT OF THE CONTROL ROOM - LOCAL COMMISSION:**¹⁹¹ On 11-10-2010 the Tribunal constituted a local commission headed by Malik Imran Shahbaz, Civil Judge 1ST Class, Kot Addu, Naseem Abbas, I.T. Expert, Lahore High Court, Lahore and Mr. Shafiq Ali, Deputy Director (Electrical), P.M.O. for Punjab Barrages. The Local Commission was directed to activate the Control System and obtain the data stored in the Data Memory of the System through a print out. The Commission visited the Control Room, Taunsa Barrage on 12.10.2010 and submitted the following report:

- i. HRC&DAS (Hoist Remote Control & Data Acquisition System) was not in operating condition and the Central Control Room was also locked at the time of our visit at Taunsa Barrage.
- ii. The system (HRC&DAS) was not under the control of any expert/technical/qualified person for its operation and maintenance purpose.
- iii. After hectic effort, partial data of 31.07.2010, 01.08.2010 and 07.08.2010 was

¹⁹⁰ I.W. 77

¹⁹¹ Ex I.W. 77 /1 - Appendix 5

collected. The perusal of said data showed that (HRC&DAS) was not functional during flood days and the computer was switched on for a short span of time by some untrained person and computer collected some partial and incomplete data on 31.07.2010, 01.08.2010 and 07.08.2010. It has been noticed that millions of rupees were spent on this project but the same was not used during the heavy flood days.

iv. The software applications i.e., EDC Service (Engineering Data Control Service) and EDMIS (Engineering Data and Information Manage System) were not working due to certain faults in software and hardware and the requisite information/data history could not be collected.

v. The partial data of the abovementioned dates was not collected in proper format (Software Generated Report), as the partially collected data was retrieved from the Log History File.

14.10. **STATEMENT OF PMO¹⁹²:** As reported by the Deputy Director Electrical PMO: "Hoist remote control and date acquisition system was installed at Taunsa barrage under Taunsa Barrage Rehabilitation & Modernization Project, ICB-Contract # 02 and the system was handed over to XEN Taunsa Barrage on February 05, 2010.

The electronic control room has multiple functions including;

- Monitoring of the barrage and canal gates, and associated hardware.
- Remote control of the barrage and canal gates.

The remote control function was performing satisfactorily at the time of system handed over to the barrage operators. The monitoring function also allows the storage of date and its retrieval. This function is accomplished through software and hardware. This module was also functioning but some software correction was required to be made for which suitable deductions were proposed by the Consultants and made good from the contractor's bill. Later the electronic control room Taunsa Barrage was checked on 1.8.2010 before the flood and flowing faults were found in the system:

a. Remote operation of the barrage gates was not functional due to faults developed in magnetic (contact) relays in the local control panels because of voltage fluctuations at site.

b. Water discharge calculation and monitoring date as displayed on the workstation terminal was also showing incorrect values due to incomplete data received through sensors.

¹⁹² Ex I.W. 7/4

Moreover, during the flood (after breach of LMB) out of the two power supply feeders for the barrage, one on the left bank was completely damaged and second feeder was severely disturbed having frequent and excessive shut downs and voltage fluctuations. The generators were, therefore, used making electric supply off and on frequently, which also caused more bugs in the software. With such interruptions the UPS system for central control room also developed faults. Software applications installed on the Workstation terminals i.e. EDC Service (Engineering Data Control Service) and EDMIS (Engineering Data and information Management System) are also not working. It may also be mentioned that the control room was understaffed as requirements for adequately qualified staff proposed by the consultants for proper functioning of the barrage control and monitoring system were not fulfilled. The electronic and computerize system is intricate. Suitable experts are being sought. However, two computer operators were appointed for central control room operation from July 21, 2010 on work charge basis having diplomas in computers. One died recently."

14.11. PMO submitted that it is to be noted that, at the time of taking over in February 2010, the system output printing module was found to be slow and unable to print quick changes in information. However, the remote control and data storage including display on workstation, was working satisfactory.

14.12. The Defect Liability Certificate (DLC) was therefore issued on March 30, 2010, with the condition that the contractor will rectify the problem within one month, with his guarantee cover extended. Later, on expiry of guarantee, an amount of **Rs.12,528,529/-** is still with the PMO. The system is highly complicated and the contractor had to get specialist form China which he could not due to local security uncertainties. The issue is still alive as a dispute to be resolved in the Dispute Review Board (DRB). The formation of DRB is in process and its recommendations will decide the issue. Due to above, the contractor's final payment certificate has yet to be finalized and the discharge certificate is still withheld. The finalization will be done after decision of DRB. The Contractor submitted his final statement to the Engineer and upon disagreement between the Engineer and the Contractor, the final statement was converted into interim payment certificate (IPC) No.27. One of the matter on which the agreement could not be reached was of control room. The tender rate of control room was **Rs.69,454,050/-** and the payment made in last interim payment certificate No.27 is Rs.55,263,240/. Due to above, the contractor's final payment certificate has yet to be finalized. The approval of the final bill has not been given and the discharge certificate is still withheld. The finalization of the process of final statement / bill will be done after decision of DRB. The Director Mechanical / Deputy Director Electrical information that the defect in the system occurred on 20.07.2010 as reported by Sub Engineer, Headworks Section. The Chinese contractor has promised to call the experts form China within 20-30 days to set right the system.

14.13. **CONCLUSION**

14.14. It is admitted that the Control Room is not functional. Inability to retrieve the record

of gate openings during exceptionally high flood makes it probable that the control room was never functional. During the exceptional high flood it would have been easier to control the gates through the control room rather than going up the deck and operating the gates. Secondly, it is also disturbing that PMO took over the charge of the Control Room without carrying out any pre-trial inspection. It also makes the role of the consultant dubious and irresponsible. This matter requires further investigation and a third party validation on the completion of the rehabilitation project at Taunsa Barrage.

15. POLITICAL INTERFERENCE

15.1. It has been alleged that the breaching section on the right side of the training works (RMB) was not operated in order to save the land of the Khosas and therefore the LMB was breached.

15.2. INQUIRY & FINDINGS

15.3. In order to address the above allegation, we perused the revenue record of Districts Muzaffargarh ad D G Khan to independently assess the location of land holding of the KHOSA Family. The land holding of Sardar Zulfiqar Khan Khosa and his family were identified and mapped to check their location from the Barrage and particular from the area upstream and downstream the RMB and the D G Khan Canal which could possibly have been the breaching site.

15.4. According to Muhammad Sohail Khawaja¹⁹³, District Officer (Revenue) D.G.Khan, a small portion of land is owned by Khosa family in *Basti Peer* and *Meeras Gurmani*. The other significant holdings of Khosa family are not close to River Indus and are in *Rakh Chabri Zareen* which is not a river affected Mauza. The largest landowners in District D.G.Khan are the *Legharis*, however, their land is not close to River Indus.

15.5. According to the statement of Farooq Bilal Khosa^{193-A} the holding of the Khosa family is in Basti Peer which is 5 to 6 k.m. downstream Taunsa Barrage and is far away from the river bank. He further deposed that lands of Sardar Zulfiqar Khan Khosa are in Mauza Bahadar Garh that is even further far away from the River bank. He deposed that Khosas had no land in the Pond Area or in the vicinity of the Link Bund.

15.6. Syed Saleem Ahmed Gillani¹⁹⁴ of the SYED family, cultivating land in the POND AREA on the right side of the Barrage stated: "I am of the view that no political interference by any of the political families in the area has been used resulting in the breach of the LMB. The cause of the breach is the unprecedented flood. Sardar Zulfiqar Ali Khan Khosa is a close family friend, however, he has no land in this area and has no business interest in our cultivation. It is not in my notice that any political family including Hanjra or Khar family have

¹⁹³ I.W.84

^{193-A} I.W.130

¹⁹⁴ I.W. 131 (s/o Syed Muhammad Akbar Gillani, Caste Syed r/o Sanjar Syedan, Tehsil Taunsa, District D.G. Khan).

recently played any active role in the appointment of officers i.e., XEN, SDO and SE at the Barrage."

15.7. On the basis of the above statements the record was perused and the following information was culled out:

Detail of ownership of Khosa Families¹⁹⁵:

| DETAIL OF OWNERSHIP OF KHOSA FAMILIES IN MAUZA CHAK BAHADUR GARH, TEHSIL & DISTRICT DG.KHAN | | | |
|---|--|----------|------------------|
| Sr.No. | Name of Owner | No.Khata | Land in Acres |
| 1. | Sardar Aurangzaib Khan Khosa s/o Sardar Taj Muhammad Khan Khosa | 120 | 62 Acres |
| 2. | Sardar Sher Nadir Khan Khosa s/o Sardar Taj Muhammad Khan Khosa | 139 | 42 Acres |
| 3. | Sardar Mohsan Atta Khan Khosa s/o Sardar Atta Muhammad Khan Khosa | 119 | 42 Acres |
| 4. | Sardar Ghulam Haider Khan Khosa s/o Sardar Atta Muhammad Khan Khosa | 49 | 61 Acres |

| DETAIL OF OWNERSHIP OF KHOSA FAMILIES IN MAUZA RAKH CHABRI ZAREEN TEHSIL & DISTRICT DG.KHAN | | | |
|---|---|----------|------------------|
| Sr.No. | Name of Owner | No.Khata | Land in Acres |
| 5. | Sardar Zulfiqar Ali Khan Khosa s/o Sardar Dost Muhammad Khan Khosa | 45-48 | 35 Acres |

¹⁹⁵ Mark 116

| DETAIL OF OWNERSHIP OF KHOSA FAMILIES IN MAUZA RAKH CHABRI ZAREEN TEHSIL & DISTRICT DG.KHAN | | | |
|--|---|-----------------|--------------------------|
| Sr.No. | Name of Owner | No.Khata | Land in Acres |
| 6. | Mst.Nadira Najam ud Din w/o Sardar Zulfiqar Ali Khan Khosa | 39-44 | 40 Acres |
| 7. | Sardar Hisam ud Din Khan Khosa s/o Sardar Zulfiqar Ali Khan Khosa | 46-47-50 | 40 Acres |
| 8. | Sardar Muhammad Muhayu-ud-Din Khan Khosa s/o Sardar Hisam ud Din Khan Khosa | 43 | 26 Acres |
| 9. | Sardar Muhammad Umar Khan Khosa s/o Sardar Hisam ud Din Khan Khosa | 42 | 27 Acres |
| 10. | Sardar Dost Muhammad Khan Khosa s/o Sardar Zulfiqar Ali Khan Khosa | 47-52 | 43 Acres |
| 11. | Sardar Muhammad Usama Khan s/o Sardar Dost Muhammad Khan Khosa | 51 | 29 Acres |
| 12. | Sardar Muhammad Samood Khan Khosa s/o Sardar Dost Muhammad Khan Khosa | 41-49 | 32 Acres |
| 13. | Mst.Zahra d/o Sardar Saif ud Din Khan Khosa | 40 | 35 Acres |



15.8. The plotting on the above map shows that the land of the Khosa are not in the vicinity of the barrage or fall in waterway of the proposed breaching section under the flood fighting plan.

15.9. Record also reveals that the river has a leftward flow and even of the breaching section on the right could have been operated the need did not arise as the water never touched the right marginal bund. There can be several different reasons for this one being the morphology of the river, the exceptional discharge, the closure of the right gates and also perhaps the zamindara bunds on the pond area on the rightside. However, we are satisfied that it wasn't the case where the breaching section could have been operated and was not operated.

15.10. We, therefore, hold that according to the evidence placed before us and on the basis of our own physical examination of the various locations at the Barrage show that no political influence was used to cause the breach of LMB or to resist the operation of the proposed breaching section. The lands of the Khosas do not fall within the watercourse of the proposed breaching section.

15.11. The only political influence that comes to fore is the possession of the Pond Area. Both sides of the Barrage and the illegal cultivation of the same. Except for Baryar family who have procured a stay from the Hon'ble Lahore High Court (discussed above) the rest of the families are cultivating the area with the strength of their economic and political muscle besides collusion with the officials of the I & P department.

16. ROLE OF CONSULTANTS

16.1. Taunsa Barrage was rehabilitated in the recent past with a cost of approx Rs. 11 billion. In this context the Tribunal has noted with concern the omission in strengthening and rehabilitating the embankments and the failure to identify a well-defined Breaching Section as part of the Rehabilitation & Modernization project.

16.2. **REHABILITATION OF EMBANKMENTS:** On November 12, 2010 the consultants were directed to elucidate, whether rehabilitation of embankments was included in their scope of services. The consultants reply submitted vide reference No.NDC/ADMN/1181 dated November, 22, 2010¹⁹⁶ carries the following :

- The consultants scope of services did include inter-alia, the adequacy of training/protection works.
-the consultants finalized the study report on fast track and submitted the draft feasibility for Taunsa on July, 03, 2004 for which consultants original assignment schedule was by December, 31, 2004.

¹⁹⁶ Ex I.W. 144/3

- The appraisal mission....endorsed the proposal of the preparatory mission of June, 2004 and did not include river training works.
- POE suggested that LMB should be raised for a flow of 100,000 cs (design flood for the barrage). Irrigation and Power Department and the Consultants are of the opinion that the marginal bund is now at level that would sustain 100 years flood. Hydraulic model studies are suggested.

16.3. During the proceedings Mr. Ijaz Ahmed Khan¹⁹⁷, Director, National Development Consultants, Lahore stated that:- “We have pointed out in the Executive summary of the feasibility report that the marginal bund would sustain 100 years flood which means that it is fit to handle 8,32,000 cs of discharge. Joint venture had, therefore, impliedly pointed out that training work was not up to the mark and required upgrading.”

16.4. INQUIRY & FINDINGS

16.5. The consultants have tried to prove that rehabilitation of the embankments and protection works could not be undertaken due to the role of the Donors and PID. In fact deployment of consultants was made, keeping in view of their technical expertise to assist the project. The consultants have admitted a crucial lapse on the design of the project and in keeping the embankments/protection works at a lower capacity i.e. 832, 000 cs in comparison to that of the main weir considered at 1,000,000 cs. The collapse of the LMB has disproved that assumption of the consultants. It also casts doubts on the professional ethics of the consultants.

16.6. **BREACHING SECTION AT TAUNSA:** The position paper dated November, 22, 2010 submitted by the NDC carries the following references:

- Consultants TORs...included, among other “studies of Breaching Section.”
- ... since the entire protection works...were excluded from the TOR...the breaching section also got excluded automatically.
- ...breaching sections can also cause heavy agriculture, infrastructure and livestock losses like those experienced in 1992 due to breaching of RMB of Trimmu Barrage.
- We feel that no new breaching sections be recommended and those already approved had to be reconsidered and replaced by properly designed bypass systems comprising spill weirs, conveyance channels and necessary cross-drainage structures.

¹⁹⁷ I.W.144

16.7. INQUIRY & FINDINGS

16.8. Change in the original consultants TOR is quite disturbing. We believe that the assumption of losses due to breaching section is not relevant. BREACHING SECTION is like a “safety fuse” and moreover the spill is routed through a pre-planned area, which is to remain clear and cause minimum damage. Obviously, the situation at RMB of Trimmu Barrage cannot be applied to Taunsa.

16.9. We consider that the consultants have been trying to present irrational reasons to cover-up their mistake.

16.10. *CONTROL ROOM.* With reference to status of the Central Room the consultants have presented in their reference dated November, 22, 2010

“The control room was functioning properly when the works were taken over by the Employer (PMO) at the end of December 2008. Since the staff deployed by the department needed further training hence the consultants had to instruct the contractor to keep operating the system with available staff of the Client to ensure effective hands on training. The Contractor remained at site until April, 21, 2010 and operated the system with available staff of the Client. When the reports came in February 2010 that the printing module is not working properly i.e. is slow, the Engineer asked the Contractor to rectify and they promised. But according to the contractor due to security situation, his specialist staff could not return to Pakistan. As reported by the barrage staff verbally, the control room displaying system except the Printing Module was working satisfactorily still July 20, 2010.”

16.11. To analyse the situation the tribunal has examined the “Consulting Services Agreement” between the PMO and Punjab Barrages Consultants signed during May, 2005. Appendix A which outlined the TOR with an initial cost of Rs.157.72 Million which was ultimately revised to Rs.186 Million during March 2010. It is quite odd that the scope of the Consultant's Services was curtailed and simultaneously the costs were enhanced. Items xii & xiii of Section 3.1 and items iii, iv, viii & ix of Section 3.2 of the Agreement provide as under:

SECTION 3.1.

- xii) Assist Employer/Client in taking over the contract work and prepare items of work to be completed by the Contractor during maintenance/defects liability period;
- xiii) Upgrade the existing “Operation and Maintenance Manual” to the international standards and provide 10 copies for the use of Employer/Client for operation and maintenance of the barrage. The O&M Manual will include an Instrumentation Plan and an Emergency Preparedness Plan. The Consultants shall also train the barrage operational staff in operationalizing the Operation and Maintenance Manual.

SECTION 3.2

- iii) Testing and commissioning of M&E equipment in association with the Employer/Client;
- iv) Measurement and verification of work quantities and certification of Contractors invoices;
- viii) Assist Employer/Client in taking over the contract work and prepare items of work to be completed by the Contractor during maintenance/defects liability period;
- xi) The Consultants shall ensure deployment of competent staff to supervise high-tech electrical/mechanical activities like installation of modern vibrating wire or such other piezometers, automated gate operation, etc.

16.12. CONCLUSION

16.13. The Consultants were fully responsible to verify proper performance of the Control Room and simple deduction of [Rs.12,528,529/-](#) from the final bill to accept the equipment with defects is highly questionable.

17. RECOMMENDATIONS (Taunsa Barrage)

17.1. On the basis of the inquiry and findings discussed in this chapter we **recommend** as follows:

Penalties

17.2. The Competent Authority to initiate departmental disciplinary proceedings against Secretary I & P Department¹⁹⁸ under relevant service laws for **inefficiency**.

17.3. The Competent Authority, on the basis of the inquiry and findings above, initiate process to terminate the contract of employment of Head PMO¹⁹⁹. The competent authority to initiate civil proceedings for recovery of damages against Head PMO for the loss caused to the life and property of the people of District Muzzafragarh and the loss caused to the Barrage.

17.4. Competent Authority to initiate departmental disciplinary proceedings against XEN²⁰⁰ under PEEDA ACT, 2006 for **misconduct and inefficiency**.

17.5. Competent Authority on the basis of the inquiry and findings above and the damages recorded in Chapter 7 (below) to initiate criminal proceedings under **sections 166, 167, 283, 322, 427 and 431 of PPC** against the above named Head PMO and XEN.

17.6. Till the conclusion of the departmental inquiry Mr. Rab Nawaz, Secretary I & P be immediately replaced, so that the Department does not face the next flood season (2011) under his stewardship.

17.7. To immediately suspend the above named XEN till the departmental action and the criminal proceedings are concluded.

17.8. That all the current assignments of Head PMO be withdrawn immediately and the role of PMO to be reconsidered by the Provincial Government. We recommend that the active management of the Barrages must remain with the C.E.'s concerned and the role of PMO should be restricted to rehabilitation work subject to the undermentioned recommendations.

17.9. Detail audit / third party validation of the Taunsa Rehabilitation Project to be conducted to assess the following in particular;

17.9.46. Whether, as planned, PMO gained experience and capacity during Taunsa Rehabilitation Project and is fully able to handle future Rehabilitation Work (

¹⁹⁸ Mr. Rab Nawaz

¹⁹⁹ Ghulam Hussain Qadri

²⁰⁰ Mr. Muhammed Munir Anjum

at Jinnah and other Barrages) independently without reliance on outside consultants? If not, why ?

17.9.47. Whether the taking over of the Rehabilitation Project from the contractors by PMO was in accordance with the contract ? whether the control room was taken over after due diligence and verifying the performance of the control room? If the audit reveals that there have been lapses, Government of Punjab to take strict action against the delinquents.

17.9.48. To verify and assess the purpose, reasons and results of the expenditure incurred on O & M of LMB and Sanawan Bund. If it is discovered that the said funds were squandered and did not serve any useful purpose the senior management incharge of the Barrage at the time be criminally prosecuted under the law.

Reform

17.10. A detail [Post Flood Report](#) along with all the post flood surveys and maps must be prepared so that a proper flood management strategy can be evolved for the next flood season.

17.11. Flood Manual (as a subset of an Integrated Flood Management Plan) be developed including instructions from the exiting flood fighting plans, Guidelines, Manual of Irrigation Practice (M.I.P), Sind Bund Manual and other related instructions available on the record. The flood managers to be put through proper training on the Flood Manual and all the flood managers to have a copy of the Flood Manual at all times.

17.12. Proper training and pre-flood rehearsals as instructed by the new Flood Manual shall be mandatory so that the flood fighting strategy is practical and functional prior to the actual floods.

17.12.1 I & P Department to develop an online [Flood Website](#) that gives real time details of the pre-flood preparation, flood forecasts, early warnings, flood fighting preparation and the flood relief work as it takes place. This will act as a good self-regulating tool for the I & P department and will be beneficial for the people.

17.13. Bund Management to be introduced. One option is to divide the long bunds into manageable segments and the vigilance and supervision of the said segments be delegated to the local residents who have their land abutting to the said embankment. These locals, having stake in the life and health of the said bund, can be officially nominated as "Bund Watchers" under law or policy, creating obligations and corresponding incentives. Obligations to regularly watch the health of bund (in their area) and regularly report to the Department. During flood season, be part of the flood fighting team of the I & P Department. Timely inform the department of any emergency so that breaches can be

avoided. In return, the Bund Watchers can be given incentives in the shape of crops, etc alongwith necessary communication tools (cell phones) so that they can timely inform the Department during floods and also act as early warning centres. Without local participation of the key stakeholders no effective monitoring can take place as I & P Department does not have the capacity to police bunds that run in several kilometers as has become evident in the Floods under inquiry.

Pond Area & Belas

17.14. I & P Department to develop in association with Wildlife & Fisheries Department, detailed POND AREA & BELAs Regulations for its management and supervision. POND AREA & BELAs to be properly mapped (through GIS) and additionally monitored through remote satellite sensing with the assistance of SUPARCO, WWF or the Urban Unit (P & D Department).

17.15. Revenue Record of the area to clearly identify and show the said areas to be POND AREA in use by the Wildlife and Fisheries Department. The Pond Area should be handed over to the Wildlife & Fisheries Department, who with the help of WWF and other reputable NGOs²⁰¹ should develop the Pond Area into a wildlife sanctuary.

17.16. Encroachments in the Pond Area should not be allowed at any cost and must be immediately cleared. These environmental pockets (Pond Area) must be protected and encouraged to support the growth of biodiversity and wildlife in the country. Pond Area can showcase a rich and wide range of wildlife, which needs to be encouraged. Technically, POND AREAS must remain free from human settlements and must be well regulated so that their service to the Barrage for maintaining the required pond level is never impaired.

17.17. I & P Department and the Wildlife and Fisheries Department will also allow public access to the Pond Areas (subject to regulation). This will encourage students and researchers from Universities and NGOs to carry out research of this rich biodiversity and multiple ecosystems.

17.18. Belas may be used as Eco-public parks (during limited hours and months) so that public can enjoy healthy entertainment and also get to know and learn from their rivers. Pond Areas and Belas to be incorporated in the Integrated Flood Management Plan.

17.19. The *zamindara* bunds or private bunds in the pond area to be immediately demolished so that there is no resistance to river water flowing into the pond area.

17.20. Provincial Government and in particular I & P Department shall vigilantly attend to [W.P. 4919/2009](#) pending at the Multan Bench, of the Hon'ble Lahore High Court, so that the petition is decided in accordance with law before the start of the next flood season i.e., 15th

²⁰¹ working in the related field.

June, 2010. The urgency in the matter shall be placed before the Hon'ble Lahore High Court, Multan Bench by the I & P Department through an appropriate application by making



CHAPTER 5

The Indus, which is warm, offers those who drink from it the courage and heroism of a lion.¹

JAMPUR FLOOD BUND & FAKHAR FLOOD BUND

1. INTRODUCTION

1.1. **JAMPUR BUND** is 51 Km long and was constructed during 1958 to protect Jampur Town National High Way and adjoining abadies, network of irrigation channels and important infrastructures from the flood of River Indus. Before the construction of this bund, vast cultivated area and thickly populated abadies came under the attack of river spill and damaged thousands of acres of standing crops, Jampur Town and National Highway². According to the flood Fighting Plan, 2010 Jampur Flood Bund (RD 0-170720) is a flood protection bund for the safety of Jampur Town, other allied abadies, irrigation network and other infrastructures³.

1.2. **FAKHAR FLOOD BUND**⁴ is 8 km long and is situated at right edge of River Indus and at a distance of 1 Km from Kot Mithan which is under administrative control of District Rajanpur. This Bund was constructed during 1990 to protect the city of Kot Mithan, adjoining abadies, fertile lands and network of irrigation channels. The Bund was constructed by Zila Council and handed over to Irrigation Department. **Its parameters are not in conformity with those prescribed by Federal Flood Commission.** The Chenab and Indus rivers have their confluence just a few kilometers upstream of this town and the accumulated water passes through this area. On 4th August, 2010, peak discharge of more than 1.20 million cusecs passed through this reach and attained a height more than the existing top level of the embankment. The observed level HFL was reported as RL 304.85 ft⁵ which resulted in overtopping and in the breach of the Bund.

1.3. Design parameters of the two flood embankments are as follows⁶:

| Sr. No. | Description | RD | Top width (ft) | Side Slopes | Designed Top level | previousH.F.L. |
|---------|-------------------|----------|----------------|-------------|--------------------|----------------|
| 1 | Jampur Flood Bund | 0-171000 | 20' | 3.1 : 2.1 | 378.0 | 373.00 |
| 2 | Fakhar Flood Bund | 0-25000 | 15' | 3/1.5 | 306.35 | 301.35 |

¹ Shane Mountjoy, Rivers in World History, The Indus River, Chelsea House Publishers, Philadelphia (2005)

² Ex I.W. 30/2

³ Flood Fighting Plan 2010, Jampur Construction Division, D.G. Khan (Ex I.W. 30/1)

⁴ Ex I.W.6/1 – Position paper of Secretary I & P.

⁵ According to the Flood Fighting Plan the designed Top Level of Fakhar Flood Bund is RL 306.35 – it is therefore confusing how overtopping took place at RL 304.85

⁶ Ex I.W. 30/1

2. NATURE OF BREACHES

| Sr. No. | Location | Design.. | Length of the bund | Date of breach | Time of breach | How was breach reported (name of the person officer) | Time & date when the officer of the Department reached the breached portion (brief explanation of the support / human resource/ machinery mobilized by the Department during this time) | Size of breach in meters. | Pre-flood inspection details (attach all the reports 2010) | Officers incharge during flood (name of the officers) | Detail work force and inventory of machinery employed at the bund prior to the breach as part of the flood fighting along with date and time. | Estimate cost of repair of the breach | Latest and last HFL at the breach (give years) | Total flow of water by the embankment prior to the breach |
|----------|--------------------------|---|--------------------|----------------|----------------|--|---|---------------------------|--|---|--|---------------------------------------|--|---|
| 1. | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| A | Jampur Flood Bund | | | | | | | | | | | | | |
| 1. | 11575 | Reach RD 5-25, Top width 16 ft with 3:1 side slope on both sides, top of bund Av. Level 372, HFL 367. | 170720ft. | 02.08.2010 | 9.30 a.m. | Relevant Officers / officials were present at site. | Relevant Officers / officials were present at site. | 9.45 | Attached. | Saifullah SDO, Mechanical Sub Division, Abid Rasheed, XEN: Jampur Construction Division. | 2 No. camp at RD 24 & 95 were fixed from 15 July 2010 well equipped by required flood watching & fighting material. 4 No. Tractor, 1 excavator with labour was hired through contractor from 31.07.2010. | 370.6 | | |
| 2 | 11610 | | | 02.08.2010 | 9.30 a.m. | | | 9.76 | | | | | | |
| 3 | 11715 | | | 02.08.2010 | 9.30 a.m. | | | 16.77 | | | | | | |
| 4 | 12000 | | | 02.08.2010 | 9.30 a.m. | | | 7.32 | | | | | | |
| 5 | 12500 | | | 02.08.2010 | 9.30 a.m. | | | 10.97 | | | | | | |
| 6 | 12730 | | | 02.08.2010 | 9.30 a.m. | | | 5.64 | | | | | | |
| 7 | 17500 | | | 02.08.2010 | 11.00 a.m. | | | 38.72 | | | | | | |
| 8 | 18430 | | | 02.08.2010 | 9.30 a.m. | | | 28.96 | | | | | | |
| 9 | 18565 | | | 02.08.2010 | 10.00 a.m. | | | 27.46 | | | | | | |
| 10 | 18655 | | | 02.08.2010 | 10.00 a.m. | | | 22.56 | | | | | | |
| 11 | 18780 | | | 02.08.2010 | 11.50 a.m. | | | 30.49 | | | | | | |
| 12 | 18900 | | | 02.08.2010 | 10.50 a.m. | | | 8.84 | | | | | | |
| 13 | 19010 | | | 02.08.2010 | 10.30 a.m. | | | 10.67 | | | | | | |
| 14 | 19326 | | | 02.08.2010 | 10.30 a.m. | | | 6.09 | | | | | | |
| 15 | 19463 | | | 02.08.2010 | 10.55 a.m. | | | 28.66 | | | | | | |
| 16 | 19669 | | | 02.08.2010 | 10.55 a.m. | | | 36.58 | | | | | | |
| 17 | 20400 | | | 02.08.2010 | 10.30 a.m. | | | 13.72 | | | | | | |
| 18 | 20450 | | | 02.08.2010 | 10.30 a.m. | | | 12.8 | | | | | | |
| 19 | 20500 | | | 02.08.2010 | 10.30 a.m. | | | 112.00 | | | | | | |
| 20 | 23250 | | | 02.08.2010 | 9.30 a.m. | | | 100.00 | | | | | | |
| 21 | 35500 | | | 02.08.2010 | 10.00 a.m. | | | 180.00 | | | | | | |

Jampur Construction Division, Dera Ghazi Khan,
Project Circle, Irrigation, Dera Ghazi Khan, D.G. Khan
Irrigation Zone, Dera Ghazi Khan.

| 16 | Detail of discharge at the time of breach | 17 | Reasons for the breach | 18 | Damage / loss caused | 19 | Current status and departmental plans for the future | 20 | Any other comments |
|--------------|---|----|--|--------------------|----------------------|----|---|----|---|
| 7300 cusecs. | | | There was sudden surge of 5-6 ft. water along the bund/ embankment composed of local treacherous soil & being dry on first wetting contracted. This caused arching action forming an open pipe and caused leakage as if an open connection existed from the water side to the outer side & eventually developed into breach. | Rs.20,000 million. | | | RD. 0 – 35500 has been restored temporarily. Permanent restoration is required. Department has prepared a plan for re-construction / rehabilitation of embankments according to the latest flood heights & criterion to be approved by FFC. | | RD. 0 – 35500 has been restored temporarily. Permanent restoration is required. Department has prepared a plan for re-construction / rehabilitation of embankments according to the latest flood heights & criterion to be approved by FFC. |
| Not assessed | | | | | | | | | Braches are restored temporarily. Permanent restoration / rehabilitation will be carried out after approval of FFC. - but the connection from |

| Sr. No. | Location | Design. | Length of the bund | Date of breach | Time of breach | How was breach reported (name of the person officer) | Time & date when the officer of the Department reached the breached portion (brief explanation of the support / human resource/ machinery mobilized by the Department during this time) | Size of breach in meters. | Pre-flood inspection details (attach all therelorts 2010) | Officers incharge during flood (name of the officers) | Detail work force and inventory of machinery employed at the bund prior to the breach as part of the flood fighting along with date and time. |
|----------------------------|----------|---|--------------------|------------------------|--------------------|--|--|---|---|---|--|
| 1. | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| B Fakhar Flood Bund | | | | | | | | | | | |
| 1. | 2-3 | Top width 15 ft: RL 306.35 HFL 301.35. | 24250 ft. | Breached on 04.08.2010 | 6.00 to 10.00 a.m. | Relevant Officer/s/officials were present at site | Concerned Officers/officials were present at site. 1 No. camp at RD.14 was fixed from 15 July 2010 well equipped by required flood watching & fighting material. 7 No. Tractor with trolleys, 1 No. excavator with labour was hired through contractor from 31.07.2010 | i. 4.57 ii. 24.39 iii.30.4 8 iv. 9.15 | Attached | Saif Ullah, SDO, Mechanical Sub Division, Abid Rasheed, XEN, Jampur Construction Division. | 1 No. camp at RD. 14 was fixed from 15 July 2010 well equipped by required flood watching & fighting material. 7 No. Tractor with trolleys, 1 No. excavator with labour was hired through contractor from 31.07.2010 |
| 2 | 3-4 | | | Breached on 04.08.2010 | 6.00 to 10.00 a.m. | | | 12.2 | | | |
| 3 | 4-5 | | | Breached on 04.08.2010 | 6.00 to 10.00 a.m. | | | 45.73 | | | |
| 4 | 5-6 | | | Breached on 04.08.2010 | 6.00 to 10.00 a.m. | | | 45.73 | | | |

| Estimate cost of repair of the breach | Latest and last HFL at the breach (give years) | Total flow of water by the embankment prior to the breach | Detail of discharge at the time of breach | Reasons for the breach | Damage / loss caused | Current status and departmental plans for the future | Any other comments |
|---------------------------------------|--|---|---|---|----------------------|--|---|
| Rs.6.33 million | 304.10 | 900000 cusecs in River Indus. | 240 Cs: 900 Cs: 1000 Cs: 400 Cs: 500 Cs: 1500 Cs: 3000 Cs: | The flood height at this site was more than the existing top level of the embankment by 1.5 ft and the water over flowed in between RD.0-6 & ultimately breached at different location within the | Note assessed. | Not restored to be restored on receipt of funds. Department has prepared a plan for reconstruction/rehabilitation of embankments according to latest flood heights & criterion to be approved by | Restoration / rehabilitation will be carried out after approval of PC-I by the competent forum. |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

RELIEF CUTS IN THE EMBANKMENTS,

Jampur Construction Division, Dera Ghazi Khan, Project Circle, Irrigation, Dera Ghazi Khan, D.G. Khan Irrigation Zone, Dera Ghazi Khan.

| 15 | 16 | 17 | 18 | 19 | 20 |
|----------------------------|---|---|------------------------|----------------------|--|
| Scattered, not measurable. | Total flow of water by the embankment prior to the relief cut | Detail of discharge at the time of breach | Reasons for the relief | Damage / loss caused | Current status and departmental plans for the future |

3. **DEPARTMENTAL WRITTEN SUBMISSION⁷:**

The super flood, after crossing Taunsa, engaged the protection bunds in DG Khan, Rajanpur and Rahimyar Khan Districts with discharges of 1.20 Million cusecs (according to the statement of the XEN the flood was around 7 lac cusecs at the time of the breach⁸). The situation became more critical due to continuous heavy rainfall and high flows in hill torrents. Strenuous efforts were made to save the bunds through day and night watching.

3.1. However, Jampur flood bund and Fakhar Flood bund could not withstand the thrust of flood water and breached, inundating the towns. The causes of breaches in Jampur and Fakhar Flood Bunds, details of relief cuts and details of staff or machinery deployed, as reported by Chief Engineer Irrigation DG Khan are given below⁹:

3.1.1. Jampur flood bund has been constructed on the right side of Indus River to protect Canal infrastructure, roads & Jampur town & other small village abadies on the right bank of the river. The length of the embankment is RD 170+000 and it is composed of local treacherous soil. The second defence embankment named as Gaddan Bund is also in place having a length of **19,500 ft** to take care of high flood events, besides a wetting channel covering a partial reach from RD 38 - 54 which is non functional. The existing parameters of the embankments are not in conformity with those prescribed by the Federal Flood Commission.

3.1.2. On 2nd of August, when high flood was passing downstream Taunsa - Guddu reach, there was sudden surge of 5-6 ft of water which accumulated and started running parallel along the embankment between RD. 0 - 35. The soil was completely dry and first wetting resulted in cracks / arching action forming an open pipe and at first wetting water flowed out as if an open connection existed from the water side to the land side washing out the soil and eventually developed into several breaches (19 nos.) between RD. 11 - 24 and one at RD. 35. This reach is without any wetting channel although the soil is poor in nature and treacherous.

3.1.3. The Sub Divisional Officer, Mechanical Sub Division, Sheikh Saifullah along with supervisory staff engaged the contractor and deployed 1 No excavator, 7 No. front blade tractors besides labourers and made strenuous efforts to plug these gaps, but the continuous precipitation / rainfall hampered the activities and the machinery could not work because of slippery conditions.

3.2. **Fakhar Flood Bund:** 3 Nos. excavators and 14 Nos. tractor trolleys were engaged to take care of the eventuality and departmental functionaries Executive Engineer, Abid Rasheed, SDO, Aga Ihsanullah alongwith S.ENG were on the spot but the tragedy could not be averted as the bund could not sustain the onslaught of gushing flood water. Most part of

⁷ EX I.W. 6/2

⁸ I.W.30

⁹ Ex I.W. 6/1

the town is situated between RL 298 to 304 ft i.e., below the observed HFL. After the receding of the flood, relief cuts were made at RD 6-7, 8-9 & 12-13 to drain off the water.

4. PRE FLOOD INSPECTION OF JAMPUR AND FAKHAR FLOOD BUNDS.

4.1. I & P Department constituted Team no. 3 comprising Ehsan Ahmed Khan, XEN and Abdul Rashid Alam, S.ENG for Pre-flood inspection of the Bunds and Spurs of D.G. Khan, Irrigation Zone on Jampur Flood Bund (17100 feet) and Fakhar Flood Bund (25000 feet) which flows in Jampur Division, D.G. Khan. Pre flood inspection report is as follows:

“Keeping in view the history of post flood events, since construction of flood protection embankments along the right side of river Indus at strategic points, no untoward incident has occurred except damages to groynes, riverside slope, apron, pitching of training works. **However, damages to top of bunds and side slopes due to trespassing and heavy rain needs immediate restoration. There are 235 encroachments on the flood embankments which require immediate attention.**”

4.2. INQUIRY & FINDINGS

4.3. Pre-inspection Report of the Departmental Committee shows that the Bund did not meet the design criteria prescribed by FFC and was in a state of total disrepair. There is nothing on the record to show that these observations and concerns of the Pre-inspection Committee were addressed. It appears that the departmental pre-inspection is a inchoate, mechanical and a half hearted exercise which carries no credibility or weight.

4.4. There is no central control system within the I & P Department that ensures that the weaknesses highlighted in the Pre-Flood Inspection Report are removed before the flood season. It appears that the office of Chief Engineer (Drainage and Floods) is the central office for all flood related matters but its performance in the recent floods and the deposition of the C.E. (D & F) before the Tribunal has shown that this office is miserably incompetent, disturbingly ineffective. In fact, the said office is practically oblivious to the preparedness and capacity of the flood fighting field formation of the I & P department. Chief Engineer (D & F) has cut a sorry figure before us. I & P Department has not placed any document on the record to show the deficiencies pointed out in the departmental Pre-Flood Inspection Report were plugged before the commencement of the flood season.

4.5. According to the Flood Fighting Plan, 2010¹⁰ the flood fighting strategy for the above mentioned embankments was that by 1st of June, the strength of the existing establishment was to be doubled to clear the jungle on slopes and toe of the embankments. Emphasis is laid to locate and puddle the holes of the burrowing animals in order to ensure the safety of the embankments. During floods, upon receiving the forecast, the Sub-Divisional Officer and Sub-Engineer Incharge shall shift their headquarters at site. The staff is to be equipped with

¹⁰ OF JAMPUR CONSTRUCTION DIVISION, DERA GHAZI KHAN – Ex I.W. 30/1

torches, gunny bags, kassies, etc to control seepage / leekage in the embankments. During exceptionally high flood stage the heavy earth moving machinery (Bull Dozers) of the Machinery Circle are to be kept ready and placed on alert at vulnerable sites of Jampur Flood Bund i.e., RD 26, 54 and Fakhar Flood Bund i.e., RD-12000.

| | | |
|---|---|-------|
| 1 | Jampur Flood Bund RD-24000-95300-104850 | 3 No. |
| 2 | Fakhar Flood Bund RD. 14000 | 1 No. |

4.7. According to the Flood Fighting Plan, labour required during flood fighting is as follows:

Jampur Flood Bund (RD 0-71000)

| Sr. No. | Description | Total |
|---------|---|--------|
| 1. | Mistri | 1 No. |
| 2. | Mate | 1 No. |
| 3. | Regular Seasonal Beldar | 5 No. |
| 4. | Additional Watching Establishment Mate / Beldar | 49 No. |
| 5. | Gauge Reader | 2 No. |

Jampur Flood Bund (RD 71-171000)

| Sr. No. | Description | Total |
|---------|---|--------|
| 1. | Mistri | - |
| 2. | Mate | - |
| 3. | Regular Seasonal Beldar | 7 No. |
| 4. | Additional Watching Establishment Mate / Beldar | 75 No. |
| 5. | Gauge Reader | 2 No. |

Fakhar Flood Bund

| Sr. No. | Description | Total |
|---------|-------------|--------|
| 1. | Beldars | 15 No. |
| 2. | Mate/Mistri | 1 No. |

4.8. The Pre Flood Inspection Report gives a long list of 207 encroachments on the Jampur Bund. The Tribunal traveled the entire stretch of Jampur Bund (entire 51 k.m.) on 6-11-2010 and found the bund encroached with clusters of unlawfully built dwellings and houses on the bund appearing after intervals as we drove over the embankment. No efforts were made to remove the said encroachments. The embankment also appeared unkempt and neglected.

4.9. There is no follow up action on the record to show that after said pre- inspection done in May, 2010, the 207 encroachments were removed or damaged embankments and side slopes, repaired.

4.10. According to Mr. Abid Rasheed, Executive Engineer, Jampur Construction Division, D.G. Khan¹¹ “there was a pre-flood inspection of the Bund in the month of May and June done by me, however, no inspection report was prepared or filed by me. I was incharge of three bunds namely, Jampur Bund, Fakhar Flood Bund and Rojhan Flood Bund and I was myself stationed at Fakhar Flood Bund.” It is surprising that a Pre Inspection Report did not follow the pre inspection allegedly carried out by the XEN. The statement of the XEN therefore does not inspire confidence.

4.11. It is noted that Mr. Abid Rashid, Executive Engineer, had no past experience of the bunds and being Mechanical Engineer by training was handed over the charge of not one but three major bunds including Jampur and Fakhar Flood Bunds. It was a serious lapse to have expected the said XEN to effectively carry out flood fighting as he had no experience of the same.

4.12. The Executive Engineer¹² further submitted that the manpower employed at Jampur Bund was 2 Sub- Engineers, 1 Sub Divisional Officer, 5 Baildars, 1 Mate and 1 Mistri. The breach took place at RD 12 between 09.00 to 10.00 a.m. It is stated that the water flowing in the river alongside the bund was 7 lac cusecs between 09.00 to 10.00 a.m. on 2.8.2010. According to the flood fighting plan 49 persons were required to be mobilized during floods, however, he failed to arrange the same. The water touched the bund at night on 1.8.2010 and all the breaches took place (19 in all) at 10:00 a.m. next day i.e., 2.8.2010. The XEN submitted that : “I think the main problem with the bund was that there was no wetting channel, however, this was not pointed out by me in PC-1 prepared in the year 2008 or highlighted by me to the Department in the pre-flood inspection report or otherwise. I had no earlier experience of managing bunds. I have done Mechanical Engineering and remained Incharge of Machinery Sub Division; however, the Department had posted me on the bund for the recent floods.” *(emphasis supplied)*

4.13. The Tribunal posed the XEN the following questions:-

Q. 1 *How did two sub Engineers inspect and observe 72 km [actually 51km] long*

¹¹ IW-30

¹² (Ibid)

bund?

Ans.1 The Sub Engineers used their personal motorbikes to inspect the bund personally.

Q.2 *At what time was seepage pointed out on RD-12 (Jampur Bund) and who pointed out the seepage?*

Ans.2 The seepage was identified by one Baildar, (at present I do not remember the name of the said Baildar), who informed the Sub Engineer Mr. Tufail Rizvi, who then informed me. We tried but could not control the flowing water and breach took place. At the same time there was heavy rainfall, which disturbed our flood fighting plan. The breach took place at 10:00 a.m. The first breach was at RD-12 at 10:00 a.m.; thereafter **18** other breaches took place.

4.14. According to the Chief Engineer, Irrigation, D.G. Khan Zone¹³, "I also reached Jampur Bund at 9.30 am on 02.08.2010, however, at that time rain had started and the seepage could not be redressed resulting in breaches at 11-RD to 35-RD. **One of the reasons is that for the last 15 years the water had not touched the Bund besides the said Bund had no wetting channel.** There is no procedure or SOP provided for the relief cuts in the Irrigation Department which were made on the spot under the direction of SDO or XEN whoever was present. The community, mostly present at the time of any relief cut, gets involved but there is no written procedure stating that community has to be involved and their consent is to be sought before making relief cuts."

4.15. According to the Chief Engineer as far as Fakhar Flood Bund is concerned, the breach was a result of overtopping. The estimated cost of damage to Jampur Bund breach is around Rs 20 million and of the Fakhar Flood Bund is **Rs 5 million**, respectively. The Chief Engineer also pointed out that the design of Jampur Bund and Fakhar Flood Bund is not in accordance with the design and layout prescribed by Federal Flood Commission.

4.16. It has been admitted by the XEN¹⁴ that the labour as required under the Plan could not be arranged.

4.17. It has been stated that due to heavy rainfall on the 2nd of August, 2010 the so called flood fighting could not be effectively carried out. According to the weather conditions given in the Daily Log Book of Taunsa Barrage (see Chapter 4) there was no rainfall and shows "cloudy" weather on 2-8-2010.

4.18. One XEN has been given charge of three main embankments. Even a team of 12 marked for Jampur Bund or Fakhar Flood Bund cannot possibly monitor or carry out effective watching of the entire embankment. The C.E who traveled with us on the

¹³ IW-23

¹⁴ I.W.30

embankments could not explain how seepage was detected and reported. It is, therefore, safe to assume that the department was informed much later, perhaps after the breach. **The time of breach being 9:30 am (2-8-2010) carries little credibility or if the breach did take place at 9:30 am then the presence of the XEN and others is highly doubtful.**

4.19. There is no system of attendance during the floods. The flood warning was given out on 29th of July, 2010. Breach took place at Jinnah Barrage on 29th July, 2010. There is nothing on record to establish that the flood fighting strategy was put into action and watching staff had started doing their rounds and the flood fighting material was put out, that the machinery was deployed and the I & P Department was ready to receive the floods. Quite on the contrary there was total inaction on the part of the Department and no steps had been taken. It appears that the officers were pulled out of their slumber after the breach. The post flood narrative submitted before the Tribunal by the I & P Department carries little credibility.

4.20. We traveled on Fakhar Flood Bund and Jampur Bund by car¹⁵. It was a difficult journey in November (2010) when the water had subsided. It is, therefore, not clear to us how flood fighting equipment and machinery could be transported to the critical points on the Bund in the hour of need. The impression given to us by the officers concerned that the machinery was mobilized and the flood managers were present on the spot before the breach took place is not likely and does not inspire confidence.

4.21. How were the I & P Department informed of the breach or likelihood of the breach ? how was the machinery mobilized on a 51 km bund? Who were the officers who managed to cover the entire embankment ? how is it to be ascertained that the officers named were on the spot at 930am ? These questions remained unanswered and it appears that a fabricated story had been concocted to cover the absence of the I & P Department. A post flood stage was set up to show to the Tribunal that all the pre flood preparation was in order but the exceptional size of the discharge caused the breach. We disagree totally. It is poor prevention, vigilance and sheer incompetence of the department that resulted in the damage.

4.22. We are of the view that the present Flood Fighting Plan is no more than a mere theoretical narrative, which has fundamental flaws and is difficult to execute. The Plan fails to provide the strategy to monitor the entire Bund. It is also not difficult to accept that during the time of exceptional high flood, finding labour would be close to impossible. There is also no system through which the department is to be notified of a leakage or seepage in any part of the embankment. The pre-flood inspection on motorbikes looking for burrowing holes is not possible.

4.23. Jampur Bund is around 51 K.M. long and there appears to be no monitoring system in place, firstly numbers of people required as per flood fighting plan were not present on the

¹⁵ in Pajero and Land Rover Jeeps

said bund. While traveling on the said bund we noticed a number of encroachments, which were not removed post pre-inspection report and the matter was not taken up in discussion in any pre-flood meeting at the Provincial level. In any case, it is not possible for staff of 9 to 10 officers to monitor and manage 51 k.m. long embankments. The statement of Mr. Abid Rashid, XEN that the entire bund was inspected on the motorbikes by the S.ENGs does not appear to be correct on the face of it, but even if it is considered to be correct it is not possible for the S.ENGs traveling on the Motorbike to spot rat holes on the sides of the embankments.

4.24. It is repeatedly pointed out that water has not touched the embankments since 1992 and wetting channels should have been provided, but no said request was earlier made by the Chief Engineer, XEN or the SDO. No request was made regarding the facts that the embankments are not in accordance with design criteria laid down by the FFC.

4.25. While traveling on the Jampur and Fakhar Flood Bunds, the Chief Engineer who traveled with us expressed his inability to remove the encroachments. There is no mechanism to note the presence or performance of the said officers assigned or posted at the Bund. There is no reporting system in this regard.

4.26. Post Flood the Department has proposed PC-1 which states that since the construction of the Jampur Bund (in 1958) **no major repair work has been carried out**. Top level of the embankments has been deteriorated due to excessive trespassing. **At present the existing bund is short of its designed parameters and cannot face high flood**. Hence raising of Jampur Flood Bund according to FFC parameters is essential to avoid any dangerous situation during flood season¹⁶. In case of Fakhar Flood Bund PC-1 proposes raising and widening of the said bund in order to avoid any future mishap i.e., the top bund to be increased from 15ft to 20 ft and free board from 5ft to 6ft as approved¹⁷.

4.27. CONCLUSION

4.28. We are of the view that the Flood Fighting Plan was not followed. The person incharge being a mechanical engineer with no Bund experience was handed over three Bunds to manage during the recent floods. The problems of encroachment and repair raised in the pre-flood inspection were not addressed. It was reported that 19 breaches took place however not a word appears in how the said 19 breaches were fought. We are of the view that breaches had already taken place when the department reached the site. There was no system of communication shown to us whereby breach in any reach of the embankment could be timely reported to the Department. The level and potential of preparedness of the I & P Department to respond to the flood emergency is seriously missing. Nothing has been shown to us to establish that the farthest reaches of Jampur or Fakhar Flood Bunds could be approached within a certain period of time when the seepage or leakage was identified. On the whole the Irrigation Department were caught unaware and stood unprepared and

¹⁶ PC-1 (I.W.30/2)

¹⁷ ibid.

numbed as the flood passed by. The Department and its flood fighting team had no clue what to do. They didn't even flow their own flood fighting plan, no matter how good that was. The heroic flood fighting tales narrated post flood by the officers of the D.G.Khan Zone of the I & P Department have no truth in them.

4.29. From the above, it appears that the Flood Fighting Plan, 2010 regarding embankments is seriously flawed and cannot attend to any breach that takes place during the flood season. One XEN (with a background in mechanical engineering) handling three major embankments is just not humanly possible. It cannot be expected of an SDO to carry out a pre-inspection of 51 k.m. embankments on a Motorbike. The absence of the wetting channel and the flaws in the design parameters as laid down by the FFC are not justifiable. We, therefore, feel that there has been total failure of governance as far as the management of Jampur and Fakhar Flood Bunds are concerned which borders on criminal negligence and serious dereliction of duty.

¹⁵ in Pajero and Land Rover Jeeps

5. RECOMMENDATIONS

Penal

5.1. The encroachments on the embankments and the repairs identified by the Report of the Departmental Pre-Flood Inspection Committee were never plugged or attended to. It was the responsibility of the Secretary I & P¹⁸, C.E¹⁹, C.E.(D & F)²⁰ and XEN²¹ to have ensured the compliance of the Pre Flood Inspection Report. None of the officers bothered to do so. We, therefore recommend initiation of disciplinary departmental proceedings against the abovementioned officers for **inefficiency** under the relevant service laws.

5.2. The XEN²², SDO²³ and S.ENGs²⁴ did not implement the Flood Fighting Plan. There were no watching huts, no machinery deployed and there was no evidence that flood fighting material was brought to the bund to fight the flood on 2-8-2010. We therefore recommend the competent authority to initiate disciplinary departmental action against the above officers for **misconduct and inefficiency** under PEEDA Act, 2006 on the basis of the inquiry and findings of this Report.

Reform

5.3. The entire concept of flood fighting relating to embankments has to be revisited. The existing "cut and paste" flood fighting plan from yesteryears will not do.

5.4. A detailed exercise has to be undertaken to develop innovative ways of flood fighting on long embankments. The option discussed in the recommendations under Taunsa Barrage (Chapter-4) may be read as an integral part of these recommendations.

5.5. The embankments ought to be GIS mapped and constantly monitored with the help of SUPARCO in addition to the on spot physical supervision of the locals.

5.6. The embankments must provide for wetting channels alongwith the necessary infrastructure to keep the said channels functional.

5.7. The embankments must be brought in conformity within the design criteria laid down by FFC.

5.8. Flood Fighting Material and machinery must be shifted to vulnerable points at the

¹⁸ Rab Nawaz

¹⁹ Mehr Muhammed Amin

²⁰ Rafique Ahmed

²¹ Abid Rashid

²² Abid Rashid

²³ Sh Saifullah.

²⁴ Tufail Rizvi, Muhammed Bilal Ali, Ejaz Hameed, Muhamemdn Ali, Asif Mehmood Fida and Muhammed Rafique Gabol

start of the flood season so that it can be speedily operationalized in the hour of need. Huts or sheds for housing the said materials and machinery on the strategic spots along the embankments must be clearly mapped and set up in every flood season.

5.9. Flood fighting rehearsals must be undertaken every year at the start of the flood season.

5.10. Appropriate number officers corresponding with the length of the embankment must be posted on each bund.



CHAPTER 6

The Indus is bigger then any river in Europe... This was the river which Alexander crossed with his army, and so entered India.¹

LMB OF GUDDU BARRAGE CAUSING DAMAGE IN PUNJAB

1. INTRODUCTION

1.1. A portion of the LMB of Guddu Barrage extends into Punjab. Any damage to the said LMB affects the residents of District Rahim Yar Khan (Bhong City) as happened in the recent floods. We therefore felt it necessary to inquiry into the mechanism of supervision of the said LMB and the level of coordination and understanding between I & P Departments of Punjab and Sind.

2. LMB OF GUDDU BARRAGE CAUSING DAMAGE IN PUNJAB²

2.1. Left Marginal Bund is an integral part of Guddu Barrage and falls within the jurisdiction of Irrigation & Power Department, Government of Sindh. LMB from miles No.6-16 (10 Miles) is located in Province of Punjab. However, the entire LMB 0-16 miles is maintained and managed by the Irrigation & Power Department, Sindh. During exceptional high flood of August 2010 LMB was breached at the following locations:-

| S. No. | Location / RD | Detail of Breach |
|--------|---------------------------------|------------------|
| 1 | 9 mile 6 furlong of LMB | 110 feet |
| 2 | 10 mile 1 furlong of LMB | 140 feet |
| 3 | 10 mile 4 furlong of LMB | 180 feet |
| 4 | 10 mile 5 furlong of LMB | 200 feet |
| 5 | 13 mile 1 furlong of LMB | 250 feet |

2.2. Breaches of LMB Sr. No.1 to Sr. No.4 were closed by Irrigation & Power Department, Government of Sindh and breach which occurred on 8.8.2010 opposite Bhong Town at 13 mile & 1 Furlong were closed by the Irrigation & Power Department, Government of Punjab.

¹ Arrian, Anabasis Alexandri, c. 145 CE

² Mark 122

2.3. The flood flow from these breaches affected the population areas of R.Y. Khan District. The flood entered Bhong Town and also Bhong Distributory System. The flood water inundated large area and damaged villages, crops and other infrastructure of Tehsil Sadiqabad of District Rahim Yar Khan. The flood water also affected Karachi – Lahore National High Way thereby disrupting the flow of traffic. Vide direction of the Secretary, Irrigation & Power Department, Government of the Punjab dated 16.08.2010 the breach in the LMB at 13 mile 1 furlong was closed by the Chief Engineer Bahawalpur. Total **33,345 Acres** were inundated due to the said flood water.

¹ Arrian, *Anabasis Alexandri*, c. 145 CE

² Mark 122

2.4. Brief detail of the flood as given by the Chief Engineer, Bahawalpur Irrigation Zone is as follows:-

- High flood was received on 31.07.2010 at Chachran Town and gauge was 10.20 ft. with the discharge of 8 lac cusecs.
- On 2.8.2010 gauge was 11.5 ft with discharge of 10 lac cusecs;
- On 3.8.2010 the flood turned into exceptional high flood with gauge at Chachran 12.6 ft with the discharge of 12 lac cusecs.

2.5. Finally, the reduction in flood was observed from 10.08.2010 to 12.08.2010. The flood rose again on 13.08.2010 and remained up till 23.08.2010 in exceptional high flood position. Later on the flood subsided and it became normal on 6.9.2010. Chachran gauge reached its highest at 14.6 feet on 07.08.2010.

2.6. *BREACH OF LMB AT GUDU BARRAGE (falling within Punjab)*

2.7. Chief Engineer, Irrigation Gudu Barrage Region Sukkur³ has submitted the Flood Report, 2010⁴ wherein following facts have been highlighted:-

2.7.1. At Gudu Barrage the normal flood was upto 18.07.2010. The river was in low flood from 19.07.2010 to 03.08.2010, then it entered in medium flood from 3.8.2010 to 04.08.2010. It remained in high flood level from 04.08.2010 to 05.08.2010 and crossed in very high and super flood stage on the same day i.e., on 5.8.2010. The river discharge of super flood on 05.08.2010 was recorded at 12:00 mid night to 20.08.2010 at 04:00 p.m. with maximum 1st peak of 11,48,738 cusecs on 08.08.2010 at 11:00 a.m. and 2nd peak of 10,76,728 cusecs on 16.08.2010 at 06:00 p.m. After 20th August 2010 the flood slowly subsided.

2.8. The contribution of Hill Torrents of Sulaiman Ranges below Taunsa Barrage on 8.8.2010 was 240,625 cusecs of eight main hill torrents namely Kaha, Chechar, Vidore, Sori Lund, Sakhi Sarwar, Vehova, Sanghar, Kaura HWT.

2.9. Pond level was kept 1.7 ft below the pond level maintained for regulation in order to accommodate the flood water. Hence no difficulty was experienced at Barrage during super flood and discharge passed smoothly. Upstream left marginal bund falls within Punjab (Districts Rahim Yar Khan & Rajanpur). According to the report since 1999 the river discharge remained less than 6 lac cusecs and main current was on right side, but due to sudden increase in flood discharge upto **1,148,738 cusecs**, the main current was shifted to center and the pressure was increased on left side. The left marginal bund was covered by local Zamindara Bund for several years from mile 8/0 to mile 15/7. It was apprehended that "since the bund is privately constructed, therefore, no river bund specifications have been observed and it is always vulnerable at high discharges and in case of failure the population

³ Mark 29

⁴ Mark-29

and cultivation contained in that bund will be damaged but also it is very likelihood⁵ (sic) that the gushing water may below out the left marginal bund." [These apprehensions were communicated to the Secretary, Irrigation & Power Department, Government of the Punjab as well as the Chief Engineers of D.G. Khan Zone and Bahawalpur Zone, but no positive response was received.](#) The apprehension became true when Zamindara Bund breached on the night of 6th and 7th August, 2010, water attacked the main LMB in the night of 7th and 8th August, 2010 between 01:00 a.m. to 04:00 a.m. At 13/0 water overtopped the bund which resulted in breach and remaining 04 leaks developed into breaches at mile 9/6, 10/1, 10/4 & 10/5.

2.10. The works on the breaches were started on 12.08.2010 and all the breaches were plugged upto 22.08.2010 during super and very high flood 2010. It has been suggested in the report 2010 that the Zamindara Bund should be removed alongwith illegal pipes. Since LMB is within Bhong city its width should be increased from 20 ft. to 40 ft.

2.11. Formulation of joint strategy between the two provincial flood managers could have lead to better prevention and effective flood fighting. The resulting damage caused in District Rahim Yar Khan could have been be avoided.

2.12. One of the most common omissions that has surfaced during these floods is the absence of wetting channels. The embankments like Jampur Bund have been dry for years and therefore failed to withstand the watery onslaught.

3. RECOMMENDATIONS

3.1. I & P Department shall immediately⁶ take up the issue of removal of Zamindara Bund, the illegal pipes and other ancillary matters with I & P Department, Sind so that the LMB is properly repaired, Zamindara bund and other impediments should be removed before the start of the flood season 2011. This is essential for the security for the people of Rahim Yar Khan and for the safety of their assets.

3.2. I & P Department to keep an active liaison with the I & P Department, Sind as well as with the administration/management of Guddu Barrage so that a joint flood fighting strategy can be developed for the LMB extending into Punjab.

3.3. A mechanism⁷ between the two Irrigation Departments to be evolved for the future so that issues get expeditiously resolved.

⁵ should be "likely"

⁶ before the start of this flood season

⁷ by constituting an Inter provincial committee or panel of Irrigation officers and experts.



CHAPTER 7

Between Kalabagh and the sea the river gives life as water, to human beings, animals and crops. It also gives death in its catastrophic floods.¹

LOSS CAUSED BY THE RECENT FLOODS IN PUNJAB

1. INTRODUCTION

1.1. During the course of inquiry various departments reported the loss recorded by them in the recent floods. We have documented these figures for three reasons: first, they tend to sharpen the gravity of the tragic event for the readers of this Report. Second, it provides evidence to initiate departmental and criminal proceedings against the delinquents. Third, this document will be useful in formulating future policies.

2. DEPARTMENTAL POSITIONS

2.1. **REVENUE DEPARTMENTS:** Revenue departments of the under-mentioned Districts appeared and placed before us the details of the loss suffered:

2.2. **DISTRICT MIANWALI²:** Total number of houses is 11,093 out of which 5,986 have been damaged which are 54% of the total number of houses. The human mortality during the recent floods was 12³.

2.3. **DISTRICT D .G.KHAN⁴:** has two tehsils namely: Taunsa and D G Khan. In D.G.Khan District 10,152 houses have been damaged partially while 37,892 houses have been fully damaged. The total area affected in Acres is 516,126 and persons affected are 166201, total number of affected villages is 619. There is no Bund alongside Indus River in the entire District except Sheri Bund which is also called Jampur Bund when it runs into District Rajanpur. Portion of the said Bund in District D.G. Khan was not affected in the recent floods.

2.4. Report on loss/damage to crops and houses due to recent floods-2010⁵.

¹ Jean Fairley- The Lion River- The Indus.

² Ex I.W. 85/3

³ MARK 92

⁴ I.W. 84

⁵ EX I.W. 84/3

| Sr.# | District | Villages affected | Persons affected | Area affected (acres) | Cropped Area affected (acres) | Houses damaged | | Govt. Building damaged |
|------|-----------|-------------------|------------------|-----------------------|-------------------------------|----------------|-------|------------------------|
| | | | | | | Partially | Fully | |
| 1. | D.G. Khan | 619 | 166201 | 516126 | 329235 | 10152 | 37892 | 255 |

2.5. Damages caused by hill torrents/ rains in tribal areas of the district⁶:

| Total No. of Villages | Total Affected families | Houses damaged | | Area / Crop affected |
|-----------------------|-------------------------|----------------|-------|--|
| | | Partially | Fully | |
| 335 | 6823 | 2703 | 5731 | The land being Shamlat, the losses of crop / land cannot be ascertained. |

2.6. Summary of katcha & pacca houses damaged⁷.

| Name of Tehsil | No. of Villages Affected | No. of Houses Damaged Partially. | | No. of Houses Damaged Completely. | | Total House damage |
|----------------|--------------------------|----------------------------------|--------|-----------------------------------|--------|--------------------|
| | | PACCA | KATCHA | PACCA | KATCHA | |
| D.G. Khan | 159 | 281 | 901 | 1360 | 14589 | 17131 |
| Taunsa | 122 | 160 | 1202 | 79 | 8991 | 10432 |
| Total | 281 | 281 | 2103 | 1439 | 23580 | 27563 |

2.7. **DISTRICT MUZZAFARGARH⁸**: According to the District Officer (Revenue) Muzaffargarh, major portion of the damage (90%) is caused due to breach in the LMB while the remaining 10% damage has been caused by the exceptional high flood.

| | | |
|----|--------------------------------|---|
| 1. | Total number of Villages - 984 | Total number of villages affected - 589 |
| 2. | Total Population (3.5 million) | Affected 2.5 million |
| 3. | Total Houses damaged | 1,31,293 |
| 4. | Roads affected | 578 km |

⁶ EX I.W. 84/4

⁷ EX I.W. 84/4

⁸ I.W. 87

| | | |
|-----|---------------------------------|-----------------|
| 5. | Schools Affected | 782 |
| 6. | Total area used for agriculture | 13,20,624 acres |
| 7. | Total area damaged | 5,88,865 acres |
| 8. | Health Units affected | 16 |
| 9. | Death toll of the livestock | 2,127 |
| 10. | Animal affected | 25,42,092 |
| 11. | Human death toll | 68 |

3. HEALTH DEPARTMENT⁹: In the seven worst flood hit districts of the Punjab, there are total 472 health facilities¹⁰ out of which approximately 57 health facilities have been damaged, mostly being District Health Units.

Category Wise Health Facility Damage¹¹

| District | THQHs ¹² | | RHCs ¹³ | | BHUs ¹⁴ | | Dispensaries | |
|-----------|---------------------|----|--------------------|----|--------------------|----|--------------|----|
| | CD | PD | CD | PD | CD | PD | CD | PD |
| R.Y. Khan | - | - | - | - | - | 5 | - | - |
| DG Khan | - | - | - | - | 1 | 5 | - | - |
| M Ghar | - | 1 | - | 4 | 1 | 9 | - | - |
| R Pur | - | 1 | - | - | - | 8 | - | 3 |
| Layyah | - | - | - | - | 6 | 6 | - | - |
| Mianwali | 1 | 1 | - | 2 | - | 3 | - | - |
| Total | 1 | 3 | - | 6 | 8 | 36 | - | 3 |

Key: CD Completely damaged (>40% damages), PD Partially damaged (<40% damage) All made functional

⁹ EX I.W. 98/2

¹⁰

| Sl.no | Health facilities | Nos |
|-------|-------------------|-----|
| (i) | BHUs | 385 |
| (ii) | RHCs | 62 |
| (iii) | THQHs | 18 |
| (iv) | DHQHs | 07 |

¹¹ EX I.W.98/2

¹² Tehsil Headquarter Hospitals

¹³ Rural Health Centres

¹⁴ Basic Health Units

3.1. The incidence of disease recorded between 1st August and 22nd October 2010 in the eight under mentioned districts is as follows¹⁵:-

| District | ARI | Injuries | Skin | PUO | Eye Ear | AWD | Others | Total |
|--------------|---------|----------|---------|---------|---------|---------|---------|-----------|
| Bhakkar | 4,544 | 65 | 5,118 | 1,253 | 603 | 1,095 | 6,415 | 19,093 |
| D.G. Khan | 62,755 | 2,857 | 70,710 | 20,460 | 6,999 | 5,617 | 38,529 | 207,927 |
| Khushab | 5,164 | 505 | 5,060 | 2,379 | 742 | 1,908 | 11,788 | 27,546 |
| Layyah | 40,032 | 6,004 | 47,986 | 15,060 | 13,471 | 4,608 | 81,698 | 208,859 |
| Mianwali | 27,020 | 3,895 | 31,883 | 4,596 | 6,190 | 5,072 | 40,176 | 118,832 |
| Muzaffargarh | 132,505 | 21,251 | 137,184 | 97,610 | 57,536 | 92,424 | 142,287 | 680,797 |
| R.Y. Khan | 44,269 | 518 | 50,827 | 32,291 | 22,698 | 20,229 | 159,008 | 329,840 |
| Rajanpur | 45,540 | 7,499 | 40,123 | 30,639 | 18,063 | 38,951 | 120,652 | 301,467 |
| Total | 361,829 | 42,594 | 388,891 | 204,288 | 126,302 | 169,904 | 600,553 | 1,894,361 |

4. **C & W DEPARTMENT¹⁶:** The tentative cost of damage to the provincial roads due to the recent floods is **Rs.744 million** and the total length of roads affected is **365 kms**. C & W Department has also been asked to repair/rehabilitate the district roads length **492 kms** at a cost of **Rs.1381 million**. The only Department, we have to consult for making the cut on the roads in the times of flood is Irrigation & Power Department and Local Administration. Three bridges have been affected in the recent flood. Two of these are on Provincial Network and the third on NHA Road N70. The provincial roads affected due to the breach of LMB were 7 in Muzaffargarh while the roads affected in D.G. Khan, Rajanpur and Mianwali were due to the hill torrents.

¹⁵ E.X I.W.98/2

¹⁶ I.W. 8

Flood / Rain Affected Roads In Punjab¹⁷

| Sr. No. | Description | No. of Road Affected | Length Affected- in kilometers | Tentative Cost* Rs in million |
|----------------------|--|----------------------|--------------------------------|----------------------------------|
| A | PROVINCIAL ROADS | | | |
| 1 | FLOOD AFFECTED | 35 | 183 | 456 |
| 2 | RAIN AFFECTED | 47 | 182 | 288 |
| SUB TOTAL:- | | 82 | 365 | 744 |
| B | DISTRICT ROADS IDENTIFIED FOR EXECUTION BY C&W DEPARTMENT | | | |
| 1 | FLOOD AFFECTED | 134 | 450 | 1,213 |
| 2. | RAIN AFFECTED | 57 | 42 | 168 |
| SUB TOTAL:- | | 191 | 492 | 1,381 |
| GRANT TOTAL:- | | 273 | 857 | 2,125 |

*NOTE:- Cost does not include rehabilitation cost of structures & contingent charges.

5. LOCAL GOVERNMENT¹⁸: Out of 36 Districts of Punjab, 8 Districts including 18 TMAs, 166 Union Councils and 1780 villages have been affected badly by the floods. As per assessment approximately Rs.1072.359 million are required for rehabilitation and restoration of the infrastructure and municipal services belonging to TMAs, details of which are as under:-

DETAIL OF DAMAGES

| TMAs | Roads | Sewerage | Water Supply | Street Pavements | Others | Total |
|--------------|-------|----------|--------------|------------------|--------|--------|
| D.G. Khan | 8.80 | 12.17 | 4.87 | - | | 25.853 |
| Taunsa | 9.80 | - | 5.50 | 10.10 | 6.10 | 30.700 |
| Tribal Area | 13.70 | 30.65 | 04.13 | - | - | 48.450 |
| Muzaffargarh | 35.86 | 3.70 | 9.95 | 28.59 | 3.7 | 82.160 |
| Kot Addu | - | 234.5 | 15.00 | - | - | 249.50 |

¹⁷ EX I.W. 8/3

¹⁸ EX I.W. 94/1

| | | | | | | |
|------------------|---------------|---------------|--------------|---------------|---------------|-----------------|
| Ali Pur | 20.66 | 33.97 | - | - | - | 54.630 |
| Jatoi | - | - | - | - | - | - |
| Rajanpur | 06 | 17 | 0.8 | 67.38 | 9.30 | 100.48 |
| Jampur | 55.4 | 60.00 | 25.00 | 74.88 | - | 215.28 |
| Rojhan | - | - | 5.30 | 10.43 | - | 15.74 |
| Layyah | - | - | - | - | - | - |
| Kar or Lal Eisan | - | - | - | - | 3.631 | 3.631 |
| Chaubara | - | - | - | - | - | - |
| Mianwali | 0.500 | 1.00 | 1.03 | | | 2.530 |
| Essa Khel | 45.5 | 10.7 | - | 18.8 | 8.9 | 83.900 |
| Piplan | - | - | - | - | 0.970 | 0.970 |
| R.Y. Khan | 33.88 | - | - | 33.8 | - | 67.765 |
| Khanpur | 4.00 | 4.00 | - | 23.5 | 1.00 | 32.50 |
| Liaquatpur | 28.28 | - | - | 28.25 | - | 56.57 |
| Sadiqabad | - | - | - | - | - | - |
| Kallurkot | - | - | - | - | - | - |
| Darya Khan | - | - | - | - | - | - |
| Bhakkar | - | - | - | - | - | - |
| Mankera | - | - | - | - | - | - |
| Khushab | - | - | 0.3 | 1.4 | - | 1.7 |
| Noorpur Thal | - | - | - | - | - | - |
| Total | 262.38 | 407.69 | 71.88 | 297.13 | 33.601 | 1072.359 |

6. AGRICULTURE DEPARTMENT: According to Secretary Agriculture Mr. Arif Nadeem¹⁹, the major damage to the crops took place in District Muzaffargarh and Rajanpur. However, by and large Rabi cultivation which will start from 20th of October will not be affected at all. Due to the recent flood, which has brought water in plenty to this area, the agricultural productivity of the land stands enhanced by 6% to 7% for Rabi crops. There is no danger of food shortage in the Province as we have already stored around 6.162 million metric tones of wheat. The total financial loss in the seven districts is estimated around Rs.67.778 billion. The damages to cotton crops in Muzaffargarh and Rajanpur are Rs.27.639 billion whereas the loss caused to sugarcane in Muzaffargarh, Rajanpur and Rahim Yar Khan is Rs.6.294 billion. According to estimate, about 80% of the farmer affected are farmers with small landholdings i.e. less than 25 acres.

7. LIVESTOCK DEPARTMENT: Additional Secretary, of the Department²⁰ (Khalid Awais Ranjha) submitted that “ The total animals affected²¹ due to the recent flood in the 9 districts namely Bhakkar, D.G. Khan, Muzaffargarh, Khushab, Mianwali, Layyah, Rajanpur, Rahim Yar Khan and Sargodha are 5,442,200 out of a total animal population of 16,949,940. The total figure of animal mortality in the districts is 4809 and animal mortality in Muzaffargarh is 2127. The estimate damages to our infrastructure i.e., Civil Veterinary Hospital, Civil Veterinary Dispensary and Artificial Insemination Centres is Rs.93.62 million. On the basis of above estimates flood loss due to animal mortality is Rs.190 million and loss to Poultry is Rs.2.43 million due to recent flood.

8. INDUSTRIES DEPARTMENT²² The total damage incurred by the industry in the seven flood affected districts is Rs 404.685 million according to the document placed on the record by the Additional Secretary.

8.1. List of industries damaged in the Area under Inquiry are as follows²³:

| Districts | Nos | Number of damaged industries |
|--------------|-----|------------------------------|
| Muzaffargarh | 162 | 27 |
| Mianwali | 19 | 02 |
| Rajanpur | 99 | 09 |
| D.G.Khan | 194 | 05 |
| Bhakkar | 14 | Nil |
| Layyah | 21 | Nil |
| R.Y.Khan | 291 | Nil |

¹⁹ IW-17

²⁰ I.W.18

²¹ mostly means “displaced”

²² Ex.IW-19/4

²³ Mark-120

9. HOUSING URBAN DEVELOPMENT AND PUBLIC HEALTH ENGINEERING

DEPARTMENT²⁴: In all 202 water supply schemes were damaged/affected in 9 Districts in Punjab due to recent floods. The total cost of rehabilitation of the affected water supply schemes is **Rs.101.264 Million**, which is to be paid by UNICEF. The Department has also water schemes and drainage scheme in the active plains in these Districts.

10. HOME DEPARTMENT: The details of the affected peoples in the flood during the period 27.7.2010 to 13.08.2010 according to Rescue 1122 is **11156** while the data of dead persons received during flood is **36²⁵**.

11. PAKISTAN FLOODS 2010 DAMAGE AND NEEDS ASSESSMENT REPORT SUBMITTED BY THE WORLD BANK/ADB has been placed on the record as Mark 106 in Appendix 81 for comparison.

²⁴ I.W. 15

²⁵ Ex.I.W.11/2



CHAPTER 8

"Water is the earth's eye, looking into which the beholder measures the depth of his own nature."¹

SYSTEMIC CAUSES OF BREACH²

- *Absence of Flood Plain Management*
- *Absence of Hill Torrent Management*
- *Weak I & P Department*
- *Ineffective role of Federal Flood Commission*
- *Lack of integration & coordination between other key departments*

1. INTRODUCTION

1.1. Direct causes of breach have been discussed in detail in the earlier chapters. Without belittling their importance, our inquiry has revealed that there are latent structural disconnects and omissions which, by and large, stem from an indifferent and disinterested I & P Department. Some of these areas (discussed below) have been on the Provincial and Federal Governments' agenda for many years supported by substantial funds but no tangible results have come forth. Today, there is no policy for flood plain management or hill torrents management. Federal Flood Commission hasn't lived upto to its objectives and has morphed into a post office, which simply complies flood schemes of various irrigation departments in the country. I & P Department has fast deteriorated over the years, its lackluster performance during the recent floods establishes. I & P Department, as it stands today, lacks expertise, research, innovation, vision and the dynamism befitting a department that has to lead the largest contiguous irrigation network in the world for the welfare and uplift of the people of Pakistan and its heavily dependent agro-economy. Other connected departments have failed to gravitate around I & P Department to evolve a collective charter for flood resilience. The overall flood governance seems to be in disarray. It is a low priority item for the Provincial leadership, I & P Department and the policy makers.

2. ABSENCE OF FLOOD PLAIN MANAGEMENT

2.1. FLOOD PLAIN or ACTIVE FLOOD PLAIN means a flat or nearly flat land adjacent to a stream or river that stretches from the banks of its channel to the base of the enclosing valley walls and experiences flooding during periods of high discharge³. It includes the

¹ Henry David Thoreau

² We are of the view that these systemic deficiencies persisting over years contributed and added to the causes of breach discussed in this Report.

³ Goudie, A. S., 2004, Encyclopedia of Geomorphology, vol. 1. Routledge, New York.

floodway, which consists of the stream channel and adjacent areas that carry flood flows, and the flood fringe, which are areas covered by the flood, but which do not experience a strong current.

2.2. *INQUIRY & FINDINGS*

2.3. The prime revenue authority of the Province⁴ i.e., Board of Revenue describes the flood plains to be KHADAR area or SELABI AREA. According to the I & P Department, flood plains is the area which is not under a canal command and is irrigated by the river. Revenue Officers who presented maps of the districts in Punjab had clearly marked the boundaries of the flood plains, which was helpful to assess the impact of the recent flood on the human settlements in and outside the flood plains.

2.4. According to Senior Member Board of Revenue, Punjab (SMBR)⁵: "There is no law at the present regulating the inhabitants within the River Land i.e., Area/active flood plain or Khadar Area". He submitted that presently, there is no ban on the construction on the privately owned area which falls in the active flood plain / Khadar area. In the light of present position, Government of the Punjab is now considering this issue to introduce legislation to prohibit the construction, which can be a hazard in the normal flow of river water, and also to ban un-authorized bunds to avoid any loss/damages in future. He, however, did not place on record the proposed draft bill or any summary establishing the initiation of such a proposal.

2.5. According to the Secretary I & P Department⁶: "It is true that the active flood plain/riverine area/"khaddar area" has become sizably populated over the years. Construction has been raised by the people in the said area and also electrification has been done by PEPCO/WAPDA. Under the law, the said land belongs to the respective people in the area, however, if rules are made under the Canal & Drainage Act, 1873, the encroachment in the flood plains can be regulated but no such effort has been made so far. In the recent flood, a large number of people were affected who were residing within the flood plain... The population that has been affected by river Indus was settled within the active flood plains."

2.6. **Evidence reveals that majority of the population affected by floods lives in the flood plains**⁷. Indus passes touching seven⁸ district of the Punjab. Revenue record of all the districts has been closely monitored and statements of the District Revenue Officers recorded in order to understand more fully the size of the flood plains, the impact of floods and the character of human settlement within the active flood plains.

2.7. District wise detail is as follows:

⁴ Senior Member Board of Revenue, Punjab. (I.W.1 0)

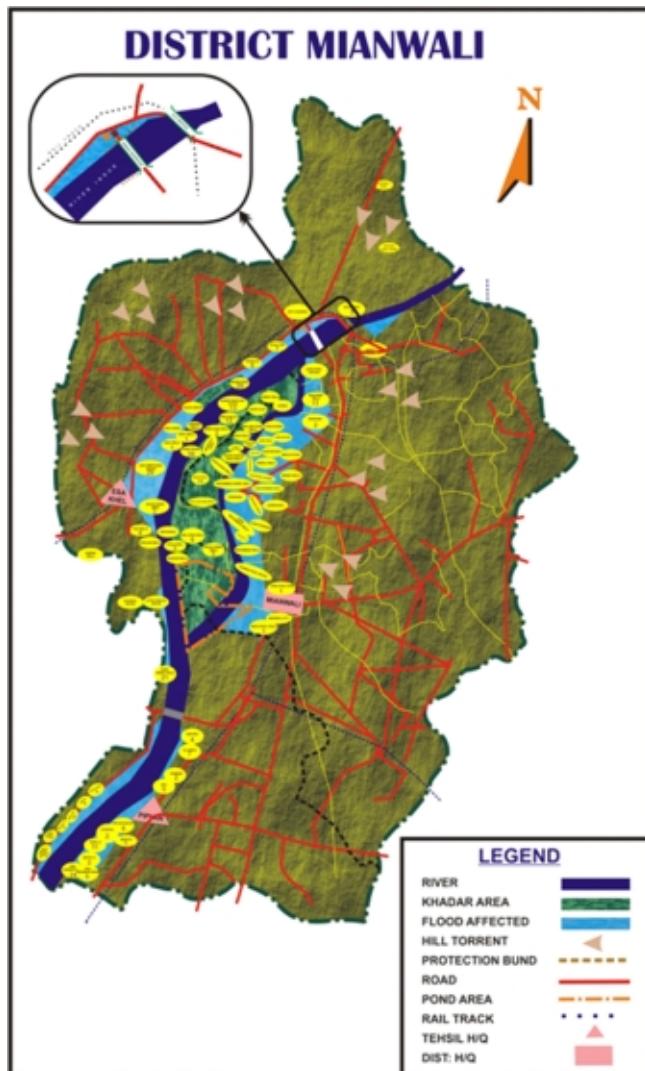
⁵ I.W.10. Mr. Akhlaq Ahmed Tarrar

⁶ I.W.6

⁷ except in Muzzaffargarh where the almost entire District got inundated due to the breach of LMB.

⁸ MIANWALI, BHAKKAR, LAYYAH, MUZZAFARGARH, D G KHAN, RAJANPUR AND RAHIMYAR KHAN.

2.7.1. DISTRICT MIANWALI



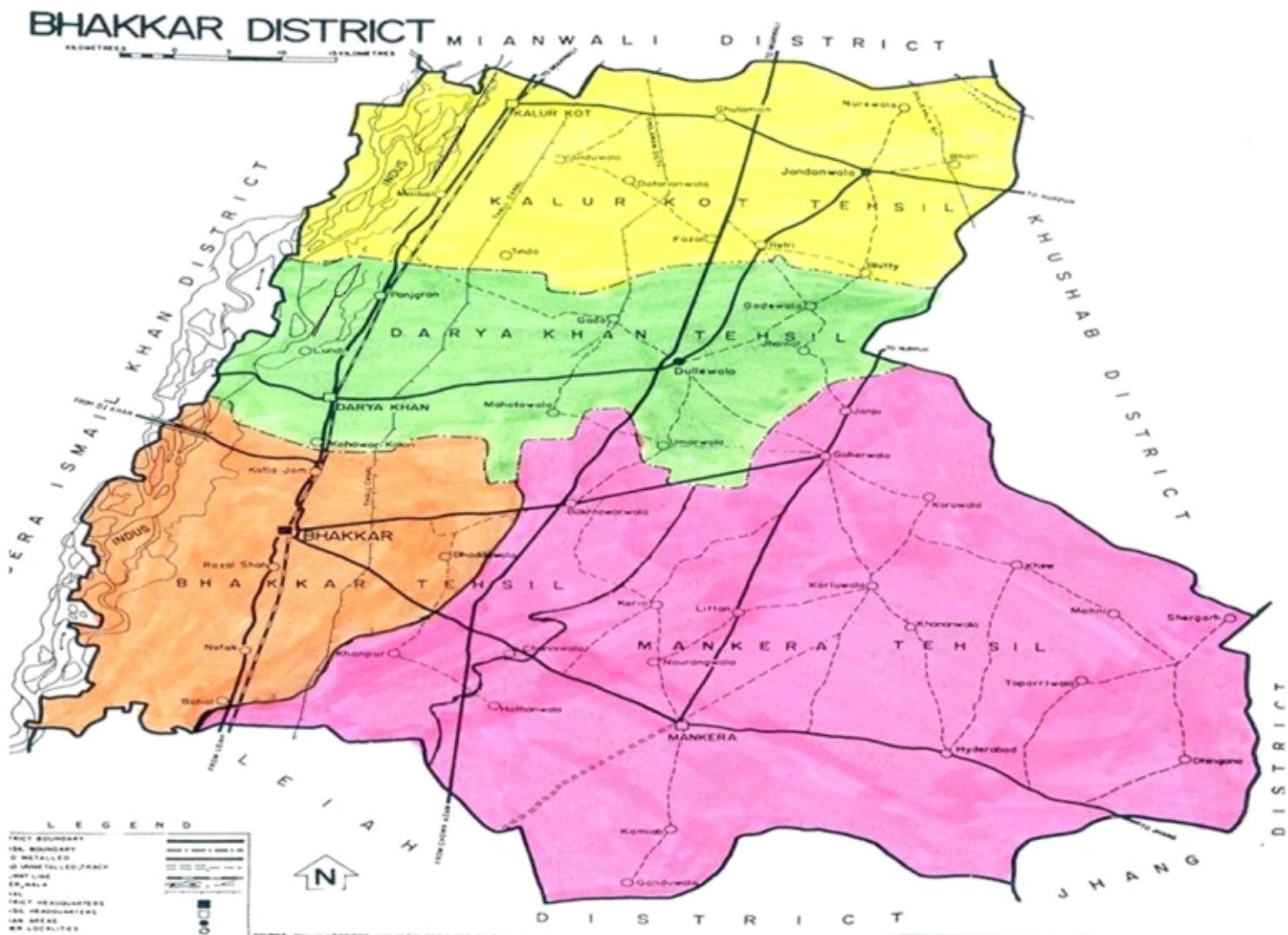
2.8. Details⁹ of Flood Plains:

| | | |
|----|---|---|
| a) | Total Population of the District? | 1,056,620 (according to 1998 census) |
| b) | Total Population residing within the Active Flood Plain (Khadar Area)? | 61,280 |
| c) | Estimate of the % of the areas of the District outside the Active Flood Plain that were inundated in the recent floods? | 12.11% |
| d) | Total number of deaths reported in the Active Flood Plains due to the recent floods as well as in the remaining part of the District? | Total: 12 Deaths One occurred in the Active Flood Plains and remaining 11 in the other parts of the District Mianwali. |
| e) | Percentage of the area of Active Flood Plains compared with the overall area of the District? | 9.4% (134,149 Acres) 14,26000 Acres (Total area of the District Mianwali. |

⁹ Mark 92

2.9. The District has three tehsils namely: Mianwali, Isakhel and Piplan. According to the revenue record of District Mianwali placed before the Tribunal by Deputy District Officer (Revenue)¹⁰, Mianwali, the villages affected in the recent floods were the villages within the active flood plain (i.e., 42 revenue estates). According to the details placed on the record¹¹ total area used for farming in the active flood plain in District Mianwali is 33,107 acres and the population residing within the flood plains is 61,280. According to the DDOR, 25,861 people (within the flood plains) have been affected by the recent floods and 67.5% of the crops has been affected. It has been reported that people carry out agriculture and have housing within the active flood plain.

2.10. DISTRICT BHAKKAR



¹⁰ I.W. 85

11 Ex.I.W.85/3



2.11. Details¹² of the flood plains are:

| | | |
|-----|---|-------------------------------------|
| (a) | Total population of the district. | 10,43,586 Persons (Census: 1998) |
| (b) | Total population residing within the active Flood Plain (Khadar area). | 2880 persons |
| (c) | Estimate of the percentage of the area of the District outside the Active Flood Plain that was inundated in the recent floods | 3.29% |
| (d) | Total number of death reported in the Active flood plain due to the recent floods as well as in the remaining part of the district. | Nil. |
| (e) | Percentage of the area of Active Flood Plains compared with the over all area of the District. | 7% |

2.12. The District has three Tehsils namely: Bhakkar, Darya Khan and Kalur Kot. Total population of active flood plain (District Bhakkar) is 2880 out of which population of 2358 has been affected in the recent floods. Total pacca structure within the active flood plain is 382 houses. 20% of the active flood plain of Bhakkar and 15% of the active flood plain of Kalur kot is electrified¹³. No bund has been breached within District Bhakkar including Kalur Kot Bund. There has been some spill over alongside the riverine area and around 5,756 kacha houses and 305 pacca houses have been damaged and around 24,325 persons have been affected. No death has been reported in the district. Major crops in the area are wheat and sugarcane but no substantial damage to agriculture has been reported in the District¹⁴.

2.13. DISTRICT LAYYAH

2.14. District Layyah has three tehsils namely: Layyah, Karor and Choubara. According to the DOR¹⁵, Layyah during the recent floods the water remained within the active flood plain of District Layyah and did not overspill.

2.15. Details¹⁶ of the Flood Plains.

¹² Mark 144

¹³ Ex I.W. 104/1

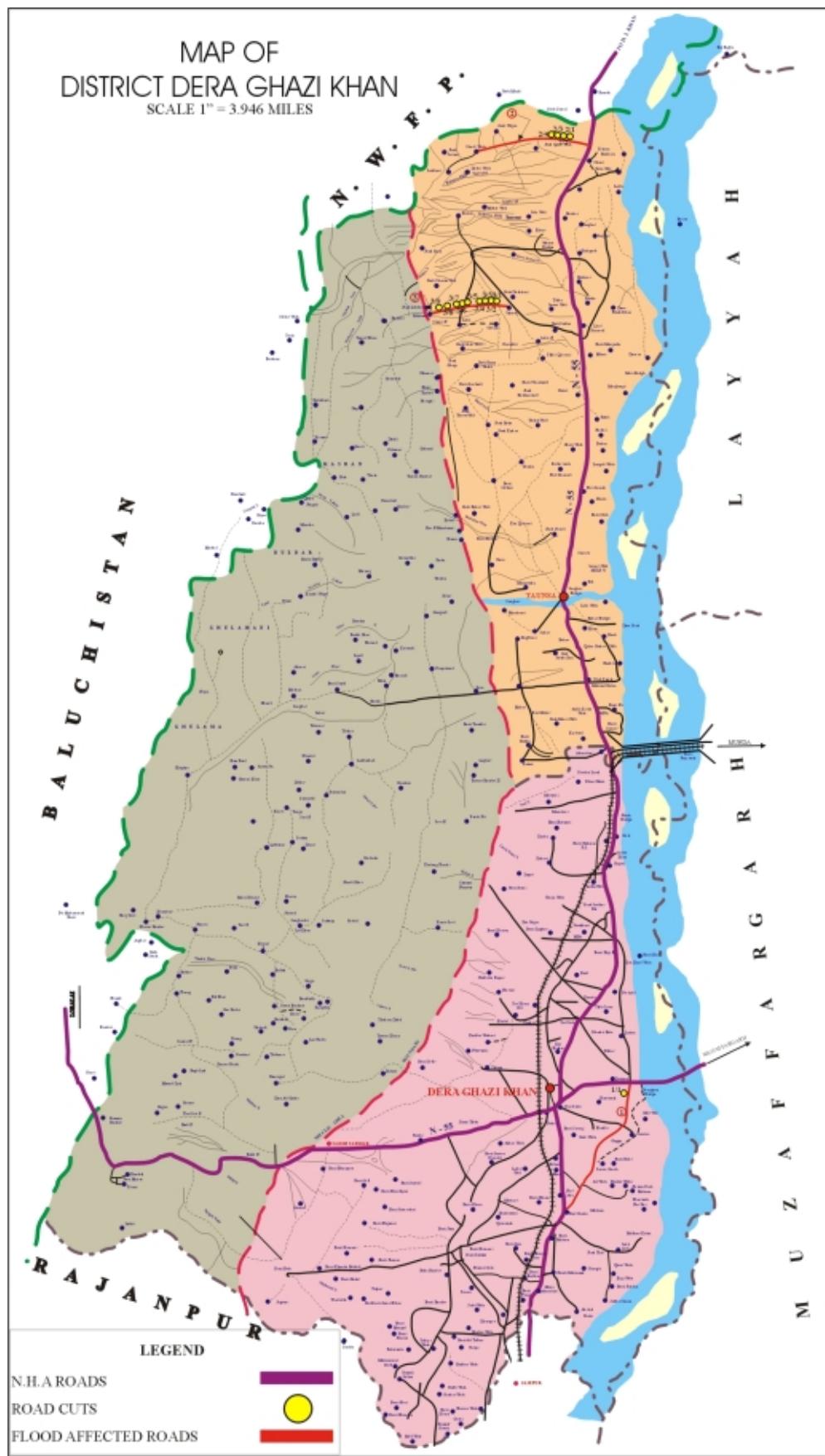
¹⁴ I.W. 86

¹⁵ I.W.14

¹⁶ Mark 127

| | | |
|-----|---|---|
| (a) | Total population of the District as per census 1998 | 11,20,951 |
| (b) | Total population residing within the Active Flood Plain (Khadar area) as per census 1998 | 2,10,236 |
| (c) | Estimate of the percentage of the area of the District outside the Active Flood Plain that was inundated in the recent floods. | Affected area = 58,411 acres Total area of Distt = 15,52,6448 acres Percentage = 4% |
| (d) | Total number of death reported in the active flood plains due to the recent floods as well as in the remaining part of the District | 19 |
| (e) | Percentage of the area of Active Flood Plains compared with the overall of the District. | Active Flood Plan area = 2,45,151 acres Total area of District = 15,52,648 acres Percentage = 16% |

2.16.DISTRICT D.G.KHAN



2.17. Details¹⁷ of the Flood Plains:

| | | |
|----|---|---|
| a) | Total Population of the District? | 1,527,890 |
| b) | Total Population residing within the Active Flood Plain (Khadar Area)? | 2,81,802 |
| c) | Estimate of the % of the areas of the District outside the Active Flood Plain that was inundated in the recent floods? | 50 % in Tehsil D G Khan and 16 % in Tehsil Taunsa |
| d) | Total number of deaths reported in the Active Flood Plains due to the recent floods as well as in the remaining part of the District? | 3 due to Rod Kohi (Hill torrents) |
| e) | Percentage of the area of Active Flood Plains compared with the overall area of the District? | 53% in Tehsil D G Khan and 11% in Tehsil Taunsa. |

2.18. According to the DOR¹⁸, DG Khan, the entire Active Flood Plain including actual riverbed is owned by private people. The Khader Area/Active Flood Plain/Selabi area is permanently demarcated and shows that the said land is not irrigated through the canal network. According to him *Khadar* area is defined as the land along the River Indus which is not cultivated by canal water but through river water or through Tubewells and Pumps. *Khadar* area is also referred as the Selabi/riverine area¹⁹.

2.19. District Officer (Revenue), D.G. Khan has proposed that there should be law enacted to restrict the local land owners to cultivate their land or raise constructions including Government buildings, Livestock, Dispensaries, BHU, Schools, PEPCO installations in the flood plains and awareness of the public in this regard is also essential.

DAMAGE ASSESSMENT INSIDE AND OUTSIDE KHADAR AREA OF D.G.KHAN DISTRICT²⁰.

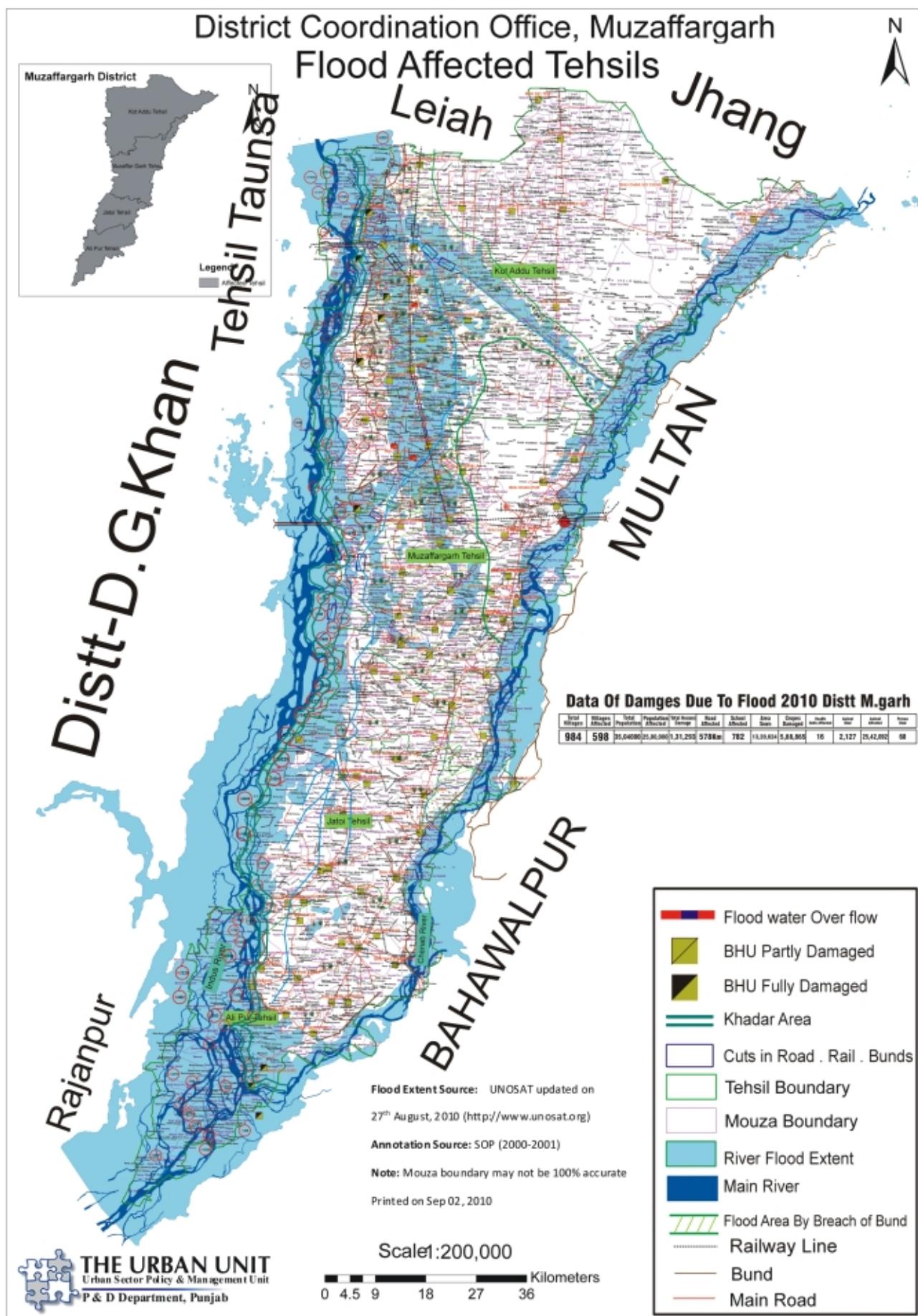
| Name of Tehsil | Description | No. of Mauza | Houses Damaged | Total Affected Area of villages (Acre) | Affected Cropped Area (Acre) |
|----------------|---------------------|--------------|----------------|--|------------------------------|
| D.G. Khan | Inside Khadar Area | 64 | 7004 | 124749 | 57538 |
| Taunsa | | 45 | 5480 | 075349 | 28060 |
| TOTAL | | 109 | 12484 | 200098 | 85598 |
| D.G.Khan | Outside Khadar Area | 30 | 6024 | 060051 | 31171 |
| Taunsa | | 29 | 0534 | 116880 | 35460 |
| TOTAL | | 59 | 6558 | 176931 | 66631 |

¹⁷ Mark 95

¹⁸ I.W.84

¹⁹ Ex I.W 84/4

²⁰ Ex I.W.84/4



2.21. Details²¹ of Flood Plains:

| Sr. No. | Questions | Department Reply | |
|---------|---|--|---|
| 1. | (a) Total population of the District? | 35,04,000 | |
| 2. | (b) Total population residing within the Active Flood Plain (Khadar area)? | 1,78,962 | |
| 3. | (c) Estimate of the percentage of the area of the District outside the Active Flood Plain what was inundated in the recent flood? | Total area of the district Total affected area of District Percentage inundated area outside Khadar area | 2052571 (acre) 394855 (acre) 288068 (acre) 14% |
| 4. | (d) Total number of death reported in the active flood as well as in the remaining part of the District? | 68 | |
| 5. | (e) Percentage of the area of Active Flood Plains compared with the overall area of the District? | Total area of District Active Flood Plain Area Percentage of Khadar area | 20,52,571 (acre) 1,06,787 (acre) 8.72% |

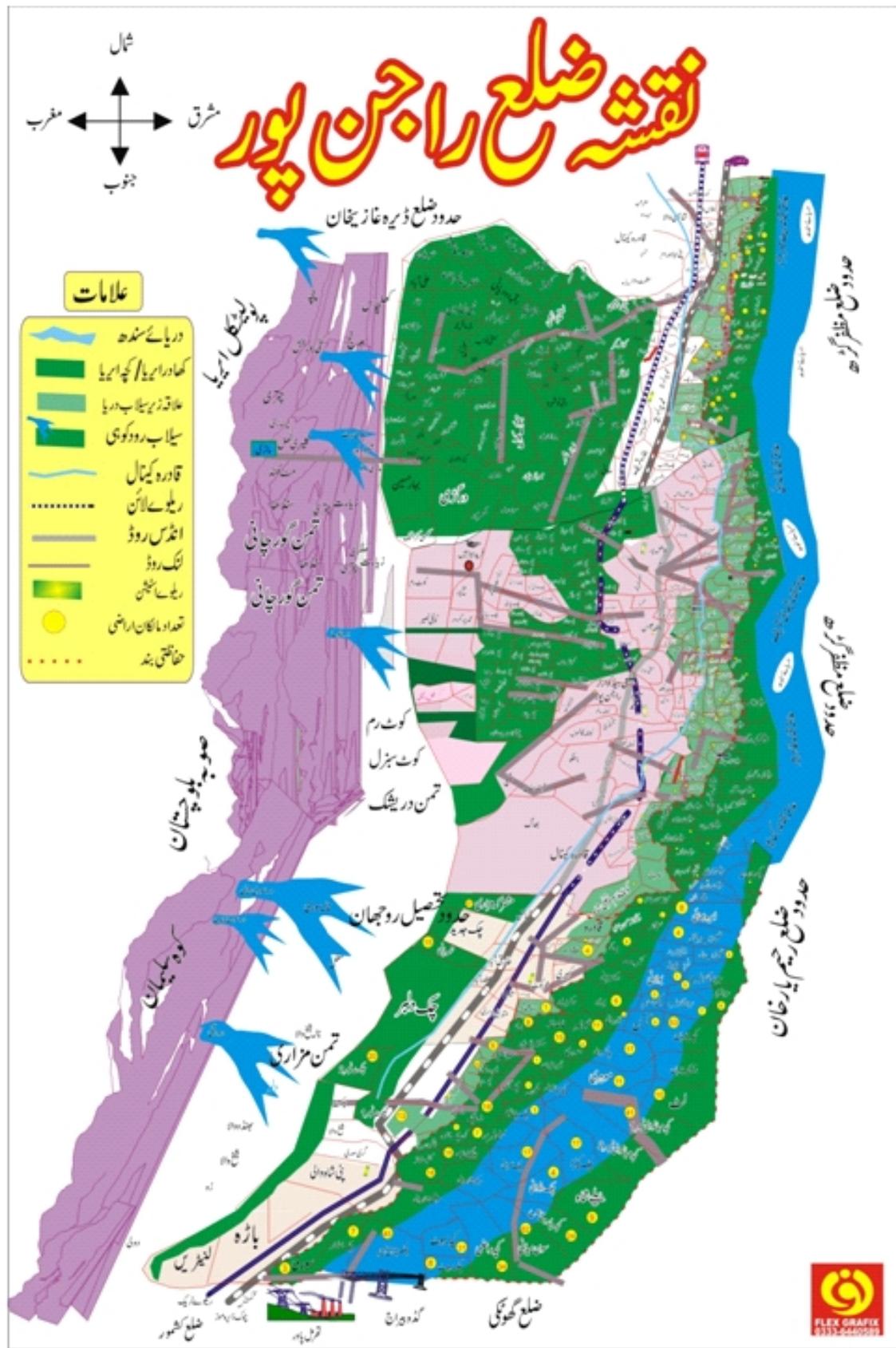
2.22. District Muzaffargarh has four tehsils namely: Kot Addu, Muzaffargarh, Jatoi and Ali Pur.

²¹ Mark-113.

2.23.DETAIL OF FLOOD DAMAGES IN ACTIVE FLOOD PLAIN (Muzzafargarh)

| Name of Tehsil | Tehsil Total Of Tehsil Kot Addu Garh Total | Total of Tehsil M. Garh Total | Total of Tehsil Jot Sar | Total of Alipur | 95 | G. Total District Muzaffargarh | |
|----------------|--|----------------------------------|----------------------------|-----------------|----|-----------------------------------|---|
| | | | | | | No. of Villages | Total Population Population affected |
| 178962 | 45300 | 32235 | 1678 | 99749 | | | Total Population |
| 137374 | 17530 | 22095 | 1290 | 96399 | | | Population affected |
| 19767 | 46669 | 54937 | 3998 | 91463 | | | Total Area in Acre |
| 106787 | 19290 | 16627 | 1137 | 69733 | | | Under Khadar Area |
| 48450 | 6547 | 25087 | 2435 | 14381 | | | Out of Khadar Area |
| 54% | 41 | 30 | 28 | 76% | | | % aGge |
| 77% | 39 | 69 | 77 | 97% | | | % aGge |
| 19767 | 46669 | 54937 | 3998 | 91463 | | | Total Area in Acre |
| 106787 | 19290 | 16627 | 1137 | 69733 | | | Under Khadar Area |
| 48450 | 6547 | 25087 | 2435 | 14381 | | | Out of Khadar Area |
| 54% | 41 | 30 | 28 | 76% | | | % aGge |
| 77% | 39 | 69 | 77 | 97% | | | % aGge |
| 19767 | 46669 | 54937 | 3998 | 91463 | | | Total Area in Acre |
| 106787 | 19290 | 16627 | 1137 | 69733 | | | Under Khadar Area |
| 48450 | 6547 | 25087 | 2435 | 14381 | | | Out of Khadar Area |
| 54% | 41 | 30 | 28 | 76% | | | % aGge |
| 41830 | 20832 | 13223 | 426 | 7349 | | | Un affected area |
| 42279 | 12810 | 8592 | 715 | 20162 | | | Cotton |
| 6870 | 0 | 847 | 20 | 6003 | | | 5. cane |
| 172 | 0 | 154 | 18 | 0 | | | Rice |
| 12992 | 1217 | 638 | 37 | 11100 | | | Other |
| 62313 | 14027 | 10235 | 790 | 37265 | | | Total |
| 14492 | 3475 | 8312 | 1160 | 1545 | | | Cotton |
| 1476 | 80 | 820 | 145 | 431 | | | Rice |
| 1195 | 70 | 602 | 65 | 458 | | | Other |
| 5899 | 183 | 2961 | 972 | 1783 | | | Total |
| 23062 | 3808 | 12695 | 2342 | 4217 | | | Out of Khadar Area |
| 36580 | 8370 | 10632 | 440 | 17138 | | | Total Houses |
| 16430 | 2154 | 1657 | 78 | 12541 | | | Under Khadar Area |
| 3027 | 146 | 104 | 13 | 2764 | | | Kacha |
| 4427 | 1148 | 2304 | 150 | 825 | | | Paka |
| 1050 | 255 | 458 | 40 | 297 | | | Total |
| 24934 | 3703 | 4523 | 281 | 16427 | | | Under Khadar Area |
| 68% | 44% | 43% | 64% | 96% | | | % aGge |

2.24. DISTRICT RAJANPUR



2.25. Details²² of active flood plain.

| Sr. No. | Tehsil | (a) | (b) | (c) | (d) | (e) |
|--------------------------|----------|------------------|---|--|---|---|
| | | Total Population | Total population residing within Active Flood Plain (Khadar Area) | Estimate of % age on Area out side Active Flood Plain that was inundated in Recent Flood | Total No. of Death Cases reported due to recent flood | %age of Area of Active Flood Plain compared with overall Total Area |
| 1 | Jampur | 544088 | 156218 | 52% | 18 | 31% |
| 2 | Rajanpur | 565426 | 142610 | 46% | 15 | 29% |
| 3 | Rojhan | 223589 | 144684 | 61% | 11 | 35% |
| Total of District | | 1333103 | 443512 | 53% | 44 | 32% |

2.26. Rajanpur district clearly highlights that active flood plain and the torrent flood plains are the worst hit areas. The area inundated other than the active plain is rather limited and a result of the breaches in the Jampur bund.

2.27. **PEPCO'S POSITION ON ELECTRIFICATION OF FLOOD PLAINS:** Pakistan Electric Power Company submits^{22-A} that under the Rural Electrification Program, electric connections are extended to people living in the vicinity of the river i.e, active flood plains. PEPCO stated that electricity being the basic necessity, demand for electric connection cannot be turned down. In the recent floods close liaison was established with the local administration regarding flood warning and the electricity supply of the affected area was disconnected in time. Therefore no fatal accident took place on account of electrification network during the recent flood. Even the Active Flood Plains are electrified by WAPDA under the Rural Electrification Program. This encourages habitation within the Active Flood Plains. Any policy relating to Active Flood Plains will have to also address the extension of utility services to the said people.

2.28. **INDUSTRIES DEPARTMENT AND FLOOD PLAINS:** According to the Industries Department²³, list²⁴ of industries in the active flood plains is as under:

²² Mark 128

^{22-A} IW.97/1

²³ I.W. 19

²⁴ Mark 120

| <i>Districts</i> | <i>Nos.</i> |
|------------------|-------------|
| Muzaffargarh | 162 |
| Mianwali | 19 |
| Rajanpur | 99 |
| D.G.Khan | 194 |
| Bhakkar | 14 |
| Layyah | 21 |
| R.Y.Khan | 291 |

2.29. The revenue record reveals that flood plain is the most vulnerable area in a district. The record also shows that it forms a small percentage of the District with a limited population. The damage in the recent floods has been mostly in the flood plains and the adjoining areas have been affected due to overspill due to poor flood plain management.

2.30. There is no law or policy that deals with flood plain management. The land use within the flood plain requires regulation. The maintenance and regulation of embankments abutting the flood plains falls under the flood plain management.

2.31. Flood Plain management should also plan other non structural and if possible ecologically friendly measures for flood mitigation e.g., development of river forests, retention pools or lakes can be developed alongside the flood plains to enhance resilience against damage caused by floods.

3. **RECOMMENDATIONS**

3.1. Government should urgently develop Flood Plain Management Plan as a part of the larger integrated Flood Management Plan.

3.2. Flood Plains must be clearly zoned and demarcated. Inhabitants and built up structures within the flood plains be subjected to special regulation which ensures extra protection for their life and property.

3.3. Construction in the said area to be regulated and special building codes to be developed. Architecture and design within flood plains need to adapt to frequent flooding. One option can be of raised structures, preferably stilted (or built on stilts) to withstand the heavy flood discharge.

3.4. Towered Emergency centers or shelters can also be of huge benefit to the resident population that is invariably displaced and finds shelter on the dry tops of the embankments or high roads. One suggestion can be that the architecture of the government schools and basic health units in the area can be such that they are used as emergency shelters and also act as early flood warnings centers. Local schools and hospitals carry more credibility amongst the local population than the seldom seen irrigation officers and might take early warnings more seriously than they do now²⁵. One of the reasons being poor trust and confidence in the flood managers.

3.5. Provincial Government through legislation or executive order must provide for the following :

- Demarcation of the flood plains duly GIS mapped.
- No future construction to be allowed in the flood plain
- Flood Plains be allowed for agriculture with proper advice on the kinds of crops to be sown.
- Provide regulations to control/manage deforestation and use for livestock grazing.
- Flood Insurance to be encouraged in the flood plains for agriculture.
- Converting existing structures into flood resistant structures. Stilted or raised architecture to be used.
- Government schools or government hospitals within the flood plains to be made flood resistant by raising their structures and using them as shelters and early warning centres during floods.
- Local participation to be encouraged in decision making and reform process.

²⁵ During our inquiry we discovered on location that flood warnings issued by the I & P Department did not move the people.

4. ABSENCE OF HILL TORRENT MANAGEMENT

4.1. Hill torrents contribute to the flood peaks and have not been harnessed or tamed over the years. This rich water resource can be channelized and stored for agriculture in one of the most backward districts of Punjab i.e., DG Khan and Rajanpur. Even though there is no reliable data of the hill torrents discharge that gets added to the peak discharges in river Indus, it is most certain that a portion of this high velocity discharge finally flows into Indus after playing havoc with the infrastructure that comes in the way.

4.2. Hill torrent-irrigation systems is traditionally called *Rod-Kohi* or Indigenous Spate Irrigation. Rod means water channel and Kohi pertains to mountains. In these areas major constraint is the use of flood flow which is highly variable in quantity and distribution, both in time and space. Annual rainfall is low, uncertain and patchy. Flow is laden with high silt in each flood. It is unfortunate that inspite of scarcity of water, we fail to capitalize (store and use) this large water resource in the shape of hill torrents. In Punjab, major part of the system falls in the districts of D.G.Khan and Rajanpur. According to the study done by NESPAK in 1998 the potential area that can be covered by hill torrents in Punjab is 1.41 (MA) where the potential water 2.71 (MAF).

4.3. Spate Irrigation is traditionally used system for diverting hill torrents into cultivable command areas for growing seasonal crops. The farming system is characterized by extreme events of floods and droughts. It usually entails the construction of an earthen diversion weir across the torrent with large channel on one or both sides of the river to convey flood water across large distances. These earthen diversion structures and water conveyance system has traditionally been constructed by the beneficiaries / communities themselves, making use of traditional technology. Farmers construct embankments from 3 to 6 feet high to store the water depending upon the soil type, share in water and various other factors. The economic significance of Rod-Kohi Irrigation agriculture is centered around subsistence agriculture and live-stock raising which are the main sources of income.

4.4. Major Rod Kohi areas traversed by hill torrents constitute nearly 48²⁶ percent of the total area of Pakistan and encompass entire Balochistan. The other major hill torrent areas include D.G.Khan and D.I.Khan, FATA and AJK. In Sindh province, the systems are spread in Dadu district (Kirthar range). There are around 17.13 million acres as the potential area under hill torrent / Rod-Kohi / Sailaba fanning excluding riverine areas. Spate irrigation is being practiced in piedmont plains of [Kohat, D.I. Khan](#) (KPK), [D.G. Khan, Rajanpur](#) (Punjab), [Larkana, Dadu](#) (Sindh), [Barkhan and Kachhi plait](#) (Balochistan). Heavy rains in the catchments areas i.e., Sulaiman range and Bhattani range, result into various torrents toward the foothill plains. The Rod Kohi system is being practiced since centuries. However, it is still less understood and improperly managed due to lack of resources and high water velocities. Spate irrigation based on floodwater is the major source of irrigation for Rod-Kohi farming in the district of D.G. Khan.

²⁶Mark 26

4.5. More than 0.2 Million hectares (Mha) of the cultivated area is irrigated by seven major hill torrents which emerge from the adjacent Sulaiman ranges. These torrents, from North to South, are: Kaura, Vehowa, Sanghar, Sori Lund, Vidore, Sakhi Sarwar and Mithawan. The command area adjacent to the mountainous region is called "Pachadh" and is irrigated by these torrents. The total catchment area of these hill torrents is 10,180 km square that receives annual average rainfall of 250 mm with average run off ranging from 17 million m³ for Sakhi Sarwar to 784 million m³ for Sanghar. In addition to the non-perennial torrents, there are perennial spate irrigation systems prevailing in the area. The perennial Rod-Kohi systems are named as "Kalapani or Aab-e-Siah". Water Resources Research Institute ("WRRI") of Pakistan Agricultural Research Council ("PARC") Islamabad has developed earthen reservoirs for storage of water, few sites were selected in various Mauzas to harness rainwater. The said stored water is used for human and livestock consumption besides providing supplemental irrigation.

4.6. The above details pertain to the project title Rod-Kohi System Development and Management Project, which was implemented in Mithawan watershed area of D.G. Khan from June 1995 to June 2004 with a total cost of Rs.8.95 million. It is surprising that Water Resources Research Institute ("WRRI") Pakistan Agricultural Research Council ("PARC") had annual budget of approximately Rs.2.7 million in 2009-2010 and now has a budget of Rs.2.6 million in the year 2010-2011, however, nothing concrete or material has been done by WRRI²⁷.

4.7. There are 200 hill torrents originating from the Suleman Range. 13 hill torrents have large catchment areas and flood flow potential. The details of the hill torrents and the area cultivated by them are as under:-

4.8. SALIENT FEATURE OF MAJOR HILL TORRENTS²⁸

| Sr. No. | Name | CATCHMENT AREA | | CULTIVATED AREA | |
|--------------------------|--------------|----------------|-----------|-----------------|--------|
| | | Sq. Km. | Sq. Miles | Hectare | Acres. |
| DISTRICT D.G.KHAN | | | | | |
| 1. | Kaura | 523 | 202 | 17310 | 42773 |
| 2. | Vehowa | 2634 | 1017 | 26730 | 64874 |
| 3. | Sanghar | 4913 | 1897 | 25770 | 63678 |
| 4. | Sori Lund | 500 | 193 | 15660 | 38696 |
| 5. | Vidore | 772 | 298 | 13348 | 32983 |
| 6. | Sakhi Sarwar | 158 | 61 | 4190 | 10353 |
| 7. | Mithawan | 710 | 274 | 11010 | 27206 |

²⁷ Mark 26

²⁸ Mark 102

| Sr. No. | Name | CATCHMENT AREA | | CULTIVATED AREA | |
|--------------------------|--------------|----------------|-----------|-----------------|---------------|
| | | Sq. Km. | Sq. Miles | Hectare | Acres. |
| DISTRICT RAJANPUR | | | | | |
| 8. | Kaha | 5716 | 2207 | 36253 | 89581 |
| 9. | Chachar | 710 | 274 | 17100 | 42254 |
| 10. | Pitok | 231 | 89 | --- | --- |
| 11. | Sori Shumali | 332 | 128 | --- | --- |
| 12. | Zangi | 394 | 154 | 9080 | 22437 |
| 13. | Sori Janubi | 1707 | 659 | 16180 | 39980 |
| TOTAL | | | | 192131 | 474755 |

4.9. *FEDERAL FLOOD COMMISSION'S (FFC'S) MANUAL* fully provides for flood management of hill torrents²⁹. The Manual was developed in the year 2001 but is still unused and nothing substantial has been done on the ground by the I & P Department.

4.10. The following passages are from the FFC's manual, which we think have not even been read by the provincial flood managers.

4.10.2. *General.* Hill Torrents have been the cause of widespread devastation in downstream areas. Although some catchments areas are being managed, it is only on a small scale. For maximum utilization of the hill torrents, some effective training works will have to be introduced. *These schemes may include channelization, distribution structures, dispersion structures and check dams (or delay action dams).*

4.10.3. The catchment areas of hill torrents mostly consist of hills which have little soil cover and very sparse vegetation. A major part of the balance area is covered by torrent bed, gravelly and stony lands, gullies and mounds etc. Only a very small portion, about five (5) percent of the area, is terraced or form valley land which is under use by sparse population for limited agricultural and residential purposes. The downstream areas of hill torrents consist of piedmont plain alluvial deposits formed of alluvium brought by the hill torrent and dropped as the flow spreads over the area.

4.10.4. *Water Rights.* According to age-old-agreements among the residents of the area, the flood waters are shared in agreed ratios, the upper riparian on a torrent has the first right to use water to his need before releasing it to the downstream users. Implementation of the water rights is overseen by the Government Administration. The water-right will be an essential factor to be considered while locating, type

²⁹ Ex I.W. 103/2

selecting and designing of hydraulic structures to control/improve the overall flood/water management of the area.

4.10.5. *Existing Management of Hill Torrents:* The hill torrents are diverted by constructing temporary earthen dams/dispersion structures across the bed of torrents to store and raise water which is led directly into the embanked fields through shallow channels and trail dykes. Quite often the temporary dams breach by the flood water or often these are not completely constructed before the rains set-in and the torrents are flooded. The flood waters continually cut out new channels and ravines and whole area is affected by the flood flows. Sometimes, floods of different torrents accumulate in certain ravines, rendering the flow unmanageable and cause large devastation in the area.

4.10.6. At places, the main torrent divides into branches; there a distributor structure controls the agreed flow share to each branch. These branches then become independent torrents. The new flood control system will be developed by satisfying the existing management system for a particular hill torrent scheme. The new designing may include appropriate channelisation of the torrent, dispersion / distribution structures and check dams. Flood prone dwellings may be protected by providing the appropriate training and protection structures.

4.10.7. *Design Flood Discharges:* In remote areas where hill torrents get generated and contained in downstream channels there are no existing flow gauges on torrents or any precipitation recording stations in the area for obtaining the base data for hydrological assessment of design flood discharge in the torrent.

4.10.8. MANAGEMENT IN MOUNTAINOUS AREAS

4.10.9. Generally, the non-structural measures like soil and water conservation techniques and watershed and range management practices are carried out in such areas. These help in the utilization of flood waters, stabilizing the slopes, reducing the sediment yields and flood peaks. However, these measures are not in the scope of this project.

4.10.10. Structural measures like check dams (or delay action dams) may be provided to subside flood peaks. The check dams would be located in headwater areas depending upon the topography and sediment concentration.

4.10.11. MANAGEMENT IN SUB-MOUNTAINOUS AREAS

4.10.12. The hill torrents in sub-mountainous areas repeatedly erode large portions of land and carry with them high silt load. Structural measures like distribution/dispersion structures and retaining walls may be provided to subside land erosion.

4.10.13. MANAGEMENT IN PLAIN AREAS

4.10.14. In plain areas the hill torrents possess the maximum agriculture land use potential. At the same time it causes highest flood damages. The following structural measures may be provided to reduce the flood impact:

- i. Flood distribution / dispersion structures in order to utilize maximum flood flows for agriculture.
- ii. Flood training structures like guide banks and spurs and auxiliary weirs for controlled channelisation of flood flows.
- iii. Protection of flood prone dwellings by providing the appropriate training and protection structures.

4.10.15. PLANNING OPTIONS

4.10.16. The evolving of a comprehensive, optimal and cost effective of the flood control planning for hill torrents and ultimate utilization of flood flows for developing maximum agriculture areas essentially requires the consideration and evaluation of all the possible planning options. For this purpose the following possible alternatives may be considered:

- Flood dispersion structure;
- Flood distribution structure;
- Channelization of torrent;
- Check dam (or delay action dam);
- Combination of various alternatives.

4.10.17. FLOOD DISPERSION STRUCTURE

4.10.18. The flood dispersion structure would ensure the utilization of flood flows by directly diverting them into the irrigation channels without storage arrangement. A sizeable flood dispersion structure located at the start of natural distributary could reduce the flood peaks in main torrent

4.10.19. FLOOD DISTRIBUTION STRUCTURE

4.10.20. Where the main torrent branches off into natural distributaries a flood distribution structure would ensure the sharing of flood flows in accordance with the existing water rights. A sizeable flood distribution structure could reduce the passing of undue flood peaks into the only one distributary.

4.10.21. CHANNELISATION OF TORRENTS

4.10.22. The channelization of torrent would involve the improvement of its

existing course by raising its banks and introducing training and protection structures at appropriate locations along the torrent. These measures will be recommended only for specific reaches where flood flows need controlling and new structures could be effective for long period by contravening the high silt loads. The selection and designing of various types of training and protection structures will conform to the criteria already described under relevant sections.

4.10.23. **CHECK DAM (OR DELAY ACTION DAM)**

4.10.24. A single or successive check dams across the torrent and / or tributaries bed may be provided to reduce the flood peaks in the main torrent by temporary storage or delay action. The synchronization of entry of peak discharges from the contributing tributaries into the main torrent can be broken, thus further reducing the flood peaks in the main torrent. The check dams include deposition of sediment till the upstream reservoir is almost filled up and the erosion valley widened and slope flattened. If the valley remains still active, additional check dams can be inserted in between the existing check dams to reduce the slopes further and achieve a stable erosion valley. Sometimes a large number of such check dams has to be provided for stabilizing a very steep valley.

4.10.25. **GABION STRUCTURES**

4.10.26. Maximum use of stone-crates (Gabions) will be made in the hydraulic structure components. Gabions are very well suited for the hill torrent conditions because of their flexibility and also to make full use of readily available local stone. In order to protect crate-wires, concrete layer will be provided on all exposed surfaces, except for the floor aprons where it is liable to get damaged during de-silting operation and also due to uplift pressure. Nearly all of the hydraulic structures made of Gabions, except check dams, will be of minor type.

4.10.27. **CHECK DAM**

4.10.28. The check dam does not conserve water and control of seepage through the body of the dam. A porous structure made of Gabions will therefore serve the purpose for temporarily holding water for a few hours to reduce the flood peaks in the torrent. Another major advantage is that the structure height can be modified as desired, simply by building up or removing courses of Gabions of the existing structure. The overflow section can be adjusted within the dam body, without any expensive arrangement. In case of floods larger than the design flood, the whole structure could act as overflow weir. Due to the porous nature of the structure, horizontal and vertical pressures are less. With proper embedment, they can be safely used even where firm abutment conditions are not available. Any damage to the structure can be conveniently repaired.

5. RECOMMENDATIONS

Immediate Action

5.1. It is recommended that the Government sets up Hill Torrent Management Policy, as soon as possible and preferably before the start of the Flood season 2011. This will not only act as flood mitigation measure but will also bring agriculture and prosperity to the “barani” area in the foothills of the Suleman Range.

5.2. A detail audit be conducted before the next flood season to assess the allocation and utilization of funds and verify the results achieved through various heavily funded hill torrent projects done till date. The audit must give elaborate reasons why these projects failed. The audit report must be put up before the Chief Minister of the Province so that firm action be taken against the delinquents and road to flood and hill torrents management in this country be paved in stone, once and for all.

Reform

5.3. Large quantity of fresh water resource that comes down as hill torrent is not being tapped and harnessed. In the modern water scarce world this passes for criminal neglect. There can be no other national or provincial priority more urgent and pressing than finding ways and means of conserving fresh water resources of our country. The sustainability of our future generations depends on the water management and planning we do today.

5.4. Any future Flood Management Plan will be incomplete without Hill Torrent Management. Detailed planning and mechanism is provided in FFC's Manual. Government needs to start implementation.

Additional Recommendation (even though outside our TORs)

5.5. During our inquiry we visited³⁰ the hill resort of Fort Munro³¹. The climate, beauty and serenity of the resort left an impression on us. We were informed that several such peaks exist in the Suleman Range which can be developed into wonderful hill resorts of the likes of Murree. Any development in this direction can provide a huge economic uplift to the less prosperous districts of Punjab and provide healthy entertainment to the people of Southern Punjab. It will also open multiple avenues between Baluchistan and Punjab, which will further cement national development and cohesion.

³⁰ On a private visit for the members of the Tribunal and its secretariat which was completely funded by the Chairman of the Tribunal in his personal capacity.

³¹ an hour and half drive from D G Khan.

6. WEAK I & P DEPARTMENT – institutional structure and capacity

6.1. According to the position paper submitted by SPRU, I & P Department³², the irrigation system serves as the lifeline for sustained agriculture in the province which has arid to semi arid climate. There are 24 main canal systems which off-take from 14 headworks / barrages and irrigate 21.5 million acres of fertile land in the heart of Punjab. The total length of main, branch and distributary canals is 36,000 Km, while the total off-take capacity of canals is 120,000 cusecs. In addition, the Punjab farm lands are drained by 8000 Km of surface drains and protected by 2600 Km of flood embankments and spurs. The irrigation system is over 100 years old with ageing structures and inadequacies to meet the growing water needs. Aware of the crucial importance of water for sustainable socio-economic development, the present government is according the highest priority to the water resources development and management with the vision to provide adequate, equitable and reliable irrigation supplies to the cultivable lands of Punjab aiming at enhanced agricultural productivity and sustainable development with focus on holistic management and broad based institutional reforms.

6.2. The above position paper further states that the way forward for the Irrigation has reached a stage in which increased investment, both public and private, is needed simply to maintain the current level of efficiency. This investment is required to support measures such as modernization of barrages, lining and remodeling of irrigation conveyance network and introducing on-farm drainage. In addition, a very considerable amount of investment will be required to build water storage capacity to levels that would provide greater security against fluctuations of rainfall and snowmelt as well as cater for seasonal variations in water demands. Focus on broad-based policy and institutional reforms in the sector will continue, with appropriate refinements in the light of experience gained so far. Towards this end, the way forward is;

- Build large scale multi-purpose dams (for water storage and hydro power generation)
- Improve water use efficiency at farm level.
- Develop asset management plan and rehabilitate irrigation infrastructure
- Ensure transparency of flows through telemetric technology (inter and intra provincial levels)
- Develop groundwater management framework for sustainable use of the resource base
- Develop small and medium scale hydro power projects
- Realign mandates, organizational and governance models and build capability and relevant knowledge base for water sector institution.

6.3. Irrigated agriculture is the major determinant of economic growth potential of the province as it accounts for 26 percent of the GDP and caters for over 40 percent of the

³² Ex I.W.141/1

province's work force. Over 90 percent of agricultural output in Punjab comes from farmlands irrigated by one of the largest contiguous irrigation system in the world. The colossal irrigation conveyance network is serving 21 million acres (8.4 million hectare) cultivable command area with cropping intensities generally exceeding 120 percent. The vast irrigation system in the province, however, faces major irrigation and drainage challenges with serious economic, environmental and social implications. Hydraulic infrastructure has deteriorated and large deficits in O&M maintenance have led to sub-optimal service delivery levels characterized by low water conveyance efficiencies and inequitable water deliveries. Replacement costs for Punjab's irrigation infrastructure including barrages and conveyance network is estimated as Rs.1600 billion whereas the estimated cost for rehabilitation and deferred maintenance needs is Rs.170 billion. Consequently, development in the sector needs to enshrine rehabilitation, improvement and modernization of infrastructure coupled with holistic reforms aiming at integrity and sustainability of the system through improved management and service delivery levels³³.

6.4. *According to the MTDF 2009-2012*, one of the holistic strength for the irrigation sector is to extend and approve drainage and flood protection as well as hill torrents management. The total outlay for the year 2009-2010 for irrigation sector is Rs.10 billion. According to the MTDF, Government of the Punjab is cognizant of the safety of major hydraulic structures for sustained supply of canal water to crops and mitigation of flood hazards has planned to rehabilitate and modernize the barrages being lynchpin of irrigation system. According to the MTDF rehabilitation of Taunsa barrage has been completed in December 2008. The amount allocated for the flood work for the year 2009-2010 is in the sum of [Rs 1156 million](#)³⁴.

6.5. Some of the ongoing flood works schemes are the management of hill torrents in CRBC area D.G.Khan since 2007 at a cost of Rs 1605 million. One of the approved new schemes is the management of hill torrents in D.G. Khan Irrigation Zone Sori Lund, Vidore, Mithawan, Kaha and Chachar (Kaha Hill Torrents) at the costs of Rs 200 million³⁵.

6.6. *According to the MTDF 2010-2013*³⁶ Irrigation sectors total outlay for the year 2010-2011 is planned at Rs.11.005 million.

6.7. The sub-sector allocation is as follows:

| | |
|---------------------------------|-----|
| Irrigation | 67% |
| Drainage | 4% |
| Flood | 5% |
| Small Dams | 13% |
| Power | 6% |
| Surveillance and Investigation: | 3% |
| Miscellaneous | 2% |

³³ Ex I.W. 137/2/2

³⁴ approximately.

³⁵ Ex I. W. 137/3/2

³⁶ Ex.I.W.137/3/2

6.8. *According to Vision 2030*,³⁷ Planning Commission, Government of Pakistan (2007) while dealing with the efficiency of the bureaucracy states that the professional civil services which facilitates and implements the policies should be free of clientilism, be it political, donor related, or even cadre centered. Extensive administration reforms are needed in Pakistan to attract and retain competent officers.

6.9. *INTERNATIONAL EXPERTS:*

6.10. *JOHN BRISCOE*,³⁸ Gordon McKay Professor of the Practice of Environmental Engineering, Harvard University Schools of Engineering and Applied Sciences, Public Health and Kennedy School of Government, USA submitted before the Tribunal that 'since 1958, with the transfer of major development works to WAPDA, provincial irrigation departments' functions were reduced mainly to the operation and maintenance of the systems. PID managers have not been finding these functions sufficiently challenging, and over the years have lost much of their initiative, innovativeness, and morale. The PIDs' attention remains almost exclusively focused on the irrigation distribution network. Let alone the flood protection works, even the river barrages have been in a state of neglect. Whenever a major problem of a catastrophic nature takes place on a barrage or a flood protection embankment, lack of adequacy of maintenance funds is given as a standard cause which in several cases would be valid while in others not quite so. Deferred maintenance has become a routine practice with PIDs, which eventually results either in a disaster or in a major repair and restoration undertaking in the shape of an independent project.'

6.11. *ADIL NAJAM*,³⁹ Director and the Frederick S. Pardee Professor of Global Public Policy, Boston University,⁴⁰ USA deposed before the Tribunal that "while it is important for the future to improve the quantity of data generated, it is probably more important to strengthen the institutional abilities to analyze the data in time and over time. The current structures of data calculation and dissemination related to extreme climatic events such as floods are disbursed in multiple institutions, which have not had a history of effective coordination or communication amongst them. Improving the analytical capacity and the ability for cross-institutional connections is a key challenge in this regard. Within this challenge the role of the Irrigation Department is particularly important not only as a recipient of Meteorological Department from the PMD but also as a partner in the analysis of real time use of that data."

6.12. In the *"Case Study of the Punjab Irrigation Department"* by *Asrar-ul-Haq*,⁴¹ the history of the Irrigation Department's performance has been traced in an exclusive report regarding the reorganization of the Punjab Irrigation Department that was edited by Mazhar Ali

³⁷ Ex.I.W.137/5.

³⁸ John Briscoe spoke with the Chairman of the Tribunal over phone from USA and got recorded the above statement. On his visit to Lahore he also met the other members of the Tribunal on 6-12-2010. The above statement is transcribed from the recording made over the phone. The statement was sent to Mr. Briscoe over email which was confirmed with slight modifications on 24-12-2010. Therefore, there is no signature on the statement.

³⁹ I.W. 150

⁴⁰ The Frederick S. Pardee Center for the Study of the Longer-Range Future 67-Bay State Road Boston, Massachusetts -02215

⁴¹ Mark-107, (Ilmi, September, 1998, Pakistan National Program, International Irrigation Management Institute, Lahore.)

(1981). The report highlights the factors that have been influencing the working of the Department into sharp focus. Some selected reflections from the above report are reproduced below:

“.....In the past, the Irrigation Department of the Punjab occupied a top position in the Government's power hierarchy and in national development. Young engineers entering the department had a sense of pride and senior engineers had a feeling of deep professionalism and achievement. They worked with dedication under harsh and difficult environments and made the deserts bloom. The outlook then was progressive and forward looking.....During the One Unit period, the department successfully planned, designed, executed and operated two major irrigation projects, viz; the Guddu Barrage Project and the Taunsa Barrage Project. The department had a strong Central Design Office to conceive, plan, design and oversee major projects and to undertake major changes and improvements in operating works. It had also a large construction team to execute major projects expeditiously and economically. It carried out all the complex and difficult studies which subsequently became the basis of the Indus Basin Replacement Plan. Tripartite negotiations on the Indo-Pakistan water dispute among India, Pakistan and the World Bank were successfully handled.....In 1960, planning, design and construction activities connected with the development of water and power resources underwent a major change. All resources in materials and manpower were diverted to timely completion of the Replacement Works under the Indus Basin Plan. WAPDA was created in 1958 as an autonomous organization to execute the Indus Basin Plan, mostly with the help of foreign consultants and foreign contractors due to Pakistan's obligations under the foreign assistance for the Indus Basin plan. Policy decisions for the execution of the Indus Basin Plan were based on advice of foreign consultants with Pakistani engineers playing only a secondary role...Due to pressure of work of the Replacement Plan, a large number of experienced engineers of the Irrigation Department were assigned to WAPDA. No major canal irrigation project outside the Replacement Plan was undertaken during the period 1960-70 as the entire emphasis was on the timely execution of the plan works. The engineers in the Department found themselves at a disadvantage as compared to their colleagues in WAPDA, where they had much better career and professional opportunities. WAPDA was a young, expanding and powerful organization for the Power Sector and execution of all replacement works. Major new projects in the water sector were also assigned to this organization. The transfer of responsibilities for irrigation development to WAPDA adversely affected the professional competence of the Irrigation Department. The engineers in the department were forced into an environment of the inactivity with little chances of professional growth. An organization can blossom only in the face of challenges; inactivity can destroy even the best organizations.

Slowly, but steadily, the Punjab Irrigation Department, which was once the pride of engineers in the field of development and enjoyed a high status in the government hierarchy, went sliding down into near inactivity and stagnation. There were no

major projects where the personnel could get important field experience and professional maturity. Departmental promotions became slow as new jobs were not forthcoming. The whole climate became rather stale as there were fewer changes for exposure to modern knowledge and experience. As such, the engineers greatly lost their initiative and confidence.”

6.13. Commenting on the relevance of the present role structures of the Punjab Irrigation Department in the changed socio-political environments of the society, Bandaragoda and Firdousi (1992)⁴² have observed

“.....Organizational structures, distribution of responsibilities and even the size of organizations basically remain in the same form as left by the colonial administration. Minor sporadic changes have resulted only in some appendages, and consequent administrative anomalies...

For instance, the PID, which was created about a hundred years ago, despite its expansion with some new disciplinary wings such as Drainage, SCARP, Mechanical, etc., has not changed in its basic structure of the Open Canal Circles since its creation. Since then, the demand for water has increased manifold due to fragmentation of lands, changes in cropping patterns and expanded irrigable areas, all leading to increased problems concerning distribution of water and disputes among the irrigators.....

Among the institutional factors that affect Pakistan's irrigation performance are the problems of complex and outdated formal rules and procedures compounded by the over riding effect of several socially evolved information institutions, and the associated management deficiencies of a static administrative structure.....

It is recommended to review the present organizational structure of the Punjab Irrigation Department with a view to removing present administrative anomalies and making them more effective in supporting and monitoring irrigation management at divisional level where greater farmer participation can be achieved in decision making.”

6.14. The “[Case Study of the Punjab Irrigation Department](#)” further states that: The Punjab Irrigation Department, which once led the world in development of the science and art of irrigation engineering, is now left far behind in the fields of research and development, and the use of modern tools in irrigation management. Rather than acquiring the modern technologies for improving irrigation performance, the department has not been able even to sustain the old practices and systems. Despite some individual brilliance and isolated efforts to transform the system management, the general trend has followed the pattern of adhucism and status quo. This has been mainly due to the prevalence of a culture of indifference and stagnation in the organization, inadequate incentives for performance enhancement and a lack of forward planning and imagination on the part of the leadership.

⁴² reference Mark 107

6.15. In Flood Control & Management, Asif H Kazi⁴³ The provincial irrigation authorities are the custodians of their respective irrigation, drainage and flood protection networks. They are supposed to carry out not only the operation and maintenance of these systems but also design and development of new works. Since 1958, however, with the transfer of major development works to WAPDA, provincial irrigation departments' (PIDs') functions were reduced mainly to the operation and maintenance of the systems. PID managers have not been finding these functions sufficiently challenging, and over the years have lost much of their initiative, innovativeness and morale. This is further compounded by their unenviable role as a target of fair as well as unfair criticism by others, including the federal government, WAPDA, the agriculture departments and the international financing agencies. The large land owners with political clout have choked the small landholders to the extent that there is no such thing left, in certain Provinces, as an equitable distribution of water. The tail ends of distributary channels remain perpetually dry. In these circumstances, the PID's attention remains almost exclusively focused on the irrigation distribution network. Let alone the flood protection works, even the River Barrages have been in a state of neglect. Whenever a major problem of a catastrophic nature takes place on a Barrage or a flood protection embankments, lack of adequacy of maintenance funds is given as a standard cause which in several cases would be valid while in others not quite so. Deferred maintenance has become a routine practice with PIDs, which eventually results either in a disaster or in a major repair and restoration undertaking in the shape of an independent project. Some recent events in the form of breaches in the first line of protective embankments in Sindh and the current situation at Sukkur Barrage, are clear evidence of accumulative neglect. In Punjab as well, at present some six (6) Barrages have deteriorated to a point that deferred repairs are now being undertaken as major "Remodeling Projects".

6.16. Recommended Institutional Reform:⁴⁴ A rational though radical solution to the aforementioned problems would lie in creating a "River Management Authority" that would be responsible for integrated planning, engineering design, construction, operation and maintenance of all hydraulic structures on the major Rivers. These may include Dams, Barrages Hydropower Stations etc and, of course, all Flood Protection Works. WAPDA's entire Water Wing and the Federal Flood Commission would need to be merged together to form the proposed River Management Authority. Experts from PIDs on Barrages may also have to be arranged on temporary or permanent basis as would be considered appropriate. It stands to reason that the headquarters of this River Authority should be in Islamabad, but it should have strong presence in the four Provincial Metropolis. Funding would initially be provided by the Federal Government, while recovery arrangements through a water charge on hydropower and a storage charge on irrigation water supplied to offtaking canals, can be levied to make the Authority financially autonomous. A nominal flood protection charge may also be recovered from the City Administrations and Industrial areas to whom protection has been specifically provided.

⁴³ Mark 134 (Appendix 85 - page 5603)

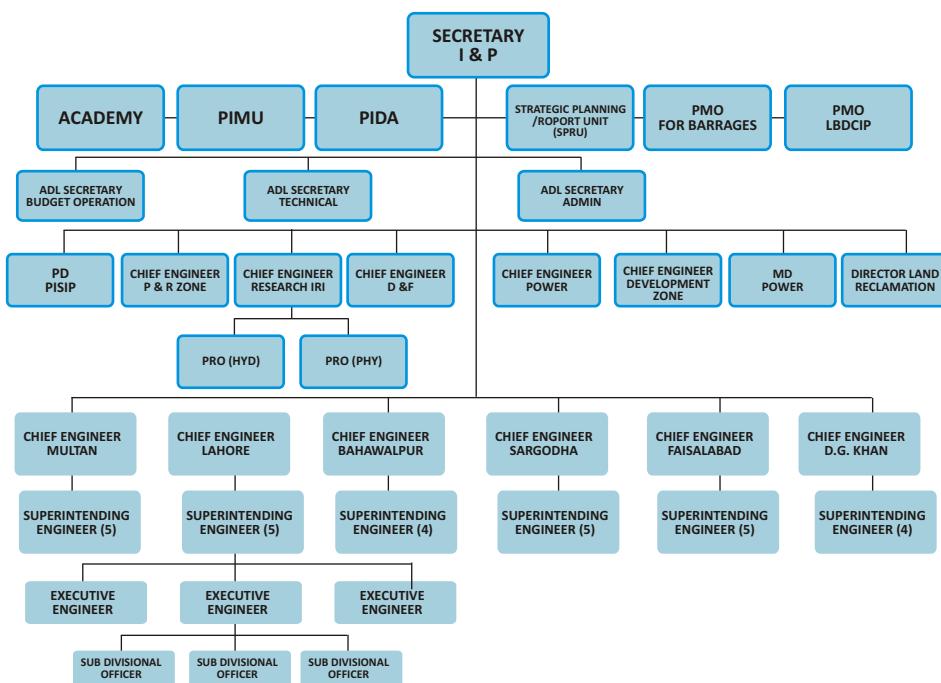
⁴⁴ ibid.

6.17. INQUIRY & FINDINGS

6.18. Our inquiry has left us amazed and shocked at the poor quality and faltering standard of the I & P Department. This is the Department that is supposed to run and manage the Indus Irrigation System i.e., the World's largest contiguous irrigation network. Pakistan's agro-economy is largely dependant on our Indus basin Irrigation System. I & P Department should therefore be the premier department of the provincial government and irrigation as a frontline sector. Sadly, this is not so. The I & P Department (in the context of flood management) does not possess the capacity or the standard to head and manage the Indus Irrigation System.

6.19. I & P department is devoid of research and future thinking, it lacks systematic decision making structure, has poor and unskilled human resource, it lacks training and development, the organogram shows a large sluggish structure which is victim of its own inertia.

ORGANOGRAM OF PUNJAB IRRIGATION & POWER DEPARTMENT



6.20. The department has no capacity or the requisite resilience to manage floods in the future. Unless of course this premier department is reengineered, its capacity improved drastically and brought up to speed with the world in irrigation practices. We have also noticed that the department is driven by corruption rather than innovative and well researched irrigation practices. The department has no vision of the flood sector. Little research, planning or thinking goes into flood protection schemes developed by the irrigation department. These schemes, find way to Islamabad and become part of the National Flood Protection Plan (a misnomer). These flood protection schemes are propelled by political interests of the locals with no correlation with any integrated flood sector master

plan. In fact there is no flood sector master plan. The schemes are independent and isolated work of zonal offices of the Irrigation Department. There is no peer review (and if any it is totally ineffective) and only its budgetary limits are looked into by the P & D Department. These schemes hardly get verified for their technical or strategic insight or vibrance.

6.21. I & P Department sadly appeared to be a vacuous and vision less department. There is neither a drawing board at the I & P Department nor the initiative to use one. There is no holistic flood management planning within the Department. There is no knowledge, study or research on climate change and the changing weather patterns which will have a direct impact on the future floods in the country. This is very worrying!!!

6.22. The Barrages according to the Secretary I & P Department⁴⁵ must show case the best officers of the Department. Barrages are the flagships which deserve the best of the best. Much to our disappointment the officials posted at the Barrages cut a sorry figure. They exhibit poor capacity, scanty knowledge of the regulations and most of them are mechanical engineers by training working on posts cut out for civil engineers. A useful snapshot is the team of officers looking after Jinnah Barrage and the Jampur Bund during the floods of 2010. The two tops slots at Jinnah Barrage and one senior slot at D G Khan is held by a Mechanical Engineer.

SARGODHA IRRIGATION ZONE SARGODHA

LIST OF OFFICERS WHO PERFORMED DUTIES AT JINNAH BARRAGE OF KALABAGH HEADWORKS DURING FLOOD 2010

| Sr.# | Name of officer/official | Date of joining the Department | Qualification | Discipline | Date of Posting | Posted As | Remarks |
|------|---|--------------------------------|-----------------------------|---------------------|-----------------|--|--|
| 1 | Rao Irshad Ali Khan s/o Rao Abdul Aziz Khan | 25/01/1975 | B.Sc. Egn. | Mechanical Engineer | 31/10/2008 | Chief Engineer Irrigation Zone, Sargodha | - |
| 2. | Mr. Khalid Iqbal | 22/03/1983 | M.Sc, Diploma UK, B.Sc Eng: | Mechanical Engineer | 19/01/2010 | SE Thal Canal Circle Mianwali | Relieved on 01/08/2010 |
| 3. | Mr. Muhammad Afzal S/o Fazal Mehmood | 24/12/1987 | B.Sc Eng: | Civil | 25/07/2009 | XEN Kalabagh H/W Division Daudkhel | Relieved on 01/08/2001 |
| 4. | Mr. Ghulam Asghar Mirani S/o Ghulam Hussain | 10/08/1983 | B.Sc. Eng: | Civil | 22/07/2010 | XEN Bhakkar Division Bhakkar | Took over charge as SE Thal on 02/08/2010 |
| 5. | Mr. Abid Masood Aamir S/o Mian Dilmir Khan | 20/11/1983 | M.Phil Eng: | Civil | 16.09.2010 | EXN Shahpur Division Sargodha | Took over charge as XEN Kalabagh on 01/08/2010 |
| 6. | Mr. Nawazish Khan | Faisalabad Zone | B.Tech (Hon) | Civil | 08/07/2009 | SDO H/W Sub Division Daudkhel | Relieved on 05/10/2010 |
| 7. | Muhammad Younas | 26/04/1979 | DAE | Civil | 23/07/2007 | SEN Headworks Section | Relieved on 22/12/2010 |

⁴⁵ I.W.6

LIST OF OFFICERS/OFFICIALS INCHAREG OF JAMPUR AND FAKHAR FLOD BUND DURING FLOOD 2010.

| Sr.No. | Name of Flood Bund | Name of officers/officials | Qualification | Remarks. |
|----------------|--------------------|---|--|----------|
| Regular | | | | |
| | | Mahr Muhammad Amin, Chief Engineer/S.E. | B.Sc (Civil Engg) M.Sc. (Irrigation Engg:) | |
| 1. | Jampur | Abid Rasheed XEN | BSC (Mechanical Engineering) | |
| 2. | Jampur | Sh. Saif Ullah SDO | DAE Civil, DPE pass | |
| 3. | Jampur | Tufail Rizvi, Sub Engineer | DAE (Civil) | |
| 4. | Jampur | Muhammad Bilal Ali Sub Engineer | DAE (Mechanical | |
| 5. | Jampur | Ejaz Hameed, Sub Engineer | B.Tech | |
| 6. | Jampur | Muhammad Ali, Sub Engineer | B.Tech | |
| 7. | Jampur | Asif Mahmood Fida, Sub Engineer | DAE Civil | |
| 8. | Jampur | Muhammad Rafique Gabol, Sub Engineer. | DAE Civil | |

6.23. The Secretary⁴⁶, Irrigation & Power Department deposed before the Tribunal that: "According to details of posting held by Muhammed Afzal XEN, he was appointed at Kalabagh Head Works on 24-7-2009 on current charge basis. He had no past experience of a Barrage and was never appointed as an SDO on any of the Barrages earlier in his entire career which starts in the year 1990. Ideally an XEN appointed at a Barrage should have worked on a Barrage as SDO but this was not the case here. Service profile [of Khalid Iqbal S.E.] shows that he is B.S. 19 (current charge) with degree in Mechanical Engineering and was promoted in the year 1992 as XEN, however, through out his career he has never held the posting on Barrage except once in the year 2008-2010 at Sidhnai." The Secretary further submitted that "there is a tradition that best of the lot has to be appointed on the Barrage. In my view Muhammed Afzal XEN did not fit the qualifications". "..... posting of a Mechanical Engineer on a Barrage was considered to be a sin." "Traditionally Mechanical Engineers are not even posted on the canals." Inspite of the same, Muhammed Afzal XEN was not removed, no reason has been placed on the record for this grave inefficiency by the Secretary I & P Department.

6.24. The officer appointed are either on current charge or look after charge. Muhammed Munir Anjum, XEN , Taunsa Barrage during floods was on a look after charge. What level of seriousness and commitment comes with a look after charge and that too while holding additional charges i.e., SDO Headworks and SDO Bunds. Performance of Muhammed Munir Anjum leaves little doubt that the service structure and service rules within the Irrigation Department require a serious overhaul. There is also serious shortage of good professionals. When Munir Anjum was suspended by the Chief Minister on 1-8-2010, the Department did not have a pool of Barrage experienced XENs awaiting postings. This reflects poor governance and human resource management within the I & P Department.

6.25. The Strategic Planning & Research Unit (SPRU) has done no planning. They had no thought about the Flood Management strategies or Flood Risk Management. The Drainage and Flood Zone is headed by the least informed officer as he failed to tell us the formula and

⁴⁶ I.W.6

the regulation which provides for the quantity of reserve stones required at the barrages during floods.

6.26. The Irrigation Research institute (IRI) set up in 1924 has a rich history which the department needs to emulate. The C.E. (Research) heading IRI being mechanical engineer had little understanding of research and left a poor impression on us. Similarly, Director Design is also holding a degree in mechanical engineering. The PRO, IRI on the other hand was reasonably satisfying. This institute needs to be enriched into a strong research wing of the department and reliance on foreign consultants to be reduced.

7. RECOMMENDATIONS

7.1. In order to proudly manage the “World's largest contiguous irrigation network,” I & P department requires immediate reengineering and reform. It has to be the flagship department of the Government of the Punjab.

7.2. “Water” being the most valuable resource of the future (not so distant future) – Irrigation Department must procure and acquire the **best of the best human** resource available within the Provincial bureaucracy. Able, educated and well trained officers need to fill this department. The current state of affairs is destined for a disaster if nothing is done soon.

7.3. Irrigation department must be known for its technical ingenuity and avant garde research capabilities. Irrigation in the modern world by any measure is a highly technical field requiring constant innovation and research besides selection of the best minds.

7.4. Our economy rests on Agriculture and cannot progress unless complimented by a robust, modern and innovative irrigation system. I & P Department cannot be equated with just any other department and therefore requires immediate reform and uplift.

7.5. The administrative Secretary has been most useless in the recent floods. The top managerial structure needs a rethought. A Secretary and a special secretary team might be more effective, with the special secretary being a technical irrigation person.

7.6. The historic Irrigation research Institute must be strengthened and its lost glory be restored. Reliance on consultants must be successively reduced. Development must be sustainable, driven by passion and must factor in homespun wisdom.

7.7. Irrigation Department must closely work with the engineering universities of the country to attract its best minds and be current with the recent developments in science, climatology, irrigation and agriculture.

7.8. Best officers (civil engineers only) must be posted on the Barrages. This field formation must be immediately revisited so that a team of abler men is holding guard at the barrages before the start of the Flood Season 2011.

7.9. The job description of various engineering cadres must be clearly defined (if not already done) alongwith required minimum qualification. No officer should be posted to any position without having requisite minimum qualification (for example Mechanical Engineer to be posted on post suited for a civil engineer and vice versa).

7.10. We noticed that XEN appointed at Taunsa Barrage to be on LOOK AFTER charge and holding other charges as SDO. Secretary I & P Department deposed that most of the officers have adhoc promotions. Munir Anjum held the posts of SDO Headworks and Bunds besides

a look after charge as an XEN. This needs to go. Proper Service Rules need to be introduced and team heading Barrages must be confirmed and duly promoted officers holding just one charge. Officers appointed must not be transferred or disturbed during the Flood Season. The suspension of the XEN at Taunsa Barrage on 1-8-2010⁴⁷ during the height of the flood season by the Chief Minister, Punjab on a complaint of a local is deprecated.

7.11. Postings on the Barrages must be incentivized and made more attractive.

7.12. XENs and SDOs on Barrages must pass the [Fit And Proper Test](#).

7.13. Continuing local and international training/ capacity building in Barrage regulation and flood management be conducted.

7.14. Severe departmental penalties to be provided for gross negligence in managing floods.

7.15. Vacant posts of engineers must be filled immediately through Punjab Public Service Commission and process should be regularized in future so that there should not be discontinuity for any trained engineer on the job.

⁴⁷ when the Barrage was faced with exceptionally high flood.

8. INEFFECTIVE ROLE OF FEDERAL FLOOD COMMISSION (“FFC”).

8.1. After creation of Pakistan, Central Engineering Authority was constituted under Chief Engineer Advisor to deal with the issues of water, power and allied engineering matters at national level. It was re-designated as Chief Engineer Advisor after establishment of Water & Power Development Authority (WAPDA) in 1958. Prior to 1976, Provincial Governments were responsible for the protection works. Disastrous floods of 1973 and 1976 resulted in heavy losses indicating that existing flood protection facilities and planning were inadequate to provide effective protective measures for the country. Consequently, in January 1977, Federal Flood Commission was established for integrated flood management on country wide basis⁴⁸.

8.2. FFC was constituted through Resolution No.W-II3(23)/76 dated 4.1.1977 for formulating a **National Flood Protection Plan** to be implemented by the Provinces⁴⁹.

8.3. Under the said Resolution the functions of the FFC are as follows:

- I. Preparation of flood protection plan for the country.
- ii. Approval of flood control/protection schemes prepared by Provincial Government and Federal Line Agencies.
- iii. Recommendations regarding principles of regulation of reservoirs for flood control.
- iv. Review of damages to flood protection works and review of plans for restoration and reconstruction works.
- v. Measures for improvements of flood forecasting and flood warning system.
- vi. Preparation of research programme for flood control and protection
- vii. Standardization of designs and specifications for flood protection works.
- viii. Evaluation and monitoring of progress of implementation of National Flood Protection Plan.

8.4. **National Flood Protection Plan 1978**⁵⁰: The Plan set the tone for strategic planning was back in 1978. Chapter 1 provided the vision in the following words:

“Population growth and economic expansion bring with them increasingly complex resources problems requiring increasingly greater efforts in planning and coordination. The wide range of uses and functions that must be considered in planning for water resources development must include flood management and flood plain management. Interests of government agencies at all levels and of private enterprises need to be integrated in comprehensive water and related land resource planning.”

8.5. The Plan providing the relationship of flood planning to overall planning states:

⁴⁸ wwwffc.gov.pak (website)

⁴⁹ Ex.I.W.103/1

⁵⁰ Mark 60/2

“Flood management planning must be in harmony with the overall water and land resources planning for the Nation.”

8.6. According to the National Flood Protection Plan 1978 (Main Report)⁵¹ the goal of flood management planning is to reduce;

- situation threatening the life and health of the people;
- economic losses;
- costs of emergency evacuation and relief;
- loss of public revenues; and
- impairment of national security by fostering a unified programme of structural and non-structural flood management.

8.7. Towards meeting this goal, the specific objectives adopted by the FFC for flood management planning are as follows:

- i. To reduce flood losses
- ii. To give priority for Flood protection to areas of greatest economic flood damage hazard and/or greatest potential for human suffering, as far as possible;
- iii. Protection from flood damages to areas lying outside active flood plains and also vital infrastructural installations.
- iv. Maintaining standards of the existing flood control/protection facilities
- v. Promoting appropriate land use by avoiding the growth of **flood vulnerable development in flood hazard areas and adjusting land use to be compatible with the frequency and duration of flooding.**
- vi. To minimize adverse affects on natural ecosystem and on environmental values.

8.8. Flood management in Pakistan requires a balance of flood control by reservoirs, flood protection by bunds, nonstructural measures, operation and maintenance and flood watch and flood fighting.⁵²

8.9. Plan 1978 frankly states that proposals for specific flood protection objectives generally originate in field offices by local irrigation officials without special training in flood protection planning. The proposal most likely is in response to the problems highlighted by the most recent flood. These schemes then pass upward through the organization usually, with minimum additional technical input. Eventually, PC-1 Proformas are prepared.

⁵¹ Mark 60/2

⁵² National Flood Protection Plan 1978, Chapter-2. (Mark 60/2)

8.10. According to National Flood Protection Plan, 1978 following improvements in flood management have been recommended.

8.11. **COMPREHENSIVE FLOOD MANAGEMENT PLANNING.** A comprehensive flood management for Pakistan is required to identify priority problems to be studied and scheduled priority projects to be implemented within available resources. The comprehensive flood management plan should consider the Indus River in major tributaries as a single system so that changes in one reach of the system will be reflected in other reaches. Compatible structural and nonstructural projects and plan elements must be efficiently coordinated over the entire system to achieve maximum flood loss reduction. The investigations undertaken to prepare the 1978 National Flood Protection Plan are only the initial steps towards preparing a Comprehensive Flood Management Plan (CFMP)

8.12. **PLANNING FOR FLOOD PROTECTION.** Planning of individual component of flood planning system by the Irrigation department has been essentially on a judgment basis. There are no formal criteria or guideline for planning of flood protection systems. Systematic procedures have not been used for determining priorities of flood protection needs or for evaluating the economic justification of flood protection works. Sizing of facilities has been almost completely based on highest experience flood event.

8.13. Three levels of investigation and planning should be undertaken in the planning process for flood protection project, reconnaissance, appraisal and feasibility.

- **Bund design and construction practice.**
- **Reservoir Operation.**
- **Nonstructural measures.**

8.14. Effective flood management requires structural and nonstructural measures applied in balance. Structural measures such as dams, bunds, channelization and diversions attempt to control or modify floods on a large scale. Nonstructural measures attempt to modify or adjust flood susceptible structure or areas on an individual or limited area basis. Principal nonstructural measures include flood forecasting and warning, permanent, relocation, flood proofing, flood insurance and land use regulation. Three areas have been identified where nonstructural measures could be the most effective means for reducing flood damages.

- i. Active Flood Plain of the major rivers
- ii. Area downstream from intentional breaching sections;
- iii. Hill torrents flood plains.

8.15. **NATIONAL FLOOD PROTECTION PLAN PHASE-II (MAIN REPORT)**⁵³

⁵³ Mark-61

8.16. Proceeds from the same premises as the National Flood Protection Plan Phase-I (1978) while it gives guidelines for planning projects and over all strategic planning of flood management.

8.17. **NATIONAL FLOOD PROTECTION PLAN PHASE-III (1998-2008)⁵⁴ and COMPREHENSIVE NATIONAL FLOOD PROTECTION PLAN-IV (2008-2018)⁵⁵ & Report of Sub Group on Flood Control Management and Development (2005-06 to 2009-10)⁵⁶**

8.18. The comprehensive and integrated flood management programme lists existing problems of Punjab to be (a) inundated bank erosion, (b) hill torrents, (c) integrated river management and (d) flood forecasting warning and preparedness.

8.19. The first National Flood Protection Plan ("NFPP-I") was prepared by Federal Flood Commission ("FFC") in 1978. The master plan have problems relating to the flood sector and presented viable solution for the immediate requirement as well as further long term plans, which would be up-dated after every 10 years. The master plan was firstly updated in 1988 as NWFPP-II and was followed by the formulation of the first Flood Protection Sector Project ("FPSP-I") in 1988. FPSP-I was completed in 1998 at a cost of Rs.4,820 million with the assistance of Asian Development Bank. FPSP-I emphasis on immediate flood protection needs of the country through implementation of structural and non-structural measures. However, there were many gaps in the network and certain rivers and streams could not be included in the first project. FPSP-II was an urgent follow up of FPSP-I. PC-1 for FPSP-II was prepared and approved by ECNEC on 22.01.1998 for a capital cost in Pak Rs.8,000/- million. The project estimate for offer of cost of works and services were US\$ 200 million.

8.20. The prime objective of FPSP-I was to reduce flood damages in the areas and communities settled along major rivers and streams in the country. Estimated area of 18,000 sq, kms of flood prone tracts of agriculturally productive land would receive the benefits of the protection and security against flood hazards. The collective objective of the project was aimed to reduce damages due to flooding in the designated areas of the project, which would be achieved by (a) constructing flood protection and river training works in and along the main rivers as well as secondary and tertiary rivers including hill torrents; (b) Extent and gravity weather data collection system. Weather and flood forecasting techniques, in order to increase the response time required to mitigate the damage; (c) Strengthen the knowledge base on the process involved in the constantly changed behaviour of the main rivers. FPSP-II was finally completed in May 2007.⁵⁷

8.21. National Flood Protection Plan according to FFC are the Flood Protection Schemes prepared by the respective provinces. Three National Flood Protection Plans starting from 1978 till 2008 have been approved and implemented. NFPP-IV was submitted with the Ministry of Water and Power Department on November, 20, 2006 for approval by the

⁵⁴ Mark-62

⁵⁵ Mark-63

⁵⁶ Mark 58

⁵⁷ Second Flood Protection Center Projects, Project Plan Report Volume-I (Main Report)

competent authority, however, this plan has not yet been approved by the Planning Commission.

| Sr. No. | Planning | Duration | Programme | No. of Schemes | Costs in millions. |
|---------|-------------------------------------|-----------|----------------------------|----------------|--------------------|
| 1. | National Flood Protection Plan -I | 1978-88 | GOP funding | 350 | 1,630 |
| 2. | National Flood Protection Plan -II | 1988-98 | GOP Funding ADB funding | 182 256 | 1,454 4,860 |
| 3. | National Flood Protection Plan -III | 1998-2008 | GOP funding ADB funding | 362 90 | 2360 3,603 |
| 4. | National Flood Protection Plan-IV | 2008-2018 | Not yet approved | 863 | 30,000 |

8.22. The role of FFC is to technically examine the flood protection schemes prepared by Provinces, Federal Line Agencies and recommended them for approval by higher forum i.e. DDWP/CDWP/ECNEC. FFC has the Scrutinizing Committee which comprises representatives of Federal and Provincial Governments to technically examine and clear schemes.

8.23. According to FFC they have undertaken a number of research studies aiming at effective flood control measures including master feasibility studies for harnessing of flood flows of hill torrents in Pakistan (However, no progress in this regard has been made).

8.24. According to Mr. Zarar Aslam, Chairman, FFC⁵⁸ “ for the preparation of National Flood Protection Plan all the Provincial Irrigation Departments prepare their schemes and submit it to the FFC. Once the said schemes are received by Federal Flood Commission they are compiled and called the National Flood Protection Plan....**the role of FFC is [merely] that of coordination.** We help in the approval of schemes which are approved by ECNEC and Central Development Working Party (CDWP). FFC also ensures timely disbursement of funds for execution of schemes.”

8.25. According to the Chairman, FFC has also prepared a design criteria and methodology in the year 2001 (referred to as the FFC Manual in this Report) which studies standards of flood protection works. The said Code has been sent to the Irrigation Department, however, there is no survey conducted to find out whether existing protection works have been brought in conformity with the FFC Manual.

8.26. According to Naseer Ahmad Gillani⁵⁹, Chief (Water) Planning Commission, Government of Pakistan, Islamabad: **"the prime role of developing integrated and holistic Flood Management Plan is the sole responsibility and mandate of the Federal Flood**

⁵⁸ I.W.103

⁵⁹ I.W. 143

Commission (“FFC”) and it is for this primary purpose that FFC was established. The Planning Commission has funded FFC, Rs.4.8 Billion for FPSP-I and Rs.4.5 Billion approximately for FPSP-II. The Planning Commission has also advised Departments of the Federal as well as Provincial Governments to build their in-house research capacity and to place less reliance on outside consultants.”

8.27. *INQUIRY & FINDINGS*

8.28. National Flood Protection Plan (1978) clearly laid down the foundation and framework for the development of a Flood Management Plan way back in 1978 as seen above. However, since then FFC has miserably failed to provide the vision and the plan it was set out to give.

8.29. Since then FFC has been reduced to a post office, stamping away flood protection schemes prepared and developed after every flood season by the zonal chiefs of the I&P Department.

8.30. There is no master plan or a holistic flood management plan, which controls the scope or tests the usefulness of the schemes. Besides the schemes generated by the zonal heads of the I & P department lack research, innovation and ingenuity. The schemes that go through are usually the one that are pushed by the local political patronage. The result is, a series of haphazard, unstructured and ineffective flood protection scheme go through at a heavy financial cost borne by the State exchequer.

8.31. Guidelines set out in the National Flood Protection Plan, 1978 need to be strictly followed. FFC has to perform its real role i.e., of developing a national flood management plan and implementing the same.

9. **RECOMMENDATIONS**

9.1. The current Chairman and the previous Chairmen are accountable for their failed stewardship of the Commission since 1977. The country does not have an Integrated Flood Management Plan - this omission is criminal and the Chairmen must be held accountable for it. We recommend the Federal Government to hold a detail audit of FFC by panel of experts including members of the civil society to assess the performance of FFC since its inception. Why has FFC failed to develop a Flood Management Plan and how and why has the FFC continued to approve localized flood sector schemes⁶⁰ without first assessing their need in the larger context of the Flood Management Plan 

9.2. FFC needs to be pulled out of its cocoon – it is not to act as a lame secretariat or a post office for the PIDs but must immediately assume its real role of a principal flood sector authority of the country. It is recommended that Federal Government must ensure that FFC develops the first ever National Flood Management Plan before the start of the next flood season and shares it with the flood managers of the provinces. In doing so, FFC is to have a participatory approach and should involve the local residents of the area. FFC must display the said PLAN on its website for wider dissemination.

9.3. Federal Flood Commission has to be made accountable for failing to develop a National Flood Management Plan since its inception in the year 1977.

9.4. Federal Flood Commission simply rubber stamps flood sectors schemes prepared at the end of every flood season by the zonal officers of the irrigation department. This is not the role of FFC. Federal Government must immediately pull up this apex flood sector institution to perform its role under the law.

9.5. FFC must have a regular technical and financial audit so that all the approved flood protection schemes and the flood management plans remain under strict accountability.

9.6. FFC must also place on its website all the schemes approved along with their budget so that flood sector work remains within public domain and subject to open criticism.

⁶⁰ mostly driven or supported by the local politicians.

10. LACK OF INTEGRATION & COORDINATION BETWEEN OTHER KEY DEPARTMENTS

10.1. INTRODUCTION

10.2. Other key departments and institutions who also combat flood within their own spheres have no symbiosis with each other. They operate independently without drawing on the each others synergies.

10.3. INQUIRY & FINDINGS

10.4. **NATIONAL DISASTER MANAGEMENT AUTHORITY, ISLAMABAD:** Written submissions⁶¹ dated 19.10.2010 filed by the Director Administration, National Disaster Management Authority (NDMA) states that the subject matter of the Flood Inquiry Tribunal does not relate directly to the National Disaster Management Authority, established under National Disaster Management, Ordinance, 2009, however, in his statement⁶² before the Tribunal, he submitted that “National Disaster Management Authority is formulating the national disaster management plan with the help of JICA and the said plan has a detailed component on **flood management.**”

10.5. Under the Ordinance, National Disaster Management Authority has, *inter alia*, the following functions

- Prepare the National Plan to be approved by the National Commission;
- implement coordinate and monitor the implementation of the National policy;
- lay down guidelines for preparing disaster management plans by different Ministries or Departments and the Provincial Authorities;
- provide necessary technical assistance to the Provincial Governments and Provincial Authorities for preparing their disaster management plans in accordance with the guidelines laid down by the National Commission;
- coordinate response in the event of any threatening disaster situation or disaster;
- lay down guidelines for, or give directions to the concerned Ministries or Provincial Governments and the Provincial Authorities regarding measures to be taken by them in response to any threatening disaster situation or

⁶¹ Ex.I.W.95/1

⁶² I.W.95

⁶³ section 9 of the Ordinance.

disaster;

- promote general education and awareness in relation to disaster management; and

10.6. National Disaster Management Authority will also develop⁶⁴ a National Plan which shall include:

- measures to be taken for the prevention of disasters or the mitigation of their effects;
- measures to be taken for the integration of mitigation measures in the development plans;
- measures to be taken for preparedness and capacity building to effectively respond to any threatening disaster situations or disaster; and
- roles and responsibilities of different Ministries or Divisions of the Federal Government in respect of measures specified in clauses (a), (b) and ©.

10.7. **PROVINCIAL DISASTER MANAGEMENT AUTHORITY**⁶⁵ is to be established by each Provincial Government which shall have the following functions:

- formulate the provincial disaster management policy obtaining the approval of the Provincial Commission;
- coordinate and monitor the implementation of the National Policy, National Plan and Provincial Plan;
- examine the vulnerability of different parts of the Province to different disasters and specify prevention or mitigation measures;
- lay down guidelines to be followed for preparation of disaster management plans by the Provincial Departments and District Authorities;
- evaluate preparedness at all governmental or non-governmental levels to respond to disaster and to enhance preparedness;
- coordinate response in the event of disaster;
- give directions to any Provincial department or authority regarding actions to be taken in response to disaster;
- promote general education, awareness and community training in this regard;
- provide necessary technical assistance or give advice to district authorities and local authorities for conveying out their functions effectively;
- advise the Provincial Government regarding all financial matters in relation to disaster management;
- examine the construction in the area and if it is of the opinion that the standards laid down has not been followed may direct the same to secure compliance of such standards;
- ensure that communication systems are in order and disaster management

⁶⁴ Section 10(3) of the Ordinance.

⁶⁵ Section 15 and Section-16(2)

- drills are being carried out regularly; and
- perform such other functions as may be assigned to it by the National or Provincial Authority.

10.8. Provincial Plan⁶⁶ shall include:-

- the vulnerability of different parts of the Province to different forms of disasters;
- the measures to be adopted for prevention and mitigation of disasters;
- the manner in which the mitigation measures shall be integrated with the development plans and projects;
- the capacity building and preparedness measures to be taken;
- the roles and responsibilities of each Department of the Government of the Province in relation to the measures specified in clauses (b), (c) and (d);
- the roles and responsibilities of different Departments of the Government of the Province in responding to any threatening disaster situation or disaster.

10.9. *DISTRICT DISASTER MANAGEMENT AUTHORITY*⁶⁷ under the Provincial Government shall have following functions:-

- prepare a disaster management plan including district response plan for the district;
- coordinate and monitor the implementation for the National Policy, Provincial Policy, National Plan, Provincial Plan and District Plan;
- ensure that the areas in the district vulnerable to disasters are identified and measures for the prevention of disasters and the mitigation of its effects are undertaken by the department of the Government at the district level as well as by the local authorities;
- ensure that the guidelines for prevention, mitigation, preparedness and response measures as laid down by the National Authority and the Provincial Authority are followed by all departments of the Government at the district level and the local authorities in the district;
- give directions to different authorities at the district level and local authorities

⁶⁶ Section 17

⁶⁷ section 18 & 20 of the Ordinance

to take such other measures for the prevention or mitigation of disasters as may be necessary;

- lay down guidelines for preparation of disaster management plans by the departments of the Government at the districts level and local authorities in the district.
- monitor the implementation of disaster management plans prepared by the Departments of the government at the district level;
- lay down guidelines to be followed by the Departments of the Government at the district level;
- organize and coordinate specialized training programmes for different levels of officers, employees and voluntary rescue workers in the district;
- facilitate community training and awareness programmes for prevention of disaster or mitigation with the support of local authorities, governmental and non-governmental organizations;
- set up, maintain, review and upgrade the mechanism for early warnings and dissemination of proper information to public;
- prepare, review and update district level response plan and guidelines;
- coordinate with, and give guidelines to, local authorities in the district to ensure that pre-disaster and post-disaster management activities in the district are carried out promptly and effectively;
- review development plans prepared by the Departments of the Government at the district level, statutory authorities or local authorities with a view to make necessary provisions therein for prevention of disaster or mitigation;
- identify buildings and places which could, in the event of disaster situation be used as relief centers or camps and make arrangements for water supply and sanitation in such buildings or places;
- establish stockpiles of relief and rescue materials or ensure preparedness to make such materials available at a short notice;
- provide information to the Provincial Authority relating to different aspects of disaster management;
- encourage the involvement of non-governmental organizations and voluntary

social-welfare institutions working at the grassroots level in the district for disaster management;

- ensure communication systems are in order, and disaster management drills are carried out periodically; and
- perform such other functions as the Provincial Government or Provincial authority may assign to it or as it deems necessary for disaster management in the District.

10.10. District Plan for every district shall also be prepared and a National Disaster Response Force shall also be established to cope with disasters.

10.11. Under section 26, National Institute of Disaster Management shall be constituted with the following functions;

- develop training modules, undertake research and documentation in disaster management and organize training programmes;
- formulate and implement a comprehensive human resource development plan covering all aspects of disaster management
- provide assistance in national level policy formulation;
- provide required assistance to the training and research institutes for development of training and research programmes for stakeholders including Government functionaries;
- provide assistance to the Provincial Governments in the formulation of Provincial level policies, strategies, disaster management framework and any other assistance as may be required by the Provincial Governments for capacity-building of stakeholders, Government including its functionaries, civil society members, corporate sector and people's elected representatives;
- develop educational materials for disaster management including academic and professional courses;
- promote awareness among stakeholders including college or school teachers and students, technical personnel and others associated with multi-hazard mitigation, preparedness and response measures;
- do all such other lawful things as are conducive or incidental to the attainment of the above objects; and

- undertake any other function as may be assigned to it by the Federal Government.

10.12. It is clear that inspite of the Ordinance promulgated in November, 2009, no material progress has been made regarding the development of an integrated flood management plan.

10.13. In the recent floods no strategic flood management policy was initiated by the NDMA. Infact NDMA has been found missing in developing a disaster management strategy during the floods of 2010.

10.14. There is no coordination between NDMA and the I & P department or for that matter with any of the other key departments mentioned hereunder.

10.15. Written paper submitted by the Director (Administration), National Disaster Management Authority before the Tribunal carries the minutes of 4th Pre-Monsoon Coordination Meeting held in 2010 under the auspices of National Disaster Management Authority in the Prime Minister, Secretariat, Islamabad. It is surprising that while Director (Administration) has submitted that scope of Flood Inquiry Tribunal does not directly relate to National Disaster Management Authority. On the other hand, National Disaster Management Authority headed the most important Pre-Monsoon meeting regarding the recent floods.

10.16. The contents of the minutes of the meeting reveal that the Director, National Disaster Management Authority explaining the purpose of the meeting stated that it is important to identify the gaps and weaknesses in the existing arrangements and to suggest corrective measures thereof to deal with any Monsoon related to the emergency situation. He also gave a brief account of NDMA experience in dealing with disaster including flood relevant agencies.

10.17. Chief Engineer, FFC shared the details of formation of the Flood Coordination Cell, at the FFC as well as instructions to relevant authorities for removal of encroachments at water-ways to deal with flood situation. Representative of Ministry of Health stated that Ministry of Health had prepared draft contingency plan which will be finalized on 10.07.2010 and also referred to the health emergency and preparedness and response (HEPR) Centre established at PIMS.

10.18. One of the decision taken at the conclusion of the meeting was as follow:

| Decisions | Action by |
|---|--|
| <p>It was noted that existing coordination between different civil and military agencies was not up to the mark. The concerned agencies (federal, provincial, district and military authorities) were asked to ensure synergized and coordinated relief operations, involving all stakeholders, in the event of a disaster situation at the respective levels</p> | <p>Action by NDMA, FFC, PDMA, Irrigation Departments, DDMA, Irrigation Departments, FFC, Engineering Directorate GHQ</p> |

10.19. The perusal of minutes shows that the representative of the various agencies had no knowledge of the ground realities e.g. the Director General, PMD simply made a theoretical presentation without realizing that the hydrology meteorological forecasting at the FFD is serious lacking. He also did not point out the radars which were not functioning and also various pockets in the country where there are no radars. The presentation of the PMD was therefore, perfunctory carrying no depth or seriousness. Similarly, Chief Engineer, FFC referred to the Flood Coordination Cell, as well as, instructions issued by the FFC to relevant authorities for removal of encroachments in water-ways. While appearing before the Tribunal, FFC had no comments regarding FFC and its performance during the recent floods. Instructions if at all issued for the removal of encroachments in water-ways had no effect as there was a Chinese Housing Colony in the water-way of the breaching section of Jinnah Barrage which was washed away in the recent floods. More importantly, nothing has been brought on record before us to show any effort done by NDMA in attending to the crises and disaster at Jinnah Barrage, Taunsa Barrage, Jampur Bund or Fakhar Flood Bund, not even to the level of coordination seems to be visible. From the record by NDMA which from the Ordinance appears an apex authority in the country holding maximum responsibility for attending to disaster management in the country. Absence of Irrigation Department, Punjab as well as lack of Provincial Disaster Management Authority, Punjab was also noticed with regret.

10.20. If future disaster in the country are timely handled, the institute dealing with flood have to become more serious, more academic, more rebuses and more real. The perfunctory/realistic pre monsoon made in National cavities will not reach to any final results unless the agencies representatives have done their home work and are well connected and well aligned with their key formations.

10.21. We have noticed that pre-flood preparedness by Irrigation Department, Punjab has been brutal disaster, however, same never got surface at the pre-monsoon meeting held on 28.06.2010. Absence of stone at Jinnah Barrage, quality of human resource heading the

barrages, lack of labour force for flood fighting, inadequacy of the flood fighting material, the emergent work downstream Jinnah Barrage, population in the active flood plain from a poor flood warning systems, poor human resource at the PMD, lack of monsoon centre in the country, non-wetting of bunds for the last two years, never pointed out in the meeting inspite of presence of the Irrigation Department and FFC. On the whole of the above, agencies are frauding the people of this country. We recommend the Provincial Government to sent a recommendation to all the above agencies including Prime Minister Secretariat so that the recent flood be considered as a awakening up call and the budget allocated for the above agencies are put to use the benefit of people of Pakistan especially those who are victims of the recent super floods.

10.22. We are of the view that NDMA can lead the way forward to develop flood management plan for the country as a part of the larger disaster management and the Provincial and the District Government can done, however, fine tune and details of the master flood management plan. We recommend that this exercise must begin immediately so that holistic integrated flood management plan before the commencement of the flood season 2011.

10.23. *PROVINCIAL DISASTER MANAGEMENT AUTHORITY:* Mr. Khalid Sherdil⁶⁸, Director General, PDMA, submitted that no PDMA has been created by the Punjab Government, however, surprisingly, he holds the post of Director General, PDMA for Punjab. He submitted that he never supplemented the efforts of the Relief Commissioner, constituted under the Punjab National Calamities (Prevention & Relief) Act 1958.

10.24. *ENVIRONMENTAL PROTECTION DEPARTMENT/ PROVINCIAL ENVIRONMENTAL PROTECTION AGENCY:*

10.25. Secretary Environment Protection Department in his Position Paper^{68-A} submitted that the contents of the TOR of the Tribunal did not cause any responsibility on the Environment Protection Department and therefore no material, comments made regarding the recent floods. It was most disturbing to note that EPD under the Rules of Business is to lay down Policy for Environmental Protection in the Province and can play critical role in developing non-structural flood protections as a part of larger flood management plan, however, Secretary had nothing to submit regarding the floods or adaptation or mitigation of the same. Flood Management Plan of over the world are integrated with Ecological non-structural protection measures like development of Forest, Plantation, Reservoirs, Swamps and Water Sheds, but it appears that no such plan is on the ground as far as the Environment Protection Department Punjab is concerned. We recommend that more able person well versed in the field of Environment should lead the said Department, who can actively and materially contribute towards the development of Flood Management Plan for the Province. Training and harnessing water is an environmental question and so what maintenance of

⁶⁸ I.W.96

^{68-A} Ex.IW-79/1

Pond Area, therefore, Environment Department can not shrug its responsibility from this key role.

10.26. Even the Secretary Environment was asked to go back and prepare a presentation on the relationship between floods and environment. He, however, requested the Tribunal that the said presentation be allowed to be made by the Director General of EPA Punjab and not by himself. Considering the level of knowledge of Secretary in the matters of Environment this concession was allowed. Dr. Shagufta Shahjahan, Director General, EPA, Punjab^{68-B}, Lahore appeared before the Tribunal and submitted that no work regarding flood is being done by the Department and there has been no flood policy paper either before or after the floods suggesting ecological steps in flood mitigation in the future. The Power Point Presentation^{68-C} made by the said Director General leaves much to be desired.

10.27. **PAKISTAN RAILWAYS:** Secretary/Chairman, Pakistan Railways⁶⁹ submitted that there are three large bridges over river Indus in Punjab namely Attock, Khosha Garh and Kalabagh. All the bridges have a railway line. The railway tracks also across the Taunsa Barrage. The major breaches of the railways tracks were due to overtopping on account of hill torrents and the breach of LMB at Taunsa. There is no other damage reported in Punjab due to the recent floods. Average height of the embankments/railway tracks is 3 to 4 feet, however, closer to the barrage, the height of the embankment is raised around 35-feet. Cost of damage estimated in Punjab is Rs.1129 million and a length of 67-km of the railway track has been affected in the recent floods.

10.28. Pakistan Railways has an elaborate flood fighting mechanism which is to protect their own embankments carrying railway lines. Pakistan Government Railway Code, 1962⁷⁰, Pakistan Railways Way & Works Manual (1969)⁷¹, Bridge Rules (1970)⁷², Pakistan Railways Guide Book on Floods (1976)⁷³, carry material relating to flood fighting. Therefore, the rich experience and expertise of Pakistan Railways but it is not integrated with other flood managing institutions.

10.29. **HOME DEPARTMENT:** Home Secretary, Government of the Punjab⁷⁴ submitted that “the primary responsibility to attend to floods lies with the Irrigation & Power Department, as well as, the Relief Commissioner Board of Revenue. As for as the Home Department is concerned, it is to ensure law and order. Additionally, if need be, it requisitions the army in aid of civil power and acts as a coordinator between departments during emergency. The Department manages the Civil Defence and now after promulgation of Punjab Emergency Service Act, 2006, Emergency Rescue 1122 falls within its jurisdiction. Rescue 1122 carried out evacuation operations during the recent floods. Emergency Boards were also

^{68-B} IW.100

^{68-C} Ex.IW-100/1

⁶⁹ I.W.78

⁷⁰ Ex.I.W.78/3/3

⁷¹ Ex.I.W.78/3/4

⁷² Ex.I.W.78/1

⁷³ Ex.I.W.78/3/2

⁷⁴ I.W.11

constituted in order to carry out relief work under the Act.

10.30. From the Position Paper submitted by the Secretary, Home Department, it is reflected that the emergent meeting of emergency services was convened on 30.07.2010 when breach had already taken place at Jinnah Barrage. The District Emergency Board constituted under Punjab Emergency Service Act, 2006 also did not function.

10.31. We noticed that reference of letter⁷⁵ dated 29.07.2010 Commissioner Sargodha in the letter dated 30-7-2010⁷⁶ of the Home Department, Government of the Punjab requested for Army force for protection of LMB, Jinnah Barrage. The request was made by the Commissioner for service of 01 Company of Army alongwith three dozers, three hydraulic excavators and other necessary machinery. The Army had not been requisitioned when the breach had taken place on Jinnah Barrage. The Flood Fighting Plan & Guidelines clearly stipulate pre flood coordination with Pakistan Army and the civil administration.

10.32. Field formation of the Home Department, i.e. Punjab Emergency Services (1122) performed during the floods as a Directorate of Civil Defence (1204 volunteers alongwith power boats were mobilized). However, it appears that there is no coordination between Home Department and Irrigation Department or Emergency Services and the Irrigation Department.

10.33. *C & W DEPARTMENT PUNJAB, LAHORE:* Mr. Azam Suleman Khan, Secretary, Communication and Works Department, Punjab, Lahore^{76A} in his statement submitted that the role of C&W Department is different from Irrigation & Power Department when it comes to flood fighting. Practically the role of C&W Department is to safeguard the main structures i.e., Bridges and Culverts. *The sole strategy is to make cuts in the roads, if need be. There is no other flood fighting strategy with the C&W Department.*

10.34. According to the Secretary, one of the lessons learnt from recent flood is that C&W Department ought to have better coordination with the other sister Departments like I&P Department, HUD & PHE Department, N.H.A. and the District Administration/Local Government/Police. One of the proposed mechanism could be that a Core Flood Fighting Group could be developed having representation of Secretaries of all the important line Departments, which could then act as a hub to regulate/monitor the flood

10.35. Another issue is the capacity of the Department in terms of machinery, which during the recent floods was noticed and needs to be upgraded.

10.36. *LIVE STOCK & DAIRY DEVELOPMENT DEPARTMENT:* The department has a flood plan with the mission to save large and small animals as well as poultry population from contagious and infectious diseases before and during flood/ rainy season and to arrange

⁷⁵ Ex.I.W.11/1

⁷⁶ Ex I.W.11/1

^{76A} Statement of IW-8

fodder for the animals during the flood emergencies in the flood prone areas. The salient features of the flood plan⁷⁷ are:

- Curative and Prophylactic Vaccination, Control of Parasitic & other Diseases and Treatment of Sick and Wounded Animals
- Pre-flood Vaccination work.
- Curative work against parasitic and other diseases.
- Maintaining the Reserve of Dry Fodder and Stock of Animal Feed.
- Establishment of Emergency Cell at the Provincial Directorate for carrying out Pre-determined actions.
- Allocation of Reserve Quota of Medicines and Vaccines for flood Emergency.
- Village to Village coverage of the flood prone areas for preventive measures and advisory services.
- Treatment of wounded and sick Animals in Flood affected areas and to take measures against spread of diseases.

10.37. It is encouraging to note that the department has a flood plan. However, it is still in isolation and without coordination with other departments.

10.38. *HOUSING URBAN DEVELOPMENT AND PUBLIC HEALTH ENGINEERING DEPARTMENT:*

According to the Secretary of the Department^{77-A}, the Department performs the following functions:-

- (i) Housing and Urban Development;
- (ii) Urban water supply and sewerage / drainage schemes;
- (iii) Rural water supply and sewerage / drainage schemes; and

10.39. Its attached departments are the Development Authorities⁷⁸ at Lahore, Faisalabad, Gujranwala, Multan and Rawalpindi, Public Health Engineering Department and Punjab Housing and Town Planning Agency (PHATA) established under the PHATA Ordinance, 2002. The Department considers selecting the site for housing schemes which are not in the flood range, however, there is no coordination between Irrigation & Power Department regarding designing the housing schemes, keeping in mind the entire flood sector even the sewerage and drainage schemes designed by the Department has no co-relation with the

| | | |
|------------------|--|---------|
| ⁷⁷ i. | No. of flood relief centers. | 580 |
| ii. | Staff deputed: | |
| | Veterinary Officers | 454 |
| | Veterinary Assistant | 2494 |
| | Target for vaccination during flood-2009 | 14.81 M |

^{77-A} Ex I.W.15/1

⁷⁸ Ex I.W.15/4

Drainage System laid down by the Irrigation & Power Department. The Department has no Flood Fighting Plan in coordination with Irrigation and Power Department or other Departments during the flood season.

10.40. From the presentation given by the Secretary^{78-A}, it once again appears that the response to the flood is reactive, which needs to change.

10.41. *INDUSTRIES DEPARTMENT*: Additional Secretary (Mr. Shahid Ahmad Bhutta)⁷⁹ failed to satisfy the Tribunal whether industries are allowed to be set up in Active Flood Plains. According to the written reply⁸⁰ of the Secretary Industries reference was made to notification⁸¹ dated 30.09.2002 issued under Punjab Industries (Control on Establishment and Enlargement) Act, 1963, which states that “no industrial unit shall be set up in areas affected by flood flowing transversely in the strip of one mile of either side across the Grand Trunk Road from Shahdara Town to Muridke Town without prior permission of the Provincial Government.” It also states that each District Government may declare a negative area for industries which shall be determined by the District Committee after consultation of all the stakeholders and the Government can preserve the right to refuse establishment of any industrial undertaking which is in contravention of the public interest, ecology or other law for the time being in force.

10.42. The general policy guideline to declare negative areas by each district government for establishment of industries mentions “flood effected areas” as one of the parameters for determining negative area.

10.43. Inspite of the Location Policy not to allow setting up of industries in flood affected areas, number of industries have been set up in the active flood plains. There is no strategy to deal with these industries during floods and no coordination between the I & P department and the Industries Department.

11. *RECOMMENDATIONS*

11.1. Key departments to gravitate around the Irrigation Department and develop a joint and an integrated flood management support system.

11.2. Flood Management Plan to assign specific roles to key departments so that departmental energies are amalgamated and flood preparedness and flood fighting response is simultaneous and in unison.

11.3. FFC & I & P Department to play a central role in bringing other departments together to attend to a common flood management plan.

^{78-A} Ex.IW.15/1

⁷⁹ IW-19

⁸⁰ Mark-120

⁸¹ No. AEA-III.3-9/91 dated 30-9-2002



CHAPTER 9

There is a need to launch a Blue Revolutionwater would thus be required to play even a more important role than it did in the so called Green revolution , which was driven primarily by agricultural expansion¹

DEVELOPING AN INTEGRATED FLOOD MANAGEMENT PLAN - THE WAY AHEAD

- *Developing integrated & holistic Flood Management Plan*
- *Factoring Climate Change into Flood Management architecture*
- *Improving Pre Flood Preparedness, Flood Forecasting, Flood Fighting, etc*

1. INTRODUCTION

1.1. This inquiry has revealed that despite multiple flood sector related institutions, Province of Punjab (or the country as a whole) does not have an **Integrated National Flood Management Plan**. In other words, our country does not have a strategy to combat floods.

1.2. We have noticed that floods are being poorly managed. Except the ritualistic high powered pre-flood meetings and perfunctory departmental pre-flood inspections there is no PLAN or STRATEGY to combat floods. Reliance by the flood managers is on Barrage Regulations and the Flood Fighting Plan which fall short of an integrated and holistic inter departmental flood management plan. This inquiry shows that the flood managers are not fully conversant with the Barrage Regulations and have failed to follow them in the recent floods. Flood Fighting Plan, on the other hand, is a document generated by thoughtless cut and paste of the previous year's plan. There has been no up gradation or innovation in these plans over the years. Such poor regulation and planning can only lead to results we witnessed in the recent floods.

1.3. To us unprecedented flood peak is of little significance. The real worrying issue is the absence of STRATEGY AND AN INTEGRATED FLOOD MANAGEMENT PLAN. Mere reliance on Barrage Regulations and Flood Fighting Plans will not do. **An Integrated Flood Management Plan is an immediate necessity, and must be put in place before the next flood season starts.**

¹ (Draft) National Water Policy (Pakistan)

1.4. With dismay and displeasure we note that the Federal Flood Commission (an authority constituted for this purpose), Provincial Irrigation Department(s), Planning Commission and Planning & Development Department have failed to come up with a Water Resource Management Plan for the country and as a consequence have also miserably failed to develop an Integrated Flood Management Plan.

1.5. Floods are a blessing² and they ought to be welcomed with the confidence and ability of the flood managers to mitigate loss and to take advantage of the benefits floods bring.

1.6. Flood management is much more than minimizing economic losses and damages. It requires intelligent management of both the flood plains and water resources generated by floods. Doing this well can support development instead of preventing it. Separating the floods from the development and natural resources context in which they occur increases the risk that poverty alleviation and adaptation strategies fail³.

1.7. Floods are part of a natural cycle that can never be fully controlled. “Flood control” is therefore a futile terminology and a counter productive mandate. It is time to move towards an integrated approach to flood management to save lives, increase resilience and take advantage of the bounty floods bring. Flooding supports ecosystems which provide services that are essential to human livelihoods.

1.8. When formulating a Flood Policy we need to take a more holistic view of the floods, one that goes beyond looking at the immediate misery that floods can cause. We need to move away from flawed strategies of “flood control” to more practical and achievable strategies of “Flood Mitigation” or “Flood Risk Management” or “Flood Resilience.”

1.9. The flood managers need to understand the challenges before drawing up a Flood Policy. Population growth is perhaps the most important challenge. Rising population requires more food and in turn more agriculture. Most rain fed agriculture is in the arable land of the flood plains. Flood plain resources require planned management, more so in a country like Pakistan which has an agro-economy. With growing population, human settlements by the river increase flood risks and threaten human safety through deforestation and altering of the hydrological properties of the catchment area. This can lead to accentuation of flood peaks, hill torrents and increased sedimentation.

1.10. While flood managers in the past have focused on structural and non structural measures to protect and mitigate flood, a broader set of objectives need to put on the agenda. While structural safety of the barrages and training works is critical, human safety, protection of human shelters, safeguards for agriculture and fisheries, roads, ecosystems, health, and biodiversity need equal attention. This further requires a more holistic planning

² Enhancing agricultural productivity and water availability, if floods are properly managed.

³ Mark 137 - article by Joachim Saalmueller, Associated Programme on flood Management Climate and Water Department, World Meteorological Organization (WMO).

pattern involving a number of connected departments and agencies.

1.11. A flood is perceived as an event best suited for the disaster and relief management agencies. This approach requires a fresh look. We need to develop our resilience, we need to accept floods as a bounty and learn to absorb them and live with them and enjoy its fruits. Our flood policy must then primarily revolve around land use zoning, flood plain management, watershed management, environment conservation and management, enhancing forest cover along the riverine belt, redesigning the architecture of human settlements in the flood plains, developing retention pools, learning to understand the morphology of the river and tampering little with nature and natural river flows unless necessary. Therefore, flood policy cannot only be a long list of structural embankments and levees. Thwarting nature will never provide a solution, it never has.

1.12. It is once again underlined that National Flood Management Plan cannot exist without a National Water Resource Management or National Water Policy/ Plan. Flood management is, therefore, weaved into a national water management plan, and any planning for the flood sector will flow from the water sector. We notice with deep concern that the National Water Policy is still a DRAFT and is awaiting approval since 2005. Additionally, the National Flood Protection Plan—IV (2008-2018) has not been approved. This governmental and perhaps bureaucratic inertness is most disturbing and can be listed as a cause behind the recent devastation.

1.13. Water and our future are deeply interlinked. Our future progress has a serious risk of being threatened if governments of the day do not put water, floods and droughts on their top agenda.

1.14. In the face of governmental inertia in devising a plan, we felt it obligatory to formulate policy recommendations for the development of an integrated flood management plan in the Province, as well as, the county.

2. EXISTING THOUGHT ON FLOOD MANAGEMENT

2.1. We draw strength from the local and international material on the subject. Relevant portions are reproduced hereunder as a guide for the flood managers and policy makers, who should waste no time in developing an Integrated Flood Management Plan VERY SOON.

2.2. **INDUS BASIN IRRIGATION SYSTEM (IBIS)- AN OVERVIEW:** Pakistan's economy is largely based on its agricultural produce. Water is therefore a critical resource for its sustained economic development. In order to fully utilize the river water resources, the IBIS has emerged as the largest contiguous irrigation system in the world. The IBIS comprises of three large dams, 85 small dams, 19 barrages, 12 inter river link canals, 45 canal commands. This network is the biggest infrastructure enterprise of Pakistan accounting for approximately US\$ 300 billion of investment. The average annual flow of Western Rivers of Indus basin is approximately 142 million acre feet (MAF) with about 104 MAF diverted for

irrigation purposes and 35 MAF outflows to the Arabian Sea.

2.3. In addition to providing food security, the agricultural produce of IBIS constitutes 23% of GDP, 70% of total export earnings and 54% of employment of labour force. The IBIS is therefore essential in sustaining the agriculture sector and consequently economic well being of Pakistan. The Indus basin now serves as a breadbasket of Pakistan⁴.

2.4. **VISION-2030 OF THE GOVERNMENT OF PAKISTAN⁵**: According to the Vision 2030 (August 2007), prepared by the Planning Commission, Government of Pakistan, natural resource will be severely depleted and stressed, especially water, land and forests, assuming that current water consumption patterns continue unabated. The projection shows that at least 3.5 billion people or 48% of the world's projected population will live in water stressed river basins in 2030 including Pakistan.

2.5. Integrated water resource management which aims at ensuring the most optimal use of water is a major strategy for overcoming the looming water scarcity. **Pakistan has not managed its water resource with care and is now becoming increasingly water-stressed** (less than 1000 cubic metres per capita). The country's current storage capacity at 9% of average annual flows is very low as compared with the world average 40%. However, on average, 35 MAF of water flows in the sea annually during the flood season. In addition, extensive damages result due to flooding. Without additional storage, the shortfall will increase by 12% over the next decade. The increasing storage capacity is thus an important part of the strategy.

2.6. **NATIONAL WATER POLICY 1987⁶ (INDIA)** : There should be a Master Plan for flood control and management for each flood prone basin. In flood control and management, the strategy should be to reduce the intensity of floods by sound watershed management and provision of adequate flood cushion in water storage projects wherever feasible to facilitate better flood management of each flood prone basin. According to the Policy (for Flood Control and Management):

- i. There should be a master plan for flood control and management for each flood prone basin.
- ii. Adequate flood-cushion should be provided by water storage projects to facilitate better flood management.
- iii. In highly flood prone areas, flood control should be given overriding consideration in reservoir regulation policy even at the cost of sacrificing some irrigation or power benefits.

⁴Mark 137

⁵ Ex I.W. 137/5

⁶ Reference in Mark 136 - NATIONAL WATER POLICY (India)(As adopted by National Water Resources Council in its 5th meeting held on April 1, 2002)

- iv. While physical flood protection works like embankments and dykes will continue to be necessary, increased emphasis should be laid on non-structural measures such as flood forecasting and warning, flood plain zoning and flood proofing for the minimization of losses and to reduce the recurring expenditure on flood relief.
- v. There should be strict regulation of settlements and economic activity in the flood plain zones along with flood proofing, to minimize the loss of life and property on account of floods.
- vi. The flood forecasting activities should be modernized, value added and extended to other uncovered areas.
- vii. Inflow forecasting to reservoirs should be instituted for their effective regulation.

2.7. **INDIAN EXPERIENCE**⁷: It has also been argued by some environmentalists that in order to control floods, the level of water in the reservoir of the dam should be kept at minimum level. However in order to generate hydro-electricity and bring more agricultural area under irrigation, the level of the water in the reservoir is kept high which leads to flooding in the upstream areas. Thus the measure that is often touted as a solution to the flood woes itself becomes a cause of it. Hence it is high time for the government to look for ecological measures that can help in the management of floods on a durable, long-term basis. Afforestation of the flood plains must be encouraged as trees not only absorb rainfall water but also obstruct its flow to the rivers. Construction activities on the flood plains should be stopped altogether. The flood plains, being very fertile, can be used for economic activities like agriculture. Those living in flood plains for these activities should have an efficient early warning mechanism that ensures their evacuation before the calamity strikes. With the advancement in space technology that India has achieved, remote-sensing should be effectively used for prediction of rainfall and floods. It is only with these comprehensive and holistic measures that an efficient management of floods can be ensured with least damage to life and property.

2.8. **BANGLADESH EXPERIENCE**: Options for flood management can include flood forecasting and warning, preservation of retention ponds, land use planning, flood zoning, emergency services, shelters, flood proofing, flood fighting and post-flood rehabilitation measures. Moreover, experiences from 1998 flood indicate that coordination between agencies responsible for flood protection and drainage of the city can significantly reduce the flood damage.

2.9. **PAKISTAN'S FLOOD POLICY**⁸: A number of Provincial and Federal Acts drive the flood policy in the country. The major Provincial Acts are Punjab Irrigation Act 1873, Sindh

⁷ Indian National Water Policy

⁸ Mark-134, (Indus Basin River System-Flooding and Flood Mitigation by H. Rehman and A.Kamal)

Irrigation Act 1879, NWFP Act 1873, Balochistan Ordinance 1980, Punjab Soil Reclamation Act 1952, Water Users Association Ordinance 1981, Provincial Irrigation and Drainage Authority (PIDA) Acts 1997, etc. At the federal level the relevant acts are WAPDA Act 1958, Indus River System Authority (IRSA) Act 1992 and Environment Protection Act 1997. Additionally, a Provincial Water Accord was signed in 1991 for apportionment of Indus River Waters between the four provinces.

2.10. None of the above laws provide a national or provincial flood management policy.

2.11. A recent report on disaster management policies in Pakistan (WCDR, 2005)⁹, inter alia, highlights that Disaster Management in Pakistan basically revolves around flood disasters with a primary focus on rescue and relief. After each disaster episode the government incurs considerable expenditure directed at rescue, relief and rehabilitation.

2.12. **NATIONAL WATER POLICY¹⁰ (Draft):** Draft National Water Policy prepared in 2005 addresses all the water related issues in the country, including the flooding issue. The Policy provides a framework whereby flood management in the country can be improved through necessary institutional and legal reforms. The National Water Policy is a landmark document and can go a long way in improving flood management in Pakistan.

2.13. The Policy acknowledges gaps in the existing policy framework and recommends rationalizing various pieces of legislature to minimize overlap and redundancy. It proposes to create a **Federal Water Commission** incorporating FFC, part of Planning Wing of WAPDA and Office of the Chief Engineering Advisor. It also recommends replacement of various water related provincial acts with a simple unified law that enables clearer understanding and subsequent application of the law.

2.14. The Policy has been prepared on modern lines and emphasizes all the necessary structural and non-structural measures for flood management. It emphasizes the need of stakeholder participation in the flood management process and enhancing flood awareness in the community.

2.15. **A step forward would be to acknowledge the floods as a 'resource' and harness the numerous benefits that are associated with the regular flooding.** In this regard flood mitigation measures need to be developed that acknowledge the floodwaters as a resource and ensure that the best possible outcome is achieved in terms of socio-economic and environmental benefits for any proposed structural measures.

2.16. The Policy also recommends strengthening of information management and research in the area of flood management. In this regard the Policy calls for promotion and support of public and private research in the fields of weather forecasting, rainfall predictions and flood forecasting.

⁹ Mark 133

¹⁰ Mark 142- Still a draft since 2005

2.17. *FLOOD MANAGEMENT.*¹¹ Draft National Water Policy provides the following flood management strategy

| Issues | Policy | Strategy |
|--|---|---|
| <ul style="list-style-type: none"> ■ Increase in flood peaks due to sedimentation of reservoirs. ■ Problem of inundation and land erosion. ■ Lack of proper maintenance of flood protection works. ■ Inadequate management of floods and flood forecasting and warning system. ■ Flood Plain encroachments. | <ul style="list-style-type: none"> ■ Greater emphasis on proper maintenance of the existing infrastructure. ■ To attenuate flood peaks, additional multi-purpose storages (including flood control) be constructed ■ Promote flood retardation structures ■ Promote Watershed Management and provision for sediment sluicing in new dams ■ Review the design and maintenance standards of existing flood protection structures, and make improvement where necessary to bring them to the level of functional capability and reliability ■ Encourage flood adaptability in riverine belts. ■ Improve flood forecasting and warning system ■ Towards better flood management, review and update Flood Manual and National Flood Protection Plan, Flood routing study be undertaken ■ Improvement of design and standards of flood protection interventions ■ Establish and promote flood zoning and enforce appropriate land use by avoiding growth of vulnerable developments in flood-hazard areas. ■ Develop River Laws to protect waterways and flood plains from encroachment, misuse etc. ■ Optimize reservoir operational rules to ensure efficient and prudent decisions to control floods, particular when reservoirs are near to maximum conservation level. | <ul style="list-style-type: none"> ■ Continue with the construction of additional flood protection facilities ■ Creation of public awareness education on flood related intervention ■ Support a special study to explore various methodologies such as dredging, flushing and/or removal of accumulated sediment from river beds, particularly in the lower reaches of Indus, to check the river levels from rising further ■ Promote and support research for better understanding of the monsoon systems ■ Strengthen Pakistan Metrological Department through modern weather forecasting equipment. |

¹¹ Mark 142

2.1.8. **FLOOD PROBLEMS¹²:** The main issues relating to flood works in the Punjab Province include the following:

- i. Lack of strategic / master planning for flood management and implementation of flood protection works.
- ii. Concerns related to planning, design and implementation of river training works, particularly with regard to the absence of objective / coherent selection criteria and repeated damages to the constructed facilities.
- iii. Partial implementation of the identified interventions due to inadequate planning, delay in approval and funding, and delays in construction.
- iv. Sustainability concerns with particular reference to lack of criteria / mechanisms for financing the O&M and restoration costs.

2.19. Mr. Asrar-ul-Haq¹³, Chief Strategic Planning / Reform Unit, Irrigation and Power Department, Lahore deposed before the Tribunal that:

“...lessons learnt from the recent floods are as follows:

- (i) To further develop the flood fighting plans which are currently merely reactive. The plan should include a plan “B” as well.
- (ii) Various second defense bunds need to be repaired and brought up to the mark;
- (iii) The system of embankments need to be improved and wetting channels may be provided for safety of embankments;
- (iv) The system of flood embankments and structures need to be revisited on the basis of new benchmarks / high flood levels as experienced this year;
- (v) Improvement of drainage infrastructure;
- (vi) Location of relief cuts need to be identified by the department like the breaching sections, so that in an emergency there is no problem of their activation and the local community is also aware of the impacts of the steps being taken by the department;
- (vii) Adequate funding for improvement / construction of flood protection

¹² Mark 107

¹³ I.W. 141

infrastructure, as well as, for operation and maintenance of the flood infrastructure.

2.20. According to Naseer Ahmad Gillani¹⁴, Chief (Water) Planning Commission, Government of Pakistan, Islamabad: “Planning Commission's view on the Flood Sector is covered in the Medium Term Development Framework (“MTDF”) 2005 – 2010. In this regard, it is pointed out that the Working Group of MTDF on Flood Sector was also constituted with the primary purpose of developing an integrated Flood Management Plan, they have tendered their report. . . . The Planning Commission has worked on the Water Resources Management, however, as far as, Flood Management is concerned, it is the understanding of the Commission that this is the task to be undertaken by the FFC which is later on integrated into MTDF.”

2.21. According to Mr. Asif H. Kazi in his paper Flood Control and Management¹⁵, the following are the key issues that need to be appropriately addressed in order to ensure a proper flood management plan for the Province:-

- i. Development in irrigation, drainage and other water management activities per se must interact with flood management. Planning for flood management must be regarded as an integrated and a continuous process which is not being done.
- ii. Most structural planning is required in developing flood protection facilities rather than a local emergency approach which is more frequent.
- iii. Design standards of existing flood protection works grossly fall short of the required levels. For instance, existing side slopes of protective embankments are rather too steep. The shanks of spurs are too long and spacing too large.
- iv. The maintenance standards of the existing flood protection infrastructure are particularly deficient. Replenishment of eroded embankments, spurs and stone aprons, etc. is carried out inordinately late while adventurous risks are taken with the result that breaches/damages are not uncommon. This needs an asset management plan and assessment of liabilities.
- v. Appropriate actions are lacking in the land use, and, therefore, growth of vulnerable developments in floodplain areas continue unabated.
- vi. Old reservoir operational rules are not being upgraded to properly attenuate flood peaks despite better forecasting methodologies now available.
- vii. Monsoon systems causing Pakistan's high-magnitude floods, including travel mechanisms of weather systems from Bay of Bengal and their interaction with

¹⁴ I.W. 143

¹⁵ Mark-134

westerly currents from Arabian Sea and Mediterranean, etc. vis-à-vis seasonal low pressure over Balochistan, Tibet Plateau pressures, wind velocities and other relevant factors are not fully integrated and understood. There are also many gaps in the coverage provided by the existing weather radars.

viii. Flood response plan lacks (1) level of awareness (2) flood warning time and (3) reliability of warnings.

ix. Implications of the vague terms currently used for Flood Warning such as "High Flood", "Very High Flood" or "Exceptionally High Flood" are not understood by even literate person, let alone the potential village affectees.

x. Progressive deposition of sediment on the river beds, particularly in the lower reaches of the River Indus, is proceeding unchecked. Current management of the problem by correspondingly raising of the dykes to contain the river every few years, is certainly not sustainable on a long-term basis.

2.22. According to Mr. Asif H. Kazi¹⁶, urgent measures are required to ensure:-

- (a) Sufficient and efficient transport system for mobility of staff.
- (b) More effective patrolling of bunds and river training works.
- (c) Strengthening of communication system by providing additional wireless equipment or use of internet in the flood affected areas.
- (d) Shingle roadways be provided on the bunds for quick access and flood fighting.
- (e) Old system of providing lanterns to patrolling staff be replaced with portable generators with poles and electric cables, if proper monitoring and timely remedial action is to be ensured to avoid breaches during floods.

NON-STRUCTURAL OPTIONS: various non-structural options are composed of the following:-

- (f) *Watershed Management Practices* - As also stated earlier, watershed management, though a long-term activity, yields major flood mitigation benefits. The function of such measures is to reduce the velocity of flow and sediment generation, by providing/restoring afforestation cover in the catchment areas. In the face of scanty rainfall, the success of planting in the catchments of hill torrents, is generally possible only under strict prohibition against grazing. In other areas such as the

¹⁶ Mark-134

upper parts of the Indus catchment, plantation is not possible because monsoon systems are unable to penetrate and thus there is hardly any rainfall to support vegetation. Mangla Dam watershed management has been under way for the last 45 years, and its positive effects became apparent some years ago when the annual silt load entering the reservoir was found to have reduced by almost half, thus doubling the life span of the reservoir. Prolonging the effective life of a reservoir indirectly helps in attenuating flood flows that are routed downstream. At the time of design and construction of Mangla Dam, the silt particles per million (PPM) were such that the annual sediment deposits in the reservoir were estimated as **60,000 acre feet** which subsequently reduced to approximately **35,000 acre feet**.

(g) Land-Use Restrictions, Cropping Patterns, etc. Flood damages are reduced by adopting modified land-use practices suitable to the local conditions. Furthermore, in flood-prone areas, development of infra-structure, residential colonies and industrial states have to be discouraged through proper legislation and only flood-resistant crops be sown, especially those spanning the flood season. In practice, there is very little work achieved under this option, and the land use/cropping patterns remain virtually unregulated, and the people continue to take risks freely. Any high-asset infrastructure has of course, to be provided with adequate flood protection.

(h) Soil and Water Conservation Techniques: Soil and water conservation practices are extremely useful if properly adopted in accordance with the catchment characteristics of river/hill torrent basins. This greatly helps in reducing erosion of otherwise productive soils, especially through storing flood waters for agriculture. In some hill torrent areas and in river catchments, conservation techniques including terracing, contouring, strip cropping, are being practiced very successfully. Such techniques significantly contribute in flood abatement, besides providing livelihood to the hilly area residents.

(i) Reservoir Operation Regulations: Pakistan has three large reservoirs, namely Tarbela and Chashma on Indus River, and Mangla on Jhelum River. These reservoirs are primarily meant for irrigation supplies, hydropower generation being the secondary purpose. However, the reservoirs also provide an opportunity in flood management by depressing flood peaks.

(j) In India, there exist five storage dams on rivers that eventually flow into Pakistan. On the Ravi River Thein Dam; on the Sutlej River Bhakara and Nangal Dams; and on the Beas River Pando and Pong Dams. These dams were constructed after the 1960 Indus Water Treaty. With these dams the Ravi and Sutlej Rivers in Pakistan, have become literally dry, except for occasional flood flow that enters Pakistan when the huge reservoirs in India, are already full or it is not otherwise feasible to store water.

(k) The power generation and irrigation requirements aim to fill the reservoir to

full capacity by the end of the monsoon in August each year, both in Pakistan and in India. In terms of releases, optimum power generation requires maintaining the high water level during the entire period of operation, while irrigation supplies require maximum level in August and minimum water level in June next year, thereby enabling full utilization of the stored water for agricultural purposes. If some degree of priority was to be given to flood, space would need to be reserved at a certain level below the full capacity. Another option would be to permit flexibility in operational regulations relying upon instant information that is now possible from the newly-installed telemetry and more efficient communication system; by storing flood peaks in the event when the reservoirs are full at the end of August and a flood is experienced (say) in early September. Under the current regulations no flood mitigation is possible in such circumstance just as it happened at Mangla in the year 1992. This aspect needs to be given serious consideration.

2.23. According to World Meteorological Organization (WMO)¹⁷ the summary of an integrated plan is as follows:

| Strategy | Options |
|--|---|
| Reducing flooding | Dams and reservoirs Dikes, levees and flood embankments High flow diversions Catchment management Channel improvements |
| Reducing susceptibility to damage | Floodplain regulation Development and redevelopment policies Design and location of facilities Housing and building codes Flood proofing Flood forecasting and warning |
| Mitigating the impact of flooding | Information and education Disaster preparedness Post-flood recovery Flood insurance |
| Preserving the natural resources of Flood Plains | Floodplain zoning and regulation |

¹⁷ Mark 146- Integrated Flood Management – concept paper – WMO no. 1047

2.24. According to *PAKISTAN WATER SECTOR STRATEGY*¹⁸ the objectives for flood protection as based on the Draft National Water Policy are to:-

- (i) Place priority for flood protection on areas of major human habitation and economic importance;
- (ii) Prepare flood and drought management strategies, especially for major cities, key secondary cities and towns & major infrastructures;
- (iii) Promote the delineation of Flood Risk Planning and Regulatory Zones to be adopted by all agencies as part of the planning process and for them to:
 - identify consistent standards of service for differing land uses
 - priorities areas for flood protection
 - prepare plans in terms of areas for full, appropriate and non-structural measures
 - regulate land use and development of floodplains
 - Develop flood forecasting, warning and preparedness strategies for flood prone areas
 - Implement effective recovery of operating and maintenance costs from beneficiaries of urban flood alleviation and stormwater drainage schemes.

2.25. FLOODING AND FLOOD MITIGATION¹⁹

2.26. Flood management in the Indus Basin is a multi-dimensional process that demands intensive resources and requires efficient coordination between various government agencies. However, even advanced flood management systems are no guarantee against flood disasters as has often been proved in the more developed countries. Pakistan being an agricultural economy cannot afford to risk its agricultural infrastructure consisting of dams, barrages and irrigation canals, which can be under severe stress in major flood events.

2.27. Currently, the flood management policy of the country is more reactive than proactive in dealing with the flood issues. However, with the preparation of National Water Policy, the situation is likely to change with far reaching effects on the flood management process in the country. The National Water Policy provides the necessary legal and institutional framework to improve the flood management process in Pakistan.

2.28. Although the National Water policy provides the necessary guidelines for flood management, there is a need for a separate national policy for flood management to deal specifically with the flood issues in the country. Such a policy may be called National Flood Policy that may outline the details of policy framework for flood management. It is worth noting here that a new paradigm in flood management that considers flood as a resource rather than a menace can be highly beneficial in achieving the environmental objectives of

¹⁸Pakistan Water Sector Strategy, Ministry of Water and Power, Chairman Federal Flood Commission (Mark 138)

¹⁹Mark 135- Indus basin River System- Flooding and Flood Mitigation - H. Rehman and A. Kamal.

the government, which are set under various international conventions to which Pakistan is a signatory.

2.29. It is envisaged that the flood forecasting capabilities would be improved considerably under the second Flood Protection Sector Project being undertaken by the Federal Flood Commission. The task of quantification of flood risk thorough detailed studies and subsequent measures required in minimizing the risk should be taken on priority basis.

2.30. BEST PRACTICE METHODS FOR VALUING FLOOD CONTROL BENEFITS²⁰

- Flood events are a part of nature. They have existed and will continue to exist. As far as feasible, human interference into the process of nature should be reversed, compensated and, in the future, prevented.
- Flood strategy should cover the entire river basin area and promote the coordinated development and management of actions regarding water, land and related resources.
- Considering the evolution and trends, the approach to natural hazards requires a change of paradigm. One must shift from defensive action against hazards to management of the risk and living with floods, bearing in mind that flood prevention should not be limited to flood events which occur often. It should also include rare events.
- Transnational efforts should be intensified to restore rivers' natural flood zones in order to reactivate the ability of natural wetlands and floodplains to retain water and alleviate flood impacts.
- Flood forecasting and warning is a prerequisite for successful mitigation of flood damage. Its effectiveness depends on the level of preparedness and correct response.
- Human uses of flood plains should be adapted to the existing hazards. Appropriate instruments and measures should be developed for all flooding related problems: flooding, rising groundwater tables, sewage network disruption, erosion, mass deposition, landslides, ice flows, pollution, etc.
- Mitigation and non-structural measures tend to be potentially more efficient and long term more sustainable solutions to water-related problems and should be enhanced, in particular to reduce the vulnerability of human beings and goods exposed to flood risk.
- Structural measures (defence structures) will remain important elements and should primarily focus on the protection of human health and safety, and valuable goods and property. We will have to keep in mind that flood protection is never absolute, and may generate a false sense of security. The concept of residual risk, including potential failure or breach, should therefore be taken into consideration.
- A compensation system should support the victims of flood disasters to restore their economic basis and their living conditions in due time. Insurance solutions at the private or public level or subsidence

²⁰ Colin Green, Flood Hazard Research Centre, Middlesex University, U.K. - Best Practice Methods for Valuing Flood Control Benefits (Mark 136)

- Therefore the responsible authorities should provide timely and reliable flood warning, flood forecasting and information.
- A specific preparedness to alert, rescue and safety measures should be planned and implemented at all levels, including the public, by maintaining regular basic information and continuous ongoing training actions. With appropriate and timely information, preparedness, everyone who may suffer from the consequences of flood events should be able to take –if possible- his/her own precautions and thus seriously limit flood damages.
- Solidarity is essential, one should not pass on water management problems in one region to another. The appropriate strategy consists of three steps: retaining, storing and draining (first make every effort to retain rainfall at the spot, store excess water locally, only then let the water be discharged to the watercourse). Flood prevention has also to be based on the precautionary principle.
- by state, which reinforce solidarity, should be furthered.
- In flood-prone areas, preventive measures should be taken to reduce possible adverse effects of floods on aquatic and terrestrial ecosystems, such as water and soil pollution. It is necessary to distinguish between different kinds of flooding and the environmental conditions that contribute to the problem. For instance, there are significant differences between on the one hand sudden flooding in upstream or headwater areas where mitigating risk involves a wide range of innovative small-scale solutions and on the other hand lowland flooding where warning periods and the duration of flood events are longer and large-scale measures have to be taken. Therefore, the effectiveness of the best practices described in part II depends on among other hydrological and environmental circumstances.

2.31. FEDERAL FLOOD COMMISSION (MANUAL²¹ OF DESIGN CRITERIA AND METHODOLOGY). **NON-STRUCTURAL PROTECTION (SECTION 7)** *General:* The non-structural protections should preferably be considered in conjunction with the planning and use of structural protection. However, at locations where structural protection are too expensive non-structural protection will be introduced. The selection of protection type will depend upon the site requirements. The most available and practiced types of non-structural protections are discussed in the subsequent sub-sections.

2.32. **FLOOD-PROOFING:** In general, people in all flood environments want the impact of flooding to be reduced, although there is a widespread acceptance of normal monsoon or other heavy rain conditions. The real concern of people is to reduce the effects of severe floods. Therefore, the flood-proofing needs and interests of local communities depend on the characteristics of the prevailing floods and local consultation and participation. Basically, five types of flood–proofing can be distinguished:

²¹ Ex I.W. 103/2

- i. Protection of infrastructure like roads, railways, water and gas pipelines, telecommunication, utility building and equipment.
- ii. Protection of public buildings, industrial plants and private houses.
- iii. Measures directed at emergency situations like creation of refuge areas including water supply, sanitation and flood storage facilities and access to refuge areas in a flood situation. The refuge areas have to be available close to the normal place of residence.
- iv. Flood-proofing in agriculture such as the use of crops which are harvested before the flooding season starts, use of flood-resistant crops and food storage facilities for well stocking prior to flood season.
- v. Drainage of flood water can be an important flood-proofing measure. It may prevent total flooding or for all cases lower the maximum floods levels and decrease the duration and extent of flooding.

2.33. **FLOOD-FIGHTING²²**: Flood-fighting is an emergency measure which has the objective of mitigating flood impacts, particularly when flood protection and control structures and flood proofing measures have proved ineffective or failed. The measures and means of flood fighting are many and diverse, always requiring adaptation to local conditions. A brief description and requirements of flood-fighting is provided below.

- i. Flood-fighting is an important element of non-structural measure for reducing flood hazards. Its important features are the preparedness of all potentially involved persons, availability of technical means and resources, support of respective authorities and cooperation of the public.
- ii. Generally, flood-fighting is required for the failures of flood protection structures, such as:
 1. Failure of dykes, flood walls and embankments The immediate causes could be scour, overtopping, piping, undermining, bank erosion, breaching and impact of floating debris.
 2. Reduced capacity of river channels, flood ways and flood bypass channels; by obstructions of the flow particularly at channel constrictions, bridges and weirs.
 3. Failure of weirs and barrages with consequent devastating flood waves.
 4. Failure of land drainage systems causing flooding of agriculture land.
 5. Failure of urban drainage systems causing flooding within protected urban area.

²² ibid.

iii. Flood-fighting plans should be part of a well-designed flood management strategy, in which priority zones are clearly indicated and possible sacrifices of areas of lesser importance envisaged. Hence, flood-fighting plans are closely linked to the other emergency measures, such as evacuation of people to safe zones, emergency flood – proofing of structures etc. Flood-fighting plans cannot remain unchanged during longer periods and these should be kept abreast of area developments.

2.34. The flood-fighting measures should be based on clear plans, containing the following main elements:

- a. Assessment of flood risk.
- b. Zoning of protected or unprotected area according to flood risk.
- c. Inventory of flood control or protection systems in the area.
- d. Analysis of possible modes of failure of protection structures and technical means to counteract failure during floods.
- e. Study of situations which may develop when parts of flood protection systems fail.
- f. Planning of second, third and subsequent defence lines for the case of progressive failure of embankments, groynes, spurs etc.
- g. Planning of measures for protection against flooding urban areas by closing gaps in flood banks and flood walls, closing sewer outlets etc.
- h. Planning of successive measures of retreat; sacrificing less important areas and defending more important areas. In critical situations, the most difficult decision is to sacrifice a certain area in order to relieve the pressure from other areas or to abandon flood-fighting. While the detail of such situations cannot always be foreseen in the flood fighting plans, this contingency must be anticipated.

2.35. Flood-fighting actions are varied, depending upon the development of the flood, the area endangered, the protection structures and available means. For flood-fighting the typical measures are:-

- a) Closing of gaps in flood walls or groynes etc. by sand bags or other available methods.
- b) Protection of river banks by sand bags, stone, or other available methods.

- c) Counteracting piping which is the main cause of collapse of embankment and dykes etc.
- d) Protection of bridge piers, weirs, barrages and dams against erosion by rockfill, sand bags and other available methods.
- e) Construction of temporary non-structural protection measures to prevent the propagation of flood on non-protected land.
- f) Construction of second and future “defence structures”, according to the flood-fighting plan.
- g) Cutting of embankment, dykes etc. in order to allow flooding of less important areas, and thus to save other more important areas, according to the flood-fighting plan.
- h) Removing obstacles from active or potential flood ways, relief and flood bypass channels.
- i) Protection of structures exposed to strong wind wash action.
- j) After the flood is over, the flood-fighting will enter the follow-up stage. The flood-fighting system should not be demobilized until the valuable experience gained during the flood has been recorded for later analysis and application for improving flood-fighting methods for the next flood event.

2.36. **PROVINCIAL PLANNING COMMISSION- CHAIRMAN²³, P&D BOARD:** The Chairman deposed that the department does not have a holistic master plan for flood management in the Province. The flood sector projects are not totally integrated, however, they have their own strength and benefit the local areas. The Planning Commission, Federal Government, does the over all vision regarding planning and development. P&D uses a master plan of the Planning Commission and does further planning on a provincial level. P&D works within the parameters of the master plan prepared by the Planning Commission (referred to as the White Paper²⁴). He admitted that there is no over all vision pertaining to water management or flood management within the White Paper.

2.37. P&D Department does not have a follow up mechanism regarding the approved flood sector projects. In the last two years, the said department has initiated third party validation (TPV). For success or failure of the project the parent department is responsible and it is the parent department alone to monitor the said projects. “**I realize that there is a need for going to the drawing board and developing an integrated flood management plan for the province²⁵.**”

²³ I.W.137

²⁴ Ex.I.W.137/6 and 7

²⁵ I.W.137

2.38. There are two main streams of funding for the flood sector. One is by the Federal Government and the other is by the Provincial Government. The Public Sector Development Programme (PSDP) is funded by the Federal Government. “the practice is that the MNAs obtain tacit approval from the Federal Government and then press the Provincial Government to initiate flood sector projects/schemes pertaining to their areas against the said fund.”

2.39. At the provincial level the funding is through the Annual Development Plan (ADP). The resource allocation for ADP is around 90% from the Federal Government (under the NFC Award) while the provincial contribution to the fund is around 10%. At times, foreign loans and borrowing from the Commercial Banks are also taken which contributes around 10% of ADP.

2.40. Projects (flood sector) are initiated by the respective departments which are scrutinized by the P&D Department (mainly regarding the budgetary limits of the projects) are included in the Annual Development Plan.

2.41. According to the Medium Term Development Framework (MTDF-2009-2012)²⁶ as well as the Development Programme 2009-2010, the sector has been described in the following manner:

“Irrigated agriculture is the major determinant of economic growth potential of the province as it accounts for 26 percent of the GDP and caters for over 40 percent of the province's work force. Over 90 percent of agricultural output in Punjab comes from farmlands irrigated by one of the largest contiguous irrigation systems in the world. The colossal irrigation conveyance network is serving 21 million acres (8.4 million hectare) cultivable command area with cropping intensities generally exceeding 120 percent. The vast irrigation system in the province, however, faces major irrigation and drainage challenges with serious economic, environmental and social implications. Hydraulic infrastructure has deteriorated and large deficits in O&M maintenance have led to sub-optimal service delivery levels characterized by low water conveyance efficiencies and inequitable water deliveries. Replacement costs for Punjab's irrigation infrastructure including barrages and conveyance network is estimated as Rs.1600 billion whereas the estimated cost for rehabilitation and deferred maintenance needs is Rs.170 billion. Consequently, development in the sector needs to enshrine rehabilitation, improvement and modernization of infrastructure coupled with holistic reforms aiming at integrity and sustainability of the system through improved management and service delivery levels.”

2.42. *INTERNATIONAL EXPERTS:*

²⁶ Ex.I.W.137/2/2

2.43. *JOHN BRISCOE*²⁷, Gordon McKay Professor of the Practice of Environmental Engineering, Harvard University Schools of Engineering and Applied Sciences, Public Health and Kennedy School of Government, USA submitted to the Tribunal that:

“The flood problem cannot be tackled in isolation without attending to the overall area of water resource management. Any flood management plan without the isolation of water resource management is erroneous.

The authority dealing with water management in Pakistan is supposed to deal with flood management. **The whole challenge is to weave “flood management” in the over all water management context, e.g., if we take Tarbela and reduce its storage prior to the floods, it raises a corresponding issue of hydropower and irrigation security, therefore, flood management and water management are inseparable.** For example, the Three Gorges Dam on the Yangtze River in China, which produces 20,000 MW of hydropower, reduces its productivity during the flood season in order to make space for flood water. Such an operating rule can work only because China has redundancy in its power generation system. Pakistan does not have this redundancy and therefore Tarbela cannot be operated in this way. This again illustrates the fact that flood management is part of a bigger picture – not just of water management but energy and food security, too.

As a conclusion there can be no Flood Plan without a Water Plan. The landmark 1968 study on Water and Power Resources of West Pakistan by Lieftinck said that Pakistan should build a dam the size of Tarbela on the Indus every 10 years. However, nothing has been built in the last 40 years. The result is that there is a massive underinvestment in storage on the Indus. Consider the comparison with major rivers in arid areas of the US and Australia. On both the Colorado and the Murray Darling dams have been built which can store about 1000 days of average flow of those rivers. Tarbela can store only 30 days of average flow of the Indus. All measures of infrastructure development point in the same direction. Whereas rich countries have developed over 70% of their economically viable hydropower potential, Pakistan has developed just 10%. Whereas the US and Australia have over 5000 cubic meters of storage capacity per person, and China has 2,500, Pakistan has only 120. **The bottom line is that there can be no security – food security, energy security or water security – without major and continuous investments in infrastructure on the Indus. There is 40 years of underinvestment in infrastructure on the Indus.**

Of course infrastructure alone does not solve the problem. Water management walks on two legs – infrastructure plus institutions. There are also major institutional issues – legal, regulatory, organization, human resources and knowledge

²⁷ John Briscoe spoke with the Chairman of the Tribunal over phone from USA and got recorded the above statement. On his visit to Lahore he also met the other members of the Tribunal on 6-12-2010. The above statement is transcribed from the recording made over the phone. The statement was sent to Mr. Briscoe over email which was confirmed with slight modifications on 24-12-2010. Therefore, there is no signature on the statement.

—that have to be addressed, too. Investments in modern institutions must go hand-in-hand with investments in infrastructure. When we did our book on water in Pakistan we commissioned a very good paper on floods. I annex an extract of what we wrote on “living with floods” which is highly germane to [this] inquiry:

“Flood management is characterized by 'short bursts of feverish activity stimulated by a flood event followed by long periods of complacency... as the memory of flood fades into the past, the motivation for action also passes away'. (*Briscoe and Qamar, page 60*). ”

While this flood was and is a horrendous event, the reality is that the endemic problem of drought looms very large. As the endemic reality of drought again takes hold, floods will fade away from people's memory. The context is therefore floods, drought, and productivity, agriculture, energy all integrated. As in many countries, attention to floods is episodic and goes into hibernation during periods of drought, with devastating consequences (as witnessed in the recent drought-ending floods in Balochistan)²⁸.

Pakistan has a long-standing and sophisticated understanding of flood management, and has long emphasized both 'hard' solutions (such as dams, embankments, and drainage works) and 'soft' solutions (such as watershed management, land use planning and flood warning systems).

There are a number of factors—including declining storage capacity in the major reservoirs, and the increased flows likely as a result of glacial retreat—which indicate that Pakistan is likely to be entering an era of increased flooding.

Flood management always involves difficult trade-offs. Embankments and drains and other protective structures cannot realistically be built to such a level that there is no threat of floods. And so when floods do occur, they should not be seen as 'a failure' of the system, but rather as an inevitable part of the uneasy balance which is struck when man lives in very large numbers in a hazardous environment. In addition, populations move into the Indus flood plain, which sustains a productive shallow-tubewell-based agriculture. Priority must be given to structural protection of high-value infrastructure assets, the failure of which would be catastrophic. This obviously includes the barrages, where there is both need for urgent structural attention (witness Sukkur Barrage) and attention to bypass floodways that need to be properly demarcated and channelized, and from which encroachments need to be removed. There are some major structures, such as the Alexandra Railway Bridge over the Chenab, that need to be extended to avoid choking and flood

²⁸ Briscoe and Qamar, Pakistan's Water Economy – Running Dry- Oxford (World Bank) - 2006: “living with floods” - page 59

ponding upstream that causes frequent inundation of towns and villages. A major problem is that maintenance of the existing flood protection infrastructure is deficient, with the result that breaches/damages are not uncommon. As for all other infrastructure (discussed in more detail in the next section), there is a need for an asset management plan, and assessment of liabilities and mechanisms for regular funding of these. While the concept of flood hazard land-use planning is well understood, the fact is that there is little enforcement, and growth of vulnerable developments in flood-vulnerable areas continues unabated. Post-dam records are long enough to give a fairly good indication of the effect of the reservoirs, but the quality of regulation is not being improved by extending the period of record by simulating reservoir operation for the pre-dam periods. There is a need to review the magnitude of Probable Maximum Flood (PMF) for major facilities.

Flood response plans exist but implementation is weak, with specific priority items being the need to raise the level of awareness, and to the timing and reliability of warnings and how they are understood by the general population.

Progressive deposition of sediment on the river beds, particularly in the lower reaches of the Indus, is proceeding unchecked. Current management of the problem by correspondingly raising the dykes to contain the river every few years is certainly not sustainable on a long-term basis.

Flood management is characterized by 'shortbursts of feverish activity stimulated by a flood event followed by long periods of complacency... as the memory of flood fades into the past, the motivation for action also passes away'.

The lack of maintenance is a very serious institutional and financial issue. 'Since 1958, with the transfer of major development works to WAPDA, provincial irrigation departments' functions were reduced mainly to the operation and maintenance of the systems. PID managers have not been finding these functions sufficiently challenging, and over the years have lost much of their initiative, innovativeness, and morale. The PIDs' attention remains almost exclusively focused on the irrigation distribution network. Let alone the flood protection works, even the river barrages have been in a state of neglect. Whenever a major problem of a catastrophic nature takes place on a barrage or a flood protection embankment, lack of adequacy of maintenance funds is given as a standard cause which in several cases would be valid while in others not quite so. Deferred maintenance has become a routine practice with PIDs, which eventually results either in a disaster or in a major repair and restoration undertaking in the shape of an independent project.'

In summary, there is a long tradition of excellent professional flood management capability in Pakistan. But the great challenges are those of making explicit but difficult trade-offs, financing, implementation, maintenance, and institutional performance—in short, the fundamental problems of development.

Finally, while it will be tempting to look for scapegoats in an enquiry on the floods, in my view this should not be the focus. The roots of the tragedy are in the failures of all – not least the Government of Pakistan and the donors who have supported Pakistan – for 50 years. **The tragedy is the result of these accumulated failures to make good decisions: both political (especially in building transparency and trust among the provinces) and on both infrastructure and institutions.** But there are some good signs –some important reforms in some provinces, for example. Pakistan is at a fork in the water road. It can continue down the path of stagnation, or it can build a new consensus on water, it can end the self-destructive bickering and start building a solid basis of infrastructure and institutions for water, energy and food security.

2.44. **ADIL NAJAM**,²⁹ Director and the Frederick S. Pardee Professor of Global Public Policy, Boston University,³⁰ USA deposed before the Tribunal that “although the current focus is on floods because of the tragedy of 2010, focusing on the Indus Water System as a whole is important because future water related disasters by climate change could include not only floods but also severe droughts. Therefore it is important to focus on water system as a whole and the water management systems that can be more feasible both in case of water and extreme drought conditions.”

2.45. **NESPAK's RECOMMENDATIONS**³¹: The flood management and protection systems need to be accorded high significance. The systems are required to be upgraded and strengthened to a high level so that upgraded systems are able to sustain high magnitude events as experienced in the 2010 floods. In this context the following areas have been identified where major improvements and major upgrades are required.

- i. Improving and extending the Flood Forecasting System to include the upper Indus above Tarbela, Kabul river system above Nowshera and Indus river below Thatta-Sajawal bridge up to coastline of the Arabian Sea.
- ii. Development of the flood passage guidelines for Tarbela reservoir so as to enhance its flood mitigation role.
- iii. Implement evacuation of the people living in the reservoir areas up to the level of designed highest flood level so that the reservoir operators can implement

²⁹ I.W. 150

³⁰ The Frederick S. Pardee Center for the Study of the Longer-Range Future 67-Bay State Road Boston, Massachusetts -02215

³¹ Ex I.W. 101/A/1

the SOPs of flood passage through the reservoirs without any constraint.

iv. Capacity building/training for enhancing the technical capability of PMD technical staff and operators of the dams and barrages is required so that they can perform their roles in an efficient and effective manner.

v. Identification of the future reservoirs that would have high flood mitigation role in addition to their agriculture and hydropower benefits and developing flood passage guidelines through them to achieve the desired flood mitigation role.

vi. Identification of flood release channels/escape channels to desert areas / off channel storages that would provide major reduction in flood peak discharge in the main rivers.

vii. Flood Plain Mapping/Zoning along all the Indus river and its tributaries for identifying high and medium flood risk areas for permanent settlements

viii. Identification of low flood risk areas for future cities, towns and villages, industrial areas and other vital installations etc.

ix. Formulation of requirements for legislation for restricting the development of permanent settlements in high and medium flood risk areas

x. Resettlement/relocation of the villages in the flood plains to safe areas outside the flood bunds

xi. Review and revise the flood design criteria of barrages, bridges, bunds and communication infrastructure on the Indus River System, and implement up-gradation where required.

2.46. ***SUBMISSIONS OF WWF (WORLD WIDE FUND FOR NATURE):*** Mr. Ali Hassan Habib, Director General, WWF, Pakistan in his Position Paper³² submitted that the recent floods are consistent with the types of events that have been projected from human-induced climate change and such extreme events are occurring with more frequency and with greater intensity or severity according to the latest IPCC report. Therefore, it can be expected that a greater number of intense floods and droughts will be occurring as a result of climate exchange.

2.47. Deforestation has led to increase peak flow of floods. According to the State of the World's Forests 2009³³, the total land area of Pakistan has only 2.5% forest cover and even that is decreasing at an alarming rate. According to this FAO report, Pakistan is losing forests

³² Ex.IW-81/1

³³ Bradshaw CJA, Sodi NS, Peh KSH, Brook BW (2007a) Global evidence that deforestation amplifies flood risk and severity in the developing world. *Global Change Biology*, 13, 2379-2395

at an annual rate of 2.1% and no other country in Asia/Pacific region has a higher rate for deforestation.

2.48. According to “Deforestation in Himalayan Forest watersheds and floods”: For centuries it has been traditionally believed that forests provide natural protection against flooding. The role of forests in sustaining water supplies, in protecting the soils of important catchments and in minimizing the effects of catastrophic floods and landslides has long been discussed and debated by scientists.

2.49. A recent study published in the journal Global Change Biology by Corey Bradshaw and colleagues details the first global-scale and empirical evidence linking loss of natural forest cover to increased flood risk and severity in developing countries. Researchers from Charles Darwin University (Australia) and the National University of Singapore analysed 10 years of flood data from the Dartmouth Flood Observatory to monitor flood frequency at a country scale. **“Our empirical results indicate that halting deforestation or reducing the rate of natural forest loss should be beneficial in alleviating the incidence and severity of floods that ultimately cause undesirable disruption and damage to human life and property”**, says Corey Bradshaw, the first author of the publication.

2.50. The extent of forest cover in Pakistan in 2005 was 1,902,000 hectares (ha) which is 2.5% of its land area. The annual rate of change of forest cover during 1990 –2000 was –1.8% while during 2000–2005 it was –2.1%. No other country in the Asia/Pacific region has a higher rate of deforestation, according to the country tables provided in this FAO report (FAO, 2009 State of the World's Forests).

2.51. The recent floods in Pakistan started from the catchment areas of the River Kabul, in Afghanistan and River Swat, in Pakistan. These catchments have lost vast areas of forest over the past few decades.

2.52. A recent study on forest cover assessment over the last eight years (2001-2009) of Swat and Shangla Districts highlights that in Swat ~ 7,300 ha of forest has been damaged which is 13% of the forest cover in 2001 and in Shangla ~ 2860 ha of forest has been damaged which is 11% of the forest cover in 2001.

2.53. This degradation has been attributed to institutional failure and lack of law enforcement leading to exploitation of forests by local communities and timber smugglers.

2.54. Mr. Ali Hassan Habib further submitted that most areas in the flood plains or sailaba areas were inundated by floodwater. Historically, Indus River used to flow in the *katcha* area which is about 5 to 25 kilometers wide. Now, one can see encroachments, human settlements, villages and extensive areas under agriculture in this floodplain. We feel this is not wise long-term management of floodplains. More sensible and long-term flood management allows inundation of pond areas, depressions along the floodplains during high flood.

2.55. The Director General of WWF further contended that management of our water resources is widely viewed as unsustainable, inefficient and inequitable. Weather extremes and climate change underscore the need for us to reform our water management practices. He suggested reliance only on building of more reservoirs, such as upper-catchments, small dams, on-farm storage, micro-hydel, localized self help dams, etc. This may also include reconnecting certain natural depressions and pond areas within the broader floodplains of our rivers. A more efficient land use management regime is needed for floodplain management including collaboration of local communities and warning systems supported by smart infrastructure.

2.56. Zoning of areas with respect to vulnerability to floods will need to be done. In cities, flood channels and storm water drainage systems should be separated from sewage systems to eliminate solid waste clogging these channels. Overlapping responsibilities of PMD, FFC, IRS, PIDA, NDMA and District Governments needs to be eliminated. It is high time that Integrated River Basin Management (IRBM) be applied in letter and spirit. Projected areas like forests, national parks, mangroves, natural depressions, marine ecosystem can play very important role as buffer zones and biological corridors which can act as disaster risk reduction measures. Hence, the role of projected area system be included in the comprehensive flood management plan. National Water Policy needs approval which also supports flood management initiatives in the country.

2.57. *[SIND] BUND MANUAL*³⁴ also provides for flood management, which is instructive. Key extracts are as under:

2.58. *PROPOSALS FOR WETTING BUNDS (PARA 28)* : Adequate arrangements for soaking are an essential pre-requisite of a safe bund, for the consolidation or compaction of a bund depends on the soaking, which helps settlement and discloses faults which can be repaired or leaks which can be filled before the main rise of the river. Therefore, every proposal for a new bund or a loop bund is incomplete without the attendant proposals for sufficient arrangements for early wetting and consolidation of a bund, unless the bund is likely to get automatically soaked with the early levels obtained in the river on account of low-lying and near the bund on the river side.

2.59. In case of existing bunds, wherever arrangements do not already exist, proposals should immediately be made for their efficient wetting wherever necessary. The two principal ways of wetting bunds in Sind are:

³⁴ Mark-38 Government of Sind, Public Works Department, Central Designs Division, Mechanical & Research Circle, Karachi Printed at the Sind Government Press 1954. Introduction: Following the breach in the Sukkur Begari Bund and the consequent floods of 1942, there was constituted by the Sind Government a Court of Inquiry into matters connected with the floods, under the Public Inquiries Act, 1940. There was, also, a Technical Inquiry into the causes of breaches in River Bunds in Sind and steps required to minimize the danger of a recurrence. The Court of Inquiry remarked that though now regarded as a complete guide in all matters pertaining to the construction and maintenance of bunds, the Bund Manual manifestly required revision. It considered that there were doubtless matters in which the Manual can be improved and that it required re-editing and keeping upto date. The recommendation to revise the Bund Manual, made both by the Court of Inquiry and the Technical Inquiry, was accepted by the Indus River Commission at their meeting on 26th October, 1943. They suggested that an officer on Special Duty may be appointed to revise the Bund Manual. The present edition of the Bund Manual is the result of that decision.

- (a) Wetting channels, and
- (b) Flooding of a compartment through a bund sluice in the front bund.

2.60. While method (a), wetting channels, can be used for soaking both front and loop bunds, method (b) is available only for wetting the loop or retired bund. In other words, while the loop bunds can be wetted by either method, the only arrangement possible for wetting front bunds is by means of wetting the channel.

2.61. Wetting channels are of two kinds:-

2.61.1. Gravity channels excavated from the river lip (which is generally higher than the other ground) to the bund along the lowest contours, to lead flow water early against the bund, in advance of the sudden over-topping of the higher ground near the river edge causing a rush of flow against the bund.

2.61.2. High level artificial wetting channels, made by adding a trench bund to a main bund (see Chapter IX para.99). In rare cases, it may be possible to get flow water in these channels with the river levels obtaining at the beginning of the season; but generally, water is lifted into the wetting channels by means of pumps. A centrifugal pump worked by a suitable engine is placed on some canal, or special channel from the river and water pumped thence into the wetting channel.

2.62. The Indus River Commission have, therefore, enjoined that:-

“ In all cases of front bunds the river water should be brought to the bunds sufficiently early through leading channels. Where, in case of important bunds this is not possible wetting trench bunds should be provided.”^{34-A}

2.63. *PRESENCE OF MAINTENANCE ESTABLISHMENT REQUIRED ON BUNDS (PARA 103):*

The principal maintenance of bunds comes during high water when the safety of the bund is threatened. Frequent inspections, particularly in case of new bunds or dangerous sections of old bunds, and constant attendance on the bunds, within their charge, by everybody from the humblest beldar to the Executive Engineer are essential.

2.64. Patrolling by beldars commences as soon as water comes against a bund. From that time onwards, until water has finally left the bund, all the establishment engaged on the maintenance of bunds, from the beldar upto the Sub-Divisional Officer, must be present on the bunds within their jurisdiction.^{34-B}

2.65. *UNREMITTING PATROLLING DURING HIGH ABKALANI ESSENTIAL (PARA 105) :* The first line of defense, when the river is in floods, requires close and constant patrol and

^{34-A} Bund Manual, Government of Sind, Public Works Department, Central Designs Division, Mechanical & Research Circle, Karachi Printed at the Sind Government Press, 1954

^{34-B} Bund Manual, Government of Sind, Public Works Department, Central Designs Division, Mechanical & Research Circle, Karachi Printed at the Sind Government Press, 1954

unremitting supervision, both by day and night, by adequate, trained staff. A stitch in time saves nine : timely warning and timely action, which efficient, unremitting patrolling alone can provide, will save a dangerous situation while complacency born of a false sense of security following a series of low rivers, may lead to disaster. Continuous vigilance in patrolling everywhere is, therefore, enjoined on all the staff, particularly during the night and in the early hours of morning when breaches most frequently occur with the slackening of supervision.

2.66. The temporary headquarters of the Overseer, Sub-Divisional Officer and Executive Engineer should, as far as possible, be in the centre of the active bund line in their charge. Katcha landhis should be constructed for the overseer in the center of his section, if no pucca landhi exists. The Executive Engineer and the Sub-Divisional Officer should, whenever necessary and as far as possible, patrol frequently at night^{34-C}.

2.67. **WETTING OF FRONT BUNDS AND LOOP BUNDS WITH WETTING CHANNELS (PARA 110):** The wetting of the bund is an essential process in the maintenance and in the safety of a bund, particularly in the excessively dry climate of Sind. However carefully the bund may have been constructed, with thorough clod-breaking, ramming, and rolling, perfect compaction, so that there will be not cavities or no settlement, however small, cannot be expected, unless the soil is also ideal for bund construction, since the clayey soils ordinarily met with in Sind are liable to expand and slide when wet and to shrink and crack when dry. The kalarish soils are even more treacherous, leading to hollows in the bund as the salts in the soil dissolve. The conditions to which bunds in Sind are exposed, alternating between excessive and sudden soaking by the river in the flood months and complete dryness during the rest of the year, make the gradual wetting of the bund in advance of the river floods impinging upon a dry and unprepared bund a vital necessity.

2.68. The purpose of wetting a bund is to consolidate the bund and render it watertight by enabling leaks to be closed, as the contact of water with the bund during the progress of wetting reveals them, so that they may not develop into breaches.

2.69. The relative merits of different methods of wetting of bunds have been set out, while dealing with proposals for wetting of bunds (para.29 Chapter IV). During maintenance, whatever artifice is available at hand has to be made use of to the fullest advantage.

2.70. A bund has to be wetted throughout its entire length if the wetting is to serve its designed purpose, *since a bund is only as strong as its weakest portion*. The plan for wetting should be carefully thought out so that the wetting of the whole length of bund is completed before the rise of the river.

2.71. First of all, water is to be led to the front bund. If the katcha and pucca foreshore on

^{34-C} Bund Manual, Government of Sind, Public Works Department, Central Designs Division, Mechanical & Research Circle, Karachi Printed at the Sind Government Press, 1954

the river side of the bund slopes towards the bund, all that may be necessary is to give cuts to the lip at the river edge, which is generally somewhat higher. If there is low-lying land near the bund on the river side but there is high land between the river and the bund, low level gravity channels have to be constructed along the lowest contours from the high river edge to the bund. If wetting by flow water is not possible, sufficiently in advance of the rise of the river, artificial wetting is possible by lifting water into previously constructed wetting channels (see Chapter IV para.28) by means of pumps; a centrifugal pump worked by a suitable oil engine is placed on some canal or special channel from the river and water pumped into the wetting channel. About 1 cusec per mile of wetting channel is required and more while the bund is new.

2.72. Wetting engines should begin to operate about the beginning of May or in sufficient time to enable the water to get to the end of the reach concerned before the water touches the bund and not later than the end of May. As, however, the canals are not generally opened till the beginning of May, in the case of water being taken from a canal, a pipe of sufficient capacity in the bunds, at the heads of the canals, will be required and/or a trench about 3 or 4 feet wide in the center of the canal, with bed level corresponding to suitable river level.

2.73. At any rate, pumping should be commenced as soon as water can be obtained from canals or through connecting channels from the river so that the bund may be soaked gradually and the establishment may have sufficient time to consolidate the surface of the slopes of the main and trenching bunds by sprinkling or splashing water over them and also to close any leaks which may develop. As there may be a considerable depth of water in the trench and as it is constructed in made-earth, leaks from the slopes or from the bed are likely to occur. Unless there is some arrangement to arrest it, the whole of the water contained in the trench may then be washed down through the leak and cause much damage. The wetting channel should therefore be provided with temporary bundas at short intervals, say every two furlongs or less, so that if a big leak occurs and the establishment is unable to detect or close it at once while the pumping engine is working, the water in the channel can be held up at the bunda next above the site of the leak. After water is held up at the bunda, the leak can be properly opened and repaired.

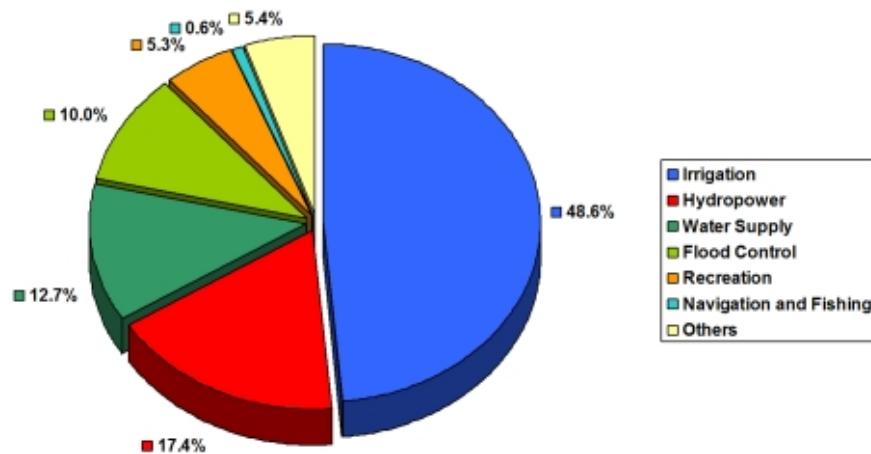
2.74. The pumps should work throughout the period of rising river. The ideal condition would be that the water level in the trench should always be about 1 foot higher than river water level against the bund while the river is rising and the bund must be wetted artificially at least 6 inches higher than the D.H.F.L. to meet any possible rise in the D.H.F.L. Gauges are provided in the wetting channel opposite every gauge in the front line, their zeroes at 4½ feet below D.H.F.L. (vide para. 48)^{34-D}

^{34-D} Bund Manual, Government of Sind, Public Works Department, Central Designs Division, Mechanical & Research Circle, Karachi Printed at the Sind Government Press, 1954

2.75. *ROLE OF DAMS- Flood Protection Benefits of Dams*³⁵ As water is not evenly distributed in spatial and temporal scale all round the world, reservoirs created by dams are necessary to even it out. The reservoirs so created are helpful in providing the water when it is in short supply and in avoiding the water it is available in excess. A majority of the dams built in the world are multipurpose in nature (as below), but irrigation is the largest user of the waters withdrawn.

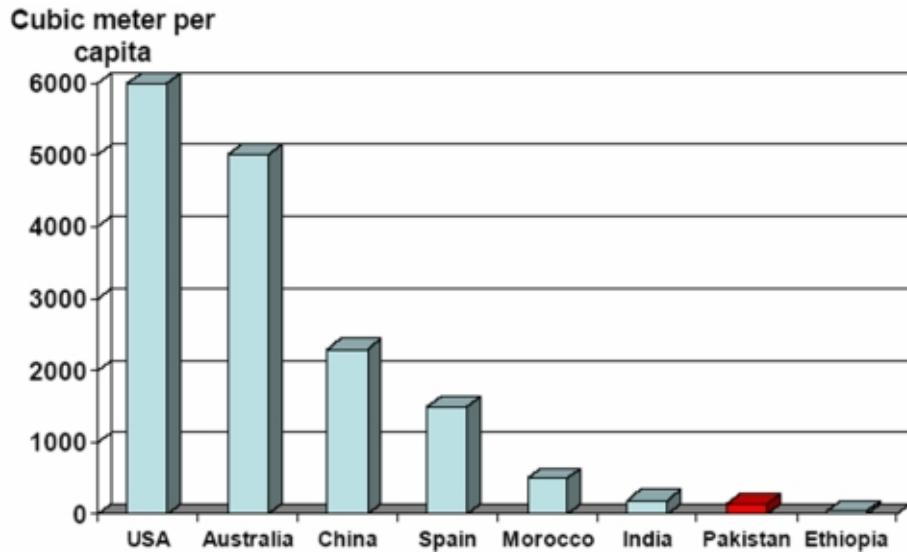
- a. Irrigation for agriculture (food supply)
- b. Flood control
- c. Hydropower
- d. Inland navigation
- e. Recreation

2.76. Primary benefit of dams/reservoirs in the world is supply of water. Other major benefits are: Out of more than 45,000 large dams around the world, 10% are constructed with the major objective of flood control, as shown in figure below.



2.77. Dam reduces the total quantum of flow and size and frequency of peak floods in the flood season, reducing flood hazard due to inundation of land, crop and property which might result into economic upheavals. Dams, reservoirs, flood levees, embankments, and river training works constitute structural measures for better flood management. Intensive economic developments have been realized, for instance in the areas of Damodar, Mississippi, Missouri, Nile, and Tennessee rivers, only because of flood protection by the dams.

³⁵ WCD (2000), WCD Case Study: Tarbela Dam and related aspects of the Indus River Basin Pakistan, Islamabad, Pakistan. website: <http://www.dams.org> E-mail: info@dams.org. ICOLD (1998), Register of Large Dam by International Commission on Large Dams, WAPDA (2007), Presentation by the Chairman WAPDA, April 2007. ICID (2000), Role of Dams for Irrigation, Drainage and Flood Control, ICID Position Paper. S K Sinha and Rishi Srivastava (2010), Role of Large Dams in Flood Moderation Case Studies. Patrick Hawker and Halcrow, UK, A Review of the Role of dams and Flood Management



2.78. Developed countries have constructed major dams to harness their water availability, as shown in figure below, while Pakistan has fallen short of constructing dams as shown in figure below. There are about 150 (technically) large dams in Pakistan, while the USA has more than 6,000 large dams. In India, Damodar Valley Reservoirs achieve flood moderation of about 75% in case of high floods, Bhakra Dam, even though not specifically designed for flood moderation, achieves a moderation of about 70% in case of very high floods and Pong Dam achieves about 90% flood moderation.

2.79. Countries which each have more than 10 registered dams with an exclusive or partial flood control function are listed in Table 1 and account for some 95% of the approximate 4400 total registered in these categories. In terms of global distribution: Some 2100 (nearly half) of the registered dams with a flood control function are in the USA; China, Japan and Korea between them have nearly 1100 such dams; Europe is also well represented, with 535 such dams spread among 12 countries; Australia is poorly represented and there are no countries in the Indian sub-continent or in sub-Saharan Africa with more than 10 registered flood control dams of the USA flood control function registered dams, nearly half are exclusively for that purpose; elsewhere, some 25% of registered flood control dams are exclusively for that purpose;

2.80. Summary of Countries with more than 10 Dams Whose Purpose Includes Flood Control (Source: ICOLD World Register of Dams, 1998)

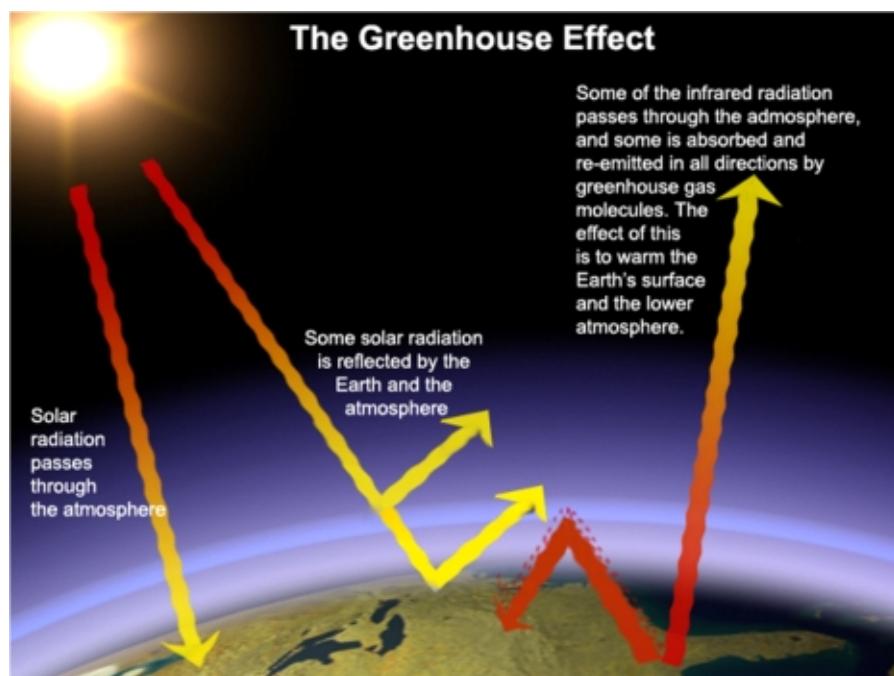
| Region | Country | Single Purpose Flood Control Dams (No) | Multi-Purpose Dams incl Flood Control. |
|-------------------|----------------|--|--|
| America N | Canada | 21 | 53 |
| | USA | 988 | 1099 |
| America Central | Mexico | 20 | 61 |
| America S | Argentina | 5 | 35 |
| | Brazil | 168 | 44 |
| | Venezuela | 0 | 25 |
| Africa North | Libya | 2 | 8 |
| | Morocco | 5 | 9 |
| Africa Sub-Sahara | | | |
| Asia-Middle East | Saudi Arabia | 13 | 0 |
| | Turkey | 2 | 65 |
| Asia-Central | | | |
| Asia-Indian SC | | | |
| Asia-Far East | China | 25 | 488 |
| Australasia | Australia | 9 | 13 |
| Europe | Austria | 1 | 22 |
| | Bulgaria | 3 | 8 |
| | Croatia | 4 | 15 |
| | Czech Republic | 7 | 48 |
| | France | 11 | 32 |
| | Germany | 57 | 117 |
| | Italy | 3 | 10 |
| | Poland | 0 | 36 |
| | Romania | 24 | 75 |
| | Slovakia | 0 | 25 |
| | Spain | 17 | 9 |

2.81. Although flood protection was not the major purpose of the Tarbela Dam constructed in 1976. In addition to recovering its costs of construction through provision of cheap electricity and water for irrigation, it has also helped in attenuation of high flood peaks during the filling period of June through August.

2.82. *Chinese Experience*³⁶: The most significant function of the dam is to control flooding, which is a major problem for the seasonal river of the Yangtze. Millions of people live downstream of the dam, with many large, important cities like Wuhan, Nanjing, and Shanghai situated adjacent to the river. Plenty of farm land and China's most important industrial area are built beside the river. The reservoir's flood storage capacity is 22 cubic kilometres (18,000,000 acre ft). This capacity will reduce the frequency of major downstream flooding from once every ten years to once every 100 years. The dam is expected to minimize the effect of even a "super" flood.

3. FACTORING CLIMATE CHANGE IN FLOOD MANAGEMENT ARCHITECTURE

3.1. Climate Change is "the greatest challenge facing the world at the beginning of the century" World Economic Forum Davos, Switzerland 2000³⁷.



3.2. *Temperature Trends over Pakistan*³⁸

3.3. The decadal changes in the mean annual temperature over Pakistan during the

³⁶ Wikipedia

³⁷ Ex I.W.134/1

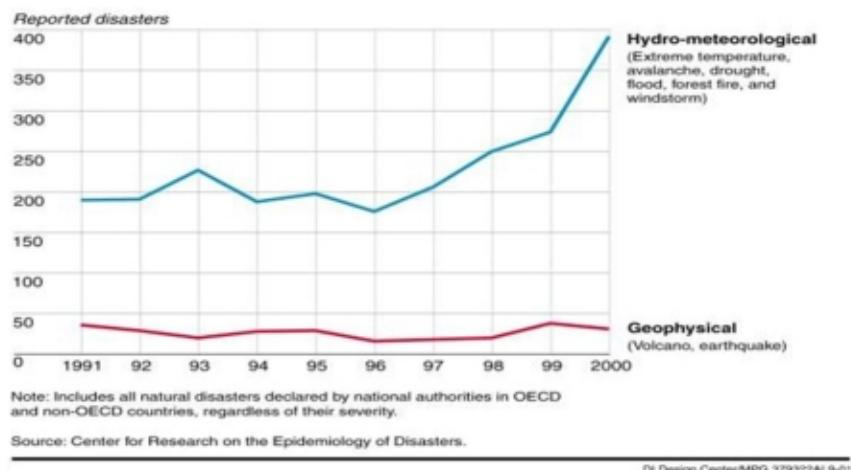
³⁸ Ex I.W. 135/1

periods are shown as under:

| | |
|-----------|----------------------------|
| 1901-2000 | 0.06 °C per decade (GCISC) |
| 1960-2007 | 0.24 °C per decade (PMD) |
| 1981-2000 | 0.27 °C per decade (GCISC) |
| 1991-2000 | 0.76 °C per decade (GCISC) |

3.4. Temperature changes during the previous century (1901-2000) over Pakistan using the CRU data has shown an increase of 0.6 degree centigrade and +25% in precipitation

3.5. The past global trends of hydro-meteorological disasters clearly point to the likelihood of increased frequency and intensity of floods with increase in average temperature.



3.6. Some Recent Precipitation related Extremes in Pakistan

| | |
|------|--|
| 2010 | Heavy rains during July, 2010 leading towards a major flood in most parts of Pakistan bringing in its wake huge devastation to life and property |
| 2010 | A Cyclone named Phet of Cat-4, the second strongest storm ever to develop in the Arabian Sea after Gonu, had a landfall along Makran Coast west of Karachi during June, 2010 and brought serious damages in its wake |
| 2009 | Karachi received 205 mm of rain on July 18 & 19. Heaviest prior rainfall event recorded at Karachi was 207 mm on July 1, 1977. The normal rainfall at Karachi for the periods 1961-1990 is 85.5 mm |
| 2007 | Record heat wave gripped Pakistan during June, 2007. 48°C temperature was recorded on June 9 at Lahore, a record repeated after 78 years. Earlier it was recorded on June 8, 1929 |

| | |
|-----------|---|
| 2007 | Two super cyclones namely Gonu (02A) of Cat-5 and Yemyin (03B) of Cat-1 developed in the Arabian Sea during June 2007 and hit Makran Coast and adjoining countries. The history of the Arabian Sea at least during the previous century shows no such events occurring twice in a month |
| 2001 | 620 mm rainfall in Islamabad during 10 hours in the month of July (on 23rd of July); it caused flooding in Lai nullah |
| 1998-2001 | History's worst drought gripped southern parts of Pakistan and parts of surrounding countries |
| 1996 | 438 mm rain in Lahore in 72 hours in August 1996 the wettest month on record |
| 1992 | Previous century's worst flood in Jhelum river |

Source: Global Change Impact Studies Centre, Islamabad

3.7. Flows at Tarbela during July 2010 show that despite the mega flood due to the heavy rains during 27-30 July, 2010, the average flows during the month remained close to 216,000 Cusecs which is less than the normal value of around 247 000 cusecs during July. Base flows or the contribution due to glacier melting is seen decreasing, consequently the [glacier melting did not contribute to the floods as reported in some press media](#)³⁹.

3.8. *El Nino and La Nina, effects on the rainfall pattern:* Studies done at GCISC reveal that rains are mostly deficient during the El Nino years. Monsoonal systems developing over the Bay of Bengal either dissipate around Bangladesh or over India and do not reach Pakistan in most of the cases.

3.9. La Nina events are mostly seen as the reverse to El Nino episodes causing heavy rains in the country. NASA studies attribute the occurrence of the July 2010 mega flood to tropical monsoon moisture coupled with a strengthened La Nina that dominate this region's weather patterns.

3.10. Additionally, "a massive heat wave in Russia during July, 2010 and the devastating flood in the same month in Pakistan can be linked by the unusual behaviour of the Jet stream, some scientists now believe. The jet stream is the high altitude wind that circles the globe from west to east. It is held by the Rossby waves that normally produce its distinctive wave-like pattern. A blocking event (still an enigma to be solved) during July brought the jet stream to a halt and made weather patterns stationary and trapped the weather systems that were caught between the meanders of the jet stream. The dry air brought from east Africa right up to Russia also observed the halt and caused heat wave to continue. Monsoonal rains in July prevailed in the country"⁴⁰."

3.11. Major CLIMATE CHANGE related concerns⁴¹ for Pakistan are:

³⁹ GCISC Ex I.W. 135/1

⁴⁰ GCISC Ex IW-135/1

⁴¹ GCISC

- Increased variability of Monsoon;
- More rapid recession of HKH Glaciers threatening IRS Flows;
- Increased risks of floods and droughts;
- Severe water- and heat- stressed conditions in arid and semi-arid regions leading to reduced agricultural productivity;
- Health Risks, Increase in Deforestation; Risk to Coastal Areas; Loss of Biodiversity

3.12. According to Dr Arshad Muhammed Khan, Executive Director, GCISC⁴² “there is no joint research activity or interaction between R & D Division of PMD and the Centre regarding monsoon or monsoon prediction. One of the tasks of the Centre is dissemination of information and knowledge regarding climate change, however, so far our focus has been on policy makers and we have not integrated with the various provincial departments especially the I & P department which could have benefited from our knowledge on climate change.”

3.13. Adil Najam⁴³, Director and the Frederick S. Pardee Professor of Global Public Policy, Boston University⁴⁴, USA deposed before the Tribunal:

“While it is very difficult to make a direct co-relation between climate change and a particular flood our knowledge about climate change science including in the South Asian Region, particularly based on recent IPCC studies is making it increasingly clear that climate variability in this region is going to be (a) high (b) is likely to increase the incidence of extreme climate events particularly those dealing with water in the South Asian Region. While our ability to predict particular events at particular places or particular times remained highly uncertain, **our general understanding of global climate model is making it clear that more such events are likely to happen with greater frequency as we move to the future.**

It is not particularly useful to figure out how much of a particular event is because of human induced human change and how much of it is because of historic weather patterns. **What is important is that climate change is likely to increase the likelihood of climatic disaster; therefore, the need to prepare for the likelihood of greater number of events as well as events of greater severity is becoming increasingly clear from climate science.**

Within South Asia and particular within Pakistan the existing literature suggests that extreme events are more likely to be water related including the possibility of greater

⁴² I.W. 134

⁴³ I.W. 150

⁴⁴ The Frederick S. Pardee Center for the Study of the Longer-Range Future 67-Bay State Road Boston, Massachusetts -02215

floods not only because of changing weather patterns but also because of the changing hydrology of the water system specially as it is driven by the glacial melting in the Himalayan region.

While the floods of 2010 were not related to glacial melting, the possibility of future change in the water system of the Indus because of glacier changes should also be kept in mind for designing future water management and flood management strategy.

Although the current focus is on floods because of the tragedy of 2010, focusing on the Indus Water System as a whole is important because future water related disasters by climate change could include not only floods but also severe droughts. Therefore it is important to focus on water system as a whole and the water management systems that can be more feasible both in case of water and extreme drought conditions.

It is important to understand that the key issue based by climate change lies in the increasing variability of climate patterns. These patterns are already very difficult to project or predict even in the best cases and the scientific consensus that it is going to become increasingly difficult to project and predict because of the new levels of variability added by climate change.

For this reason to strengthen our currently weak Meteorological capabilities and adding new capabilities to include climate change science becomes a major priority in the future and will require close collaboration between different centers of a relevant knowledge going beyond the currently narrow focus on immediate weather patterns that is already insufficient and will become increasingly more challenging.

While it is important for the future to improve the quantity of data generated, it is probably more important to strengthen the institutional abilities to analyze the data in time and over time. The current structures of data calculation and dissemination related to extreme climatic events such as floods are disbursed in multiple institutions which have not had a history of effective coordination or communication amongst them. Improving the analytical capacity and the ability for cross institutional connections is a key challenge in this regard. Within this challenge the role of the Irrigation Department is particularly important not only as a recipient of Meteorological Department from the PMD but also as a partner in the analysis of real time use of that data.

Benchmarking with best international practice within our region and internationally would be an important first step particularly in two areas: (a) Meteorological data calculation and analysis; and (b) Water System Management with a special focus on flood management.”

4. POLICY RECOMMENDATIONS

4.1. INTEGRATED FLOOD MANAGEMENT PLAN⁴⁵

4.2. *Suggestions and recommendations made above* may be considered as an integral part of these Policy Recommendations.

4.3. *The new paradigm:* Floods are part of a natural cycle that can never be fully controlled. “Flood control” is therefore a futile terminology and a counter productive mandate. The future is to think of “Flood Mitigation” or “Flood Risk Management” or “Flood Resilience.” Our flood managers should consider this new paradigm as a starting point in developing an integrated flood management plan.

4.4. *Broader set of objectives:* While flood manager in the past have focused on structural and non-structural measures to protect and mitigate flood, a broader set of objectives need to put on the table. While structural safety of the barrages and training works is critical, human safety, protection of human shelters, safeguards for agriculture and fisheries, roads, ecosystems, health, and biodiversity need equal attention.

4.5. *Non-structural measures* Ecologically friendly non-structural measures for flood mitigation measures like afforestation of the watershed and the riverine belt, developing and effectively using lakes, depression and retention pools along the river.

4.6. *Flood Forecasting:* Better flood forecasting is required. Hydro-meteorological forecast needs to assess floods on the basis of precipitation- in the air. Radars and other equipment which was missing this year needs to be immediately procured so that the upper catchment area of River Indus is fully covered.

4.7. *Early warnings* by PMD need to be relayed on TV, radio and website. Early warnings must also be in vernacular so that it is understandable and effective.

4.8. *Land use and Flood Plain Management:* Flood plains are the hardest hit during the floods. Still there is no land use or flood plain management regulation. As population increases, human settlements and agriculture in flood plain will increase and so will loss to human life and property. The regulations for proper land use and other related issues in flood plains should be made on priority basis with the consent of stakeholders. Emphasis should be laid on proper implementation of these regulations in letter and spirit.

4.9. *Managing Flood Protection Structures:* Structural measures such as embankments suffer from neglect and poor maintenance. More vigilant structural management is required involving participation of the local community. Proper Embankment Maintenance Manual to

⁴⁵ This chapter gives valuable foundational inputs for the policy and flood managers to successfully draw up a Flood Management Plan for the country.

be developed that carries out a regular check of the embankments round the year. Encroachments from embankments to be removed. All major embankments to be GIS mapped and monitored through remote sensing. Design criteria of the embankments to be ensured according to the latest design manual prepared by FFC.

4.10. *Developing detailed flood regulations or FLOOD MANUAL*

4.11. *Pre-flood preparedness* is the bedrock of any successful flood management plan. The wisdom in Sind Bund Manual, FFC Manual and series of loose leaf guidelines which are mostly unavailable are unknown to many officers and must be developed into a proper MANUAL and religiously followed by the zone during the flood season EVERY YEAR WITHOUT FAIL.

4.12. *Asset management*, environmental protection and health care must be built into the pre flood preparedness manual.

4.13. *The Flood Fighting Plan* must be enforced strictly, with strict penal consequences for non-observance.

4.14. Flood Fighting Plan must be an *integrated plan* worked out with key related departments e.g., Health, C & W, Food, Agriculture, Environment, Wildlife, Civil Administration, Army, Civil Defence, Home Department, 1122, etc.

4.15. *Localized Ownership*: Nazims, DCOs and respectable residents of the Districts to be made a part of the Integrated Flood Management Plan to broaden its ownership and effective implementation.

4.16. Other than the *Breaching Section* on the right side, shadow breaching sections and emergency relief cuts must be chalked out in the plan and clearly visible in the Flood Emergency Map which should be a part of the Flood Fighting Plan. Locals of the area must be included in the preparatory discussions so that their ownership is present at all times.

7.17. This year it was noticed that the morphology of the river changed and the flow of the water was on the left side rather than on the right side. This necessitates to rethink the breaching sections located on the right side only. Should there be breaching sections on both the sides (e.g., Taunsa Barrage this year used the left side)

4.18. *FACTORING IN CLIMATE CHANGE*

4.19. The most recent IPCC report states that climate change will be inevitable as present mitigation efforts will not be enough. Therefore, adaptation to climate change is required. As climate change will likely increase the variability of weather, Flood Management Plan should be adaptive to future floods rather than strictly preventive.

Immediate future action

4.20. It is expected that the Provincial Government will immediately set out to develop an Integrated Flood Management Plan, so that the first phase of the Plan can be operationalized in the coming Flood Season-2011⁴⁶.

⁴⁶ Integrated Flood Management Plan requires constant upgrading and updating and should be considered to be a live document that is improved every year by incorporating the post flood lessons learnt.



CHAPTER 10

One glance at the Indus and, without seeing them, we must believe in the immensity of the ...Himalaya: one glance at the Indus...it is impossible not to venerate the river.¹

CONSOLIDATED RECOMMENDATIONS

Recommendations at the end every Chapter have been reproduced hereunder as an easy and ready reference for the flood managers and the policy makers:

1. JINNAH BARRAGE (Chapter- 3)

1.1. The breach of LGB at Jinnah Barrage can be attributed to poor flood preparedness, failure to observe the regulation, absence of reserve stone, continuance of emergent work on the loose apron downstream, closure of weir gates and abuse of para 2.89. It also brings to fore the premature operation of the breaching section, conflicting statements of the officers regarding procurement of reserve stone during the critical dates and poor capacity of human resource employed at the barrage especially the XEN. This resulted in a loss of Rs 417 million² to the public exchequer, which could have been avoided.

We therefore **recommend** as follows:

Penalties

1.2. The competent authority to initiate departmental disciplinary proceedings against Secretary I & P³, under relevant service rules for **inefficiency**.

1.3. To initiate departmental proceedings against C.E⁴, C.E (D&F)⁵, S.E⁶, XEN⁷ & SDO⁸ under PEEPA, 2006 for **misconduct and inefficiency**.

1.4. Till the conclusion of the departmental inquiry Mr. Rab Nawaz, Secretary I & P be

¹ G.T. Vigne, Travels in Cashmir , Ladakh, etc

² Ex IW-5/3 Headwise list of flood damages, Sargodha Division, Restoration works 2010. (Page 793 Appendix 9)

³ Mr. Rab Nawaz

⁴ Rao Irshad Ali Khan

⁵ Rafiq Ahmed

⁶ Khalid Iqbal

⁷ Muhammed Afzal

⁸ Nawazish Ali

immediately replaced, so that the Department does not face the next flood season (2011) under his stewardship.

1.5. In order to conduct an impartial and transparent departmental proceedings and in order to avoid further loss and damage, the above named C.E, C.E (D&F), S.E., XEN & SDO be placed **under suspension** and a fresh team of able and competent officers be appointed at Jinnah Barrage for the upcoming Flood Season, 2011.

11.6. To initiate criminal proceedings against the above named C.E., S.E., XEN & SDO under sections **166, 167, 283, 322, 427 and 431 of the PPC**. The competent Authority on the basis of the inquiry and findings above as well as the damages recorded in chapter 7 below initiate criminal proceedings against the above named C.E., S.E., XEN & SDO under section **166, 167, 283, 322, 427, and 431 of the PPC**.

1.7. NAB (National Accountability Bureau) to hold an inquiry to verify the alleged procurement of reserve stone from private quarries, stone allegedly procured for the emergent work on the downstream loose apron, the quantity of stone recouped from the RGB, reserve stone of stock maintained at the Barrage, if any and the source of reserve stone made available for flood fighting between 30th July, 2010 to 2nd August, 2010.

Reforms

1.8. **Pre Flood Preparedness** must provide for the following:

- i. Proper Pre-flood Inspection of the headworks including training works. Other departmental representatives must also be included and the reports put up on the website.
- ii. An inspection check list needs to be developed, showing in detail the areas to be covered in the inspection. The said check list to be filled out by the inspection team and duly submitted with the C.E. and C.E. (D & F). The entire pre flood inspection to be videographed.
- iii. The pre inspection to be counter checked by the C.E and C.E. (D & F) separately and independently of each other.
- iv. Total stoppage of works (U/S or D/s) on the barrage during the flood season.
- v. Severe penalties attached if there are lapses on pre flood preparedness.
- vi. I & P to develop a proper procedure of using Para 2.89 of the PWD code. A new emergency clause of the I & P Department can be developed and incorporated in the Flood Management Plan.

vii. The officers posted out on a barrage must carry out the pre-inspection and should remain posted till the close of the flood season so that they can take ownership of the barrage during the flood season and effectively flood fight and coordinate with other departments.

viii. There is also no effort on analyzing climate change and its effects. The I & P Department will have to develop its capacity to read the new trends in weather and climate change and be able to predict and forecast more intelligently. It is now common knowledge that due to global warming there will be extreme weather which could result in heavy and super floods and also severe droughts. This common knowledge wasn't available at the I & P Department and was never discussed during any pre flood meeting.

1.9. The *Flood Fighting Plan* must include:

- i. Quantity of Reserve Stone required under para 6.39 M.I.P. at every barrage. The Flood Fighting Plan must specify the Reserve Stone required.
- ii. Location must marked for stacking the said stones- and a map showing such locations shall form part of the Flood Fighting Plan.
- iii. Duty roster per camp- clearly giving out names of officers.
- iv. List of Flood Fighting Material carries outdated items which are not required in this time and age. This list needs a proper revision after need assessment.
- v. List of Machinery (dumpers, trucks, etc) for flood fighting required to be specified according to the flood levels. The said machinery to be available through out the flood season. There is no mention of the machinery in the flood fighting plan or its procurement mechanism from the Machinery Division.
- vi. Personnel of Army and Civil Administration to conduct rehearsals with the officers of the I & P Department and should remain standby through out the flood season. Civil Administration and the Army must depute a point person on the Barrage who shall assist and facilitate the C.E or the XEN to arrange manpower and any other assistance as per flood fighting plan.
- vii. Flood Fighting camps and stations must be clearly demarcated on a site map.
- viii. Chief Engineer to closely monitor, supervise and manage the entire flood season, especially at the Barrages.
- ix. Emergent works should not generally be allowed to continue during the flood season. This requires to be clearly provided in the Flood Fighting Plan.

- x. Flood Fighting Plan has to be put in motion at the start of the Flood Season with weekly reporting to Flood Emergency Cell at Lahore.
- xi. The data pertaining to the management of the Barrage must be on line during the flood season so that the efforts made by the I & P Department are available to the public on the Flood Website of the I & P Department.
- xii. Complete Flood Fighting drill to be carried out before the Flood Season.
- xiii. Sensitive and high risk areas to be marked during the pre flood preparedness – so that flood fighting is based on a well thought out strategy.

1.10. *Breaching Section.*

- i. The Breaching sections must be ready to be operated.
- ii. Explosive should be housed near the barrage rather than 4 hours away in Sargodha Cantt. The explosives for the breaching section should be housed on the barrage at the start of the flood season so that there are no transportation delays. Army and Civil Administration needs to deploy a point person who shall be deputed at the barrage for immediate coordination.
- iii. Critical Gauge of RL 701 at RD 5000 needs to be revisited and its accuracy verified by IRI in close consultation with the I & P Department.
- iv. The Flood Fighting Plan must clearly spell out the number of breaching sections and the time lag involved in utilizing all the sections.
- v. The regulation setting down procedure for invoking the breaching section must be provided in the Flood Fighting Plan. Regulations spread into loose leaf circulars and notifications has also weakened the structure of governance. Without the majority of the members of the Breaching Committee being witness to the Critical Gauge, the breaching section should not be operated.
- vi. Water Course of the breaching section must be a no go area and must be kept clear at all times.
- vii. The delay in activating the breaching sections is also disturbing and in this aspect of the matter the I & P Department is directed to take up the matter in detail with the Pakistan Army.

1.11. *Pakistan Meteorological Department (PMD)*

The Tribunal recommends the following to the Federal Government:

Penalties

1.12. Departmental action for inefficiency and misconduct be initiated against the Chief Meteorologist⁹ FFD of PMD for **inefficiency** under the relevant service rules.

1.13. Departmental action against ex-D.G¹⁰, PMD for **inefficiency and misconduct** under the relevant service rules for failing to procure radars for upper catchment area of River Indus, failure to raise this as an urgent issue with the Federal Government and also in the Pre Flood Meetings held with other stakeholder organizations, failure of PMD to issue weather forecast with confidence on 26th July, 2010 when an unusual stagnation of the two weatherly systems had become clear to PMD, to issue timely forecast and issue coloured coded alerts when the monsoon moved into Pakistan on 24th July, 2010 and also in failing to issue correctly worded forecasts (strictly in terms of WMO) that could have rightly communicated the severity of the weather and the urgency and importance of the forecast.

1.14. Chief Meteorologist, FFD (PMD) be placed under suspension till the final conclusion of the departmental disciplinary proceedings.

1.15. The Federal Government should carry out an audit /assessment of PMD, particularly looking at the human resource as well as the infrastructural capacity of PMD and put the house in order before the next flood season. Four areas of concern are:

- i. Technological capacity- more QPM radars to cover the upper catchment of KPK and the Hill Torrents within Punjab.
- ii. International bench marking of the quality of Human Resource and weather models employed at PMD.
- iii. Upgrading the Research Division. PMD must lead cutting edge research in monsoons and climate change.
- iv. Ensure meaningful utilization of existing resources/ model/ equipment available with PMD and fixing responsibility / penalties in case of non-functioning of existing models acquired at heavy cost.

Reforms

11.16. Monsoon Research Centre to be set up under the auspices of PMD to develop more depth and understanding of Monsoons in Pakistan.

11.17. The human resource at PMD has to be upgraded and at the same time QPM Radar at Cherat has to be fixed and made functional. New and latest radars and other equipment to be installed for the catchment areas of Indus as well as the hill torrents.

⁹ Mr. Hazrat Meer

¹⁰ Dr. Qamar uz Zaman Ch.

11.18. We feel that PMD has to seriously buckle up if the extreme weather is to be predicted in future. On the whole, we feel that the PMD has failed in its responsibilities as the only forecaster in the country. As all the institutions have to react on the information disseminated by PMD, it takes a central role. It was also disturbing to note that inspite of the Research and Development Division within PMD, no material research has come out on monsoons or the climate change. PMD requires more internal coordination and more robust and dynamic approach towards weather and flood forecasting.

11.19. We recommend that Ministry of Defence must seriously revisit the structure as well as capacities of PMD specially FFD and stream line the same.

11.20. Better-qualified, trained, experienced and paid human resource is employed so that proper forecasts are generated at the right time. The infrastructure regarding purchase of new Radars and other equipments must be immediately attended to so that MET Office is always in the best state of preparedness at all times

11.21. According to the data supplied the human resource employed at the PMD has just one person at the FFD holding M.S. Meteorology while rest of the staff has degrees in Physics and Mathematics.

11.22. PMD has to revisit its forecast terminology. The terms used by WMO must be incorporated. "Widespread rain or showers" must be replaced by "violent or exceptional rain" (where necessary) so that the sense of emergency can be properly conveyed.

FWC & I & P Department

11.23. I & P Department needs to revamp its flood warning centre (FWC). There is no coordination between the FWC and the Department.

11.24. The lag/travel time from Tarbela to Jinnah Barrage is 16 hours and from Tarbela to Chasma is 20 hours and from Tarbela to Taunsa is 36/37 hours. If the pre flood preparation is up to the mark, flood fighting plan can be set in motion in 16 hours at Jinnah and certainly in 36 hours at Taunsa. All the emergency cells ought to do is to keep a track of gauges at Tarbela and Khairabad as a second line of defence even if the PMD fails to deliver, as it partly did this year.

2. TAUNSA BARRAGE (Chapter-4)

1.1. On the basis of the inquiry and findings discussed in this chapter we **recommend** as follows:

Penalties

2.2. The Competent Authority to initiate departmental disciplinary proceedings against Secretary I & P Department¹¹ under relevant service laws for inefficiency.

2.3. The Competent Authority, on the basis of the inquiry and findings above, initiate process to terminate the contract of employment of Head PMO¹². The competent authority to initiate civil proceedings for recovery of damages against Head PMO for the loss caused to the life and property of the people of District Muzzafragarh and the loss caused to the Barrage.

2.4. Competent Authority to initiate departmental disciplinary proceedings against XEN¹³ under PEEDA ACT, 2006 for **misconduct and inefficiency**.

2.5. Competent Authority on the basis of the inquiry and findings above and the damages recorded in Chapter 7 (below) to initiate criminal proceedings under sections **166, 167, 283, 322, 427 and 431 of PPC** against the above named Head PMO and XEN.

2.6. Till the conclusion of the departmental inquiry Mr. Rab Nawaz, Secretary I & P be immediately replaced, so that the Department does not face the next flood season (2011) under his stewardship.

2.7. To immediately suspend the above named XEN till the departmental action and the criminal proceedings are concluded.

2.8. That all the current assignments of Head PMO be withdrawn immediately and the role of PMO to be reconsidered by the Provincial Government. We recommend that the active management of the Barrages must remain with the C.E.'s concerned and the role of PMO should be restricted to rehabilitation work subject to the undermentioned recommendations.

2.9. Detail audit / third party validation of the Taunsa Rehabilitation Project to be conducted to assess the following in particular;

2.9.1. Whether, as planned, PMO gained experience and capacity during Taunsa Rehabilitation Project and is fully able to handle future Rehabilitation Work (at

¹¹ Mr. Rab Nawaz

¹² Ghulam Hussain Qadri

¹³ Mr. Muhammed Munir Anjum

Jinnah and other Barrages) independently without reliance on outside consultants. If not, why?

2.9.2. Whether the taking over of the Rehabilitation Project from the contractors by PMO was in accordance with the contract. Whether the control room was taken over after due diligence and verifying the performance of the control room. If the audit reveals that there have been lapses, Government of Punjab to take strict action against the delinquents.

2.9.3. To verify and assess the purpose, reasons and results of the expenditure incurred on O & M of LMB and Sanawan Bund. If it is discovered that the said funds were squandered and did not serve any useful purpose the senior management incharge of the Barrage at the time be criminally prosecuted under the law.

Reform

2.10. A detail [Post Flood Report](#) along with all the post flood surveys and maps must be prepared so that a proper flood management strategy can be evolved for the next flood season.

2.11. Flood Manual (as a subset of an Integrated Flood Management Plan) be developed including instructions from the exiting flood fighting plans, Guidelines, Manual of Irrigation Practice (M.I.P), Sind Bund Manual and other related instructions available on the record. The flood managers to be put through proper training on the Flood Manual and all the flood managers to have a copy of the Flood Manual at all times.

2.12. Proper training and pre-flood rehearsals as instructed by the new Flood Manual shall be mandatory so that the flood fighting strategy is practical and functional prior to the actual floods.

2.12.1. I & P Department to develop an online Flood Website that gives real time details of the pre-flood preparation, flood forecasts, early warnings, flood fighting preparation and the flood relief work as it takes place. This will act as a good self-regulating tool for the I & P department and will be beneficial for the people.

2.13. Bund Management to be introduced. One option is to divide the long bunds into manageable segments and the vigilance and supervision of the said segments be delegated to the local residents who have their land abutting to the said embankment. These locals, having stake in the life and health of the said bund, can be officially nominated as "Bund Watchers" under law or policy, creating obligations and corresponding incentives. Obligations to regularly watch the health of bund (in their area) and regularly report to the Department. During flood season, be part of the flood fighting team of the I & P Department. Timely inform the department of any emergency so that breaches can be avoided. In return, the Bund Watchers can be given incentives in the shape of crops, etc

alongwith necessary communication tools (cell phones) so that they can timely inform the Department during floods and also act as early warning centres. Without local participation of the key stakeholders no effective monitoring can take place as I & P Department does not have the capacity to police bunds that run in several kilometers as has become evident in the Floods under inquiry.

Pond Area & Belas

2.14. I & P Department to develop in association with Wildlife & Fisheries Department, detailed POND AREA & BELAs Regulations for its management and supervision. POND AREA & BELAs to be properly mapped (through GIS) and additionally monitored through remote satellite sensing with the assistance of SUPARCO, WWF or the Urban Unit (P & D Department).

2.15. Revenue Record of the area to clearly identify and show the said areas to be POND AREA in use by the Wildlife and Fisheries Department. The Pond Area should be handed over to the Wildlife & Fisheries Department, who with the help of WWF and other reputable NGOs¹⁴ should develop the Pond Area into a wildlife sanctuary.

2.16. Encroachments in the Pond Area should not be allowed at any cost and must be immediately cleared. These environmental pockets (Pond Area) must be protected and encouraged to support the growth of biodiversity and wildlife in the country. Pond Area can showcase a rich and wide range of wildlife, which needs to be encouraged. Technically, POND AREAS must remain free from human settlements and must be well regulated so that their service to the Barrage for maintaining the required pond level is never impaired.

2.17. I & P Department and the Wildlife and Fisheries Department will also allow public access to the Pond Areas (subject to regulation). This will encourage students and researchers from Universities and NGOs to carry out research of this rich biodiversity and multiple ecosystems.

2.18. Belas may be used as Eco-public parks (during limited hours and months) so that public can enjoy healthy entertainment and also get to know and learn from their rivers. Pond Areas and Belas to be incorporated in the Integrated Flood Management Plan.

2.19. The zamindara bunds or private bunds in the pond area to be immediately demolished so that there is no resistance to river water flowing into the pond area.

2.20. Provincial Government and in particular I & P Department shall vigilantly attend to [W.P. 4919/2009](#) pending at the Multan Bench, of the Hon'ble Lahore High Court, so that the petition is decided in accordance with law before the start of the next flood season i.e., 15th June, 2010. The urgency in the matter shall be placed before the Hon'ble Lahore High Court,

¹⁴ working in the related field.

Multan Bench by the I & P Department through an appropriate application by making reference this recommendation of the Report.

PMO

2.21. PMO barrages should not be allowed to manage and operate barrages which should remain within the exclusive domain of the C.E. of the respective zones.

2.22. We also recommend a detail audit (as mentioned above) of the expertise and knowledge gained by PMO during its experience at Taunsa Barrage. It needs to be ascertained with certainty if the PMO has gained any such valuable expertise and will the PMO be able to handle rehabilitation of Jinnah Barrage and other barrages without placing substantial reliance on outside consultants. This audit is essential to frame the future course of action for rehabilitation of barrages.

Political Intervention

2.23. No evidence has come to fore to establish that LMB was breached due to political pressure or intervention in order to save the proposed breaching sections at Taunsa Barrage. The lands of Khosas were identified after detailed scrutiny of the revenue records and their location was plotted on the GIS map of the area - the said lands are far away from the Right Marginal Bund and in no way fall within the water way if at all the identified breaching sections on the right side of Taunsa Barrage were to be operated. The allegation that breach at LMB was induced due to political influence in order to protect the Lands of Khosas is not established by the record before us.

2.24. It is also not established that the XEN appointed at Taunsa Barrage or the transfer of the earlier XEN was under any political pressure.

2.25. Influential's of the area (also having political background) have however, encroached upon the Pond Area of Taunsa Barrage and have to be immediately removed from the Pond Area as recommended above before the start of the next flood season.

3. JAMPUR FLOOD BUND AND FAKHAR FLOOD BUND (Chapter-5)

Penal

3.1. The encroachments on the embankments and the repairs identified by the Report of the Departmental Pre-Flood Inspection Committee were never plugged or attended to. It was the responsibility of the Secretary I & P¹⁵, C.E¹⁶, C.E.(D & F)¹⁷ and XEN¹⁸ to have ensured the compliance of the Pre Flood Inspection Report. None of the officers bothered to do so. We, therefore recommend initiation of disciplinary departmental proceedings against the abovementioned officers for **inefficiency** under the relevant service laws.

3.2. The XEN¹⁹, SDO²⁰ and S.ENGs²¹ did not implement the Flood Fighting Plan. There were no watching huts, no machinery deployed and there was no evidence that flood fighting material was brought to the bund to fight the flood on 2-8-2010. We therefore recommend the competent authority to initiate disciplinary departmental action against the above officers for **misconduct and inefficiency** under PEEDA Act, 2006 on the basis of the inquiry and findings of this Report.

Reform

3.3. The entire concept of flood fighting relating to embankments has to be revisited. The existing “cut and paste” flood fighting plan from yesteryears will not do.

3.4. A detailed exercise has to be undertaken to develop innovative ways of flood fighting on long embankments. The option discussed in the recommendations under Taunsa Barrage (Chapter-4) may be read as an integral part of these recommendations.

3.5. The embankments ought to be GIS mapped and constantly monitored with the help of SUPARCO in addition to the on spot physical supervision of the locals.

3.6. The embankments must provide for wetting channels alongwith the necessary infrastructure to keep the said channels functional.

3.7. The embankments must be brought in conformity within the design criteria laid down by FFC.

3.8. Flood Fighting Material and machinery must be shifted to vulnerable points at the start of the flood season so that it can be speedily operationalized in the hour of need. Huts

¹⁵ Rab Nawaz

¹⁶ Mehr Muhammed Amin

¹⁷ Rafique Ahmed

¹⁸ Abid Rashid

¹⁹ Abid Rashid

²⁰ Sh Saifullah.

²¹ Tufail Rizvi, Muhammed Bilal Ali, Ejaz Hameed, Muhamemdn Ali, Asif Mahmood Fida and Muhammed Rafique Gabol

or sheds for housing the said materials and machinery on the strategic spots along the embankments must be clearly mapped and set up in every flood season.

3.9. Flood fighting rehearsals must be undertaken every year at the start of the flood season.

3.10. Appropriate number officers corresponding with the length of the embankment must be posted on each bund.

4. LMB OF GUDDU BARRAGE (Chapter 6)

4.1. I & P Department shall immediately²² take up the issue of removal of *Zamindara* Bund, the illegal pipes and other ancillary matters with I & P Department, Sind so that the LMB is properly repaired, *Zamindara* bund and other impediments should be removed before the start of the flood season 2011. This is essential for the security for the people of Rahim Yar Khan and for the safety of their assets.

4.2. I & P Department to keep an active liaison with the I & P Department, Sind as well as with the administration/management of Guddu Barrage so that a joint flood fighting strategy can be developed for the LMB extending into Punjab.

4.3. A mechanism²³ between the two Irrigation Departments to be evolved for the future so that issues get expeditiously resolved.

²² before the start of this flood season

²³ by constituting an Inter provincial committee or panel of Irrigation officers and experts.

5. SYSTEMIC CAUSES OF BREACH (Chapter 8)

5.1. *Absence of Flood Plain Management.*

5.2. Government should urgently develop Flood Plain Management Plan as a part of the larger integrated Flood Management Plan.

5.3. Flood Plains must be clearly zoned and demarcated. Inhabitants and built up structures within the flood plains be subjected to special regulation which ensures extra protection for their life and property.

5.4. Construction in the said area to be regulated and special building codes to be developed. Architecture and design within flood plains need to adapt to frequent flooding. One option can be of raised structures, preferably stilted (or built on stilts) to withstand the heavy flood discharge.

5.5. Towered Emergency centers or shelters can also be of huge benefit to the resident population that is invariably displaced and finds shelter on the dry tops of the embankments or high roads. One suggestion can be that the architecture of the government schools and basic health units in the area can be such that they are used as emergency shelters and also act as early flood warnings centers. Local schools and hospitals carry more credibility amongst the local population than the seldom seen irrigation officers and might take early warnings more seriously than they do now²⁴. One of the reasons being poor trust and confidence in the flood managers.

5.6. Provincial Government through legislation or executive order must provide for the following :

- Demarcation of the flood plains duly GIS mapped.
- No future construction to be allowed in the flood plain
- Flood Plains be allowed for agriculture with proper advice on the kinds of crops to be sown.
- Provide regulations to control/manage deforestation and use for livestock grazing.
- Flood Insurance to be encouraged in the flood plains for agriculture.
- Converting existing structures into flood resistant structures. Stilted or raised architecture to be used.
- Government schools or government hospitals within the flood plains to be made flood resistant by raising their structures and using them as shelters and early warning centres during floods.
- Local participation to be encouraged in decision making and reform process.

²⁴ During our inquiry we discovered on location that flood warnings issued by the I & P Department did not move the people.

5.7. *Hill Torrents Management*

Immediate Action

5.8. It is recommended that the Government sets up Hill Torrent Management Policy, as soon as possible and preferably before the start of the Flood season 2011. This will not only act as flood mitigation measure but will also bring agriculture and prosperity to the “barani” area in the foothills of the Suleman Range.

5.9. A detail audit be conducted before the next flood season to assess the allocation and utilization of funds and verify the results achieved through various heavily funded hill torrent projects done till date. The audit must give elaborate reasons why these projects failed. The audit report must be put up before the Chief Minister of the Province so that firm action be taken against the delinquents and road to flood and hill torrents management in this country be paved in stone, once and for all.

Reform

5.10. Large quantity of fresh water resource that comes down as hill torrent is not being tapped and harnessed. In the modern water scarce world this passes for criminal neglect. There can be no other national or provincial priority more urgent and pressing than finding ways and means of conserving fresh water resources of our country. The sustainability of our future generations depends on the water management and planning we do today.

5.11. Any future Flood Management Plan will be incomplete without Hill Torrent Management. Detailed planning and mechanism is provided in FFC's Manual. Government needs to start implementation.

Additional Recommendation (even though outside our TORs)

During our inquiry we visited²⁵ the hill resort of Fort Munro²⁶. The climate, beauty and serenity of the resort left an impression on us. We were informed that several such peaks exist in the Suleman Range which can be developed into wonderful hill resorts of the likes of Murree. Any development in this direction can provide a huge economic uplift to the less prosperous districts of Punjab and provide healthy entertainment to the people of Southern Punjab. It will also open multiple avenues between Baluchistan and Punjab, which will further cement national development and cohesion.

5.12 *Weak I & P Department*

5.13. In order to proudly manage the “World's largest contiguous irrigation network,” I & P

²⁵ On a private visit for the members of the Tribunal and its secretariat which was completely funded by the Chairman of the Tribunal in his personal capacity.

²⁶ an hour and half drive from D G Khan.

department requires immediate reengineering and reform. It has to be the flagship department of the Government of the Punjab.

5.14. “Water” being the most valuable resource of the future (not so distant future) – Irrigation Department must procure and acquire the **best of the best** human resource available within the Provincial bureaucracy. Able, educated and well trained officers need to fill this department. The current state of affairs is destined for a disaster if nothing is done soon.

5.15. Irrigation department must be known for its technical ingenuity and *avant garde* research capabilities. Irrigation in the modern world by any measure is a highly technical field requiring constant innovation and research besides selection of the best minds.

5.16. Our economy rests on Agriculture and cannot progress unless complimented by a robust, modern and innovative irrigation system. I & P Department cannot be equated with just any other department and therefore requires immediate reform and uplift.

5.17. The administrative Secretary has been most useless in the recent floods. The top managerial structure needs a rethought. A Secretary and a special secretary team might be more effective, with the special secretary being a technical irrigation person.

5.18. The historic Irrigation research Institute must be strengthened and its lost glory be restored. Reliance on consultants must be successively reduced. Development must be sustainable, driven by passion and must factor in homespun wisdom.

5.19. Irrigation Department must closely work with the engineering universities of the country to attract its best minds and be current with the recent developments in science, climatology, irrigation and agriculture.

5.20. Best officers (civil engineers only) must be posted on the Barrages. This field formation must be immediately revisited so that a team of abler men is holding guard at the barrages before the start of the Flood Season 2011.

5.21. The job description of various engineering cadres must be clearly defined (if not already done) alongwith required minimum qualification. No officer should be posted to any position without having requisite minimum qualification (for example Mechanical Engineer to be posted on post suited for a civil engineer and vice versa).

5.22. We noticed that XEN appointed at Taunsa Barrage to be on LOOK AFTER charge and holding other charges as SDO. Secretary I & P Department deposed that most of the officers have adhoc promotions. Munir Anjum held the posts of SDO Headworks and Bunds besides a look after charge as an XEN. This needs to go. Proper Service Rules need to be introduced and team heading Barrages must be confirmed and duly promoted officers holding just one charge. Officers appointed must not be transferred or disturbed during the Flood Season.

The suspension of the XEN at Taunsa Barrage on 1-8-2010²⁷ during the height of the flood season by the Chief Minister, Punjab on a complaint of a local is deprecated.

5.23. Postings on the Barrages must be incentivized and made more attractive.

5.24. XENs and SDOs on Barrages must pass the [Fit And Proper Test](#).

5.25. Continuing local and international training/ capacity building in Barrage regulation and flood management be conducted.

5.26. Severe departmental penalties to be provided for gross negligence in managing floods.

5.27. Vacant posts of engineers must be filled immediately through Punjab Public Service Commission and process should be regularized in future so that there should not be discontinuity for any trained engineer on the job.

5.28. *INEFFECTIVE FFC*

5.29. The current Chairman and the previous Chairmen are accountable for their failed stewardship of the Commission since 1977. The country does not have an Integrated Flood Management Plan - this omission is criminal and the Chairmen must be held accountable for it. We recommend the Federal Government to hold a detail audit of FFC by panel of experts including members of the civil society to assess the performance of FFC since its inception. Why has FFC failed to develop a Flood Management Plan and how and why has the FFC continued to approve localized flood sector schemes²⁸ without first assessing their need in the larger context of the Flood Management Plan 

5.30. FFC needs to be pulled out of its cocoon – it is not to act as a lame secretariat or a post office for the PIDs but must immediately assume its real role of a principal flood sector authority of the country. It is recommended that Federal Government must ensure that FFC develops the first ever National Flood Management Plan before the start of the next flood season and shares it with the flood managers of the provinces. In doing so, FFC is to have a participatory approach and should involve the local residents of the area. FFC must display the said PLAN on its website for wider dissemination.

5.31. Federal Flood Commission has to be made accountable for failing to develop a National Flood Management Plan since its inception in the year 1977.

5.32. Federal Flood Commission simply rubber stamps flood sectors schemes prepared at the end of every flood season by the zonal officers of the irrigation department. This is not

²⁷ when the Barrage was faced with exceptionally high flood.

²⁸ mostly driven or supported by the local politicians.

the role of FFC. Federal Government must immediately pull up this apex flood sector institution to perform its role under the law.

5.34. FFC must also place on its website all the schemes approved along with their budget so that flood sector work remains within public domain and subject to open criticism.

5.35. *INTERGATION AND COORDINATION WITH OTHER KEY DEPARTMENTS.*

5.36. Key departments to gravitate around the Irrigation Department and develop a joint and an integrated flood management support system.

5.37. Flood Management Plan to assign specific roles to key departments so that departmental energies are amalgamated and flood preparedness and flood fighting response is simultaneous and in unison.

5.38. FFC & I & P Department to play a central role in bringing other departments together to attend to a common flood management plan.

6. DEVELOPING AN INTEGRATED FLOOD MANAGEMENT PLAN (Chapter-9)

6.1. INTEGRATED FLOOD MANAGEMENT PLAN²⁹

6.2. *Suggestions and recommendations made above* may be considered as an integral part of these Policy Recommendations.

6.3. *The new paradigm:* Floods are part of a natural cycle that can never be fully controlled. “Flood control” is therefore a futile terminology and a counter productive mandate. The future is to think of “Flood Mitigation” or “Flood Risk Management” or “Flood Resilience.” Our flood managers should consider this new paradigm as a starting point in developing an integrated flood management plan.

6.4. *Broader set of objectives:* While flood manager in the past have focused on structural and non-structural measures to protect and mitigate flood, a broader set of objectives need to put on the table. While structural safety of the barrages and training works is critical, human safety, protection of human shelters, safeguards for agriculture and fisheries, roads, ecosystems, health, and biodiversity need equal attention.

6.5. *Non-structural measures* Ecologically friendly non-structural measures for flood mitigation measures like afforestation of the watershed and the riverine belt, developing and effectively using lakes, depression and retention pools along the river.

6.6. *Flood Forecasting:* Better flood forecasting is required. Hydro-meteorological forecast needs to assess floods on the basis of precipitation- in the air. Radars and other equipment which was missing this year needs to be immediately procured so that the upper catchment area of River Indus is fully covered.

6.7. *Early warnings* by PMD need to be relayed on TV, radio and website. Early warnings must also be in vernacular so that it is understandable and effective.

6.8. *Land use and Flood Plain Management:* Flood plains are the hardest hit during the floods. Still there is no land use or flood plain management regulation. As population increases, human settlements and agriculture in flood plain will increase and so will loss to human life and property. The regulations for proper land use and other related issues in flood plains should be made on priority basis with the consent of stakeholders. Emphasis should be laid on proper implementation of these regulations in letter and spirit.

6.8. *Land use and Flood Plain Management:* Flood plains are the hardest hit during the floods. Still there is no land use or flood plain management regulation. As population increases, human settlements and agriculture in flood plain will increase and so will loss to

²⁹ This chapter gives valuable foundational inputs for the policy and flood managers to successfully draw up a Flood Management Plan for the country.

human life and property. The regulations for proper land use and other related issues in flood plains should be made on priority basis with the consent of stakeholders. Emphasis should be laid on proper implementation of these regulations in letter and spirit.

6.9.. ***Managing Flood Protection Structures:*** Structural measures such as embankments suffer from neglect and poor maintenance. More vigilant structural management is required involving participation of the local community. Proper Embankment Maintenance Manual to be developed that carries out a regular check of the embankments round the year. Encroachments from embankments to be removed. All major embankments to be GIS mapped and monitored through remote sensing. Design criteria of the embankments to be ensured according to the latest design manual prepared by FFC.

6.10. ***Developing detailed flood regulations or FLOOD MANUAL***

6.11. ***Pre-flood preparedness*** is the bedrock of any successful flood management plan. The wisdom in Sind Bund Manual, FFC Manual and series of loose leaf guidelines which are mostly unavailable are unknown to many officers and must be developed into a proper MANUAL and religiously followed by the zone during the flood season EVERY YEAR WITHOUT FAIL.

6.12. ***Asset management***, environmental protection and health care must be built into the pre flood preparedness manual.

6.13. ***The Flood Fighting Plan*** must be enforced strictly, with strict penal consequences for non-observance.

6.14. Flood Fighting Plan must be an ***integrated plan*** worked out with key related departments e.g., Health, C & W, Food, Agriculture, Environment, Wildlife, Civil Administration, Army, Civil Defence, Home Department, 1122, etc.

6.15. ***Localized Ownership:*** Nazims, DCOs and respectable residents of the Districts to be made a part of the Integrated Flood Management Plan to broaden its ownership and effective implementation.

6.16. Other than the ***Breaching Section*** on the right side, shadow breaching sections and emergency relief cuts must be chalked out in the plan and clearly visible in the Flood Emergency Map which should be a part of the Flood Fighting Plan. Locals of the area must be included in the preparatory discussions so that their ownership is present at all times.

6.17. This year it was noticed that the morphology of the river changed and the flow of the water was on the left side rather than on the right side. This necessitates to rethink the breaching sections located on the right side only. Should there be breaching sections on both the sides (e.g., Taunsa Barrage this year used the left side)

6.18. *FACTORING IN CLIMATE CHANGE*

6.19. The most recent IPCC report states that climate change will be inevitable as present mitigation efforts will not be enough. Therefore, adaptation to climate change is required. As climate change will likely increase the variability of weather, Flood Management Plan should be adaptive to future floods rather than strictly preventive.

Immediate future action

6.20. It is expected that the Provincial Government will immediately set out to develop an Integrated Flood Management Plan, so that the first phase of the Plan can be operationalized in the coming Flood Season-2011³⁰.

³⁰ Integrated Flood Management Plan requires constant upgrading and updating and should be considered to be a live document that is improved every year by incorporating the post flood lessons learnt.



CHAPTER 11

The Indus is a foul and perplexing river.¹

PICTORIAL TOUR

¹ Lieutenant John Wood, 9 February 1836.



Aerial view of Upstream Taunsa Barrage (Muzaffargarh and DG Khan Canals)
(22---09---2010)



Aerial View Downstream Taunsa Barrage (22---09---2010)



Aerial View of water entering Kot Mithan from the breached Bund (22---09---2010)



Aerial view of water approaching the city of Kot Mithan (22---09---2010)



Briefing to Tribunal at Jinnah Barrage (01---11---2010)



Downstream view of the gates of the Jinnah Barrage (01---11---2010)



Tribunal examining the destruction of LGB at Jinnah Barrage (01---11---2010)



Small portion of LGB still intact at Jinnah Barrage (01---11---2010)



Damaged quarters of Chinese engineers near RMB Jinnah Barrage, Mianwali (01-11-2010)



Tribunal at Nawab of Kalabagh's guest house damaged by the recent floods, Mianwali (01- 11-2010)



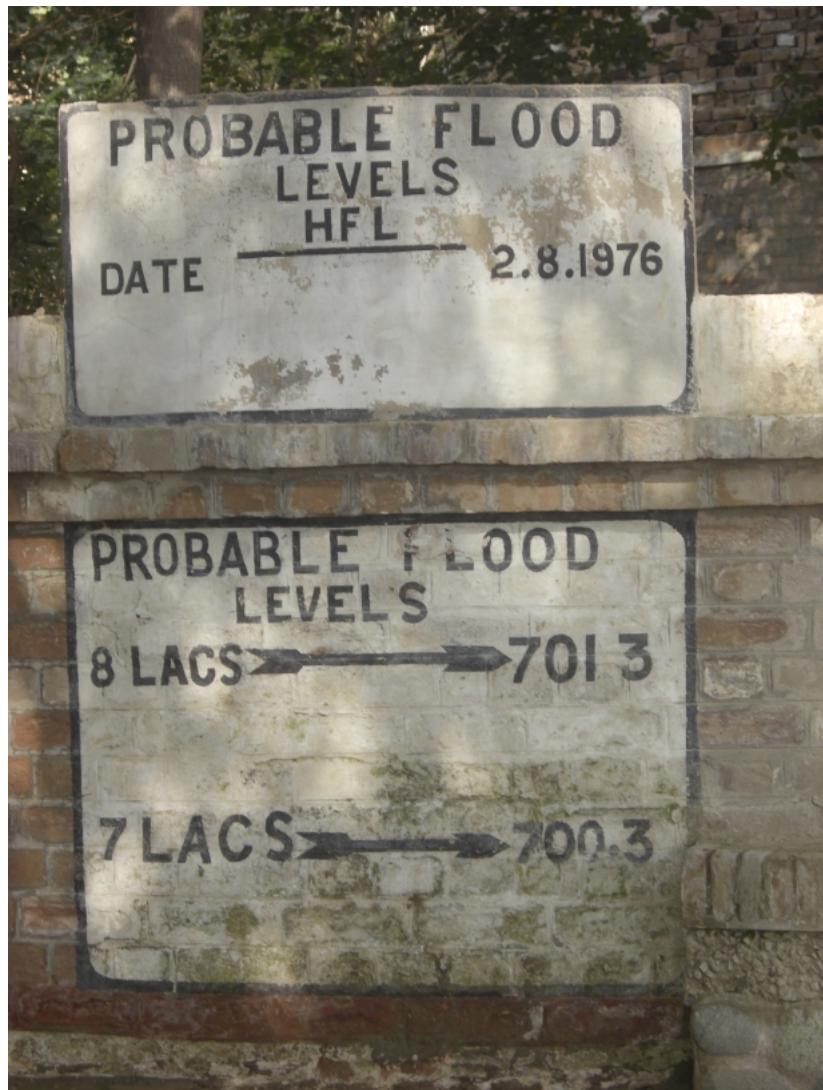
Water Marks of flood inside Nawab Kalabagh's Guest House–Mianwali (01-1-2010)



View of rail cum road bridge from Nawab Kalabagh's Guesthouse-Mianwali (01-1-2010)



Tribunal sitting in the courtyard of Nawab Kalabagh's Guesthouse-Mianwali (01-11-2010)



Probable Flood Levels marked at Nawab Kalabagh's Guesthouse- Mianwali (01-11-2010)



Tribunal getting a briefing at Chashma Barrage (03---11---2010)



Tribunal visiting the structure of Chashma barrage (03---11---2010)



Water flowing through the gate of Chashma barrage (03---11---2010)



Tribunal at Chashma Hydro power station (03---11---2010)



Breached LMB at Taunsa Barrage. (5---11---2010)



Taunsa Barrage – aerial view (22---9---2010)



Tribunal carrying out proceedings at Taunsa barrage (05-11-2010)



Tribunal examining the breached embankment at Abbas Wala (Taunsa Barrage) (05-11-2010)



Breached portion of the embankment at Taunsa (05-10-2010)



View from the Ring Bund of the un-pitched portion of the breached embankment at Taunsa (05-10-2010)



Destroyed Road Near Taunsa Barrage (05-11-2010)



Destroyed Rail Track near Taunsa (05-10-2010)



Constructed house on embankment near breached portion of Jampur flood bund
(06---11---2010)



Tribunal examining the breached Jampur Bund from the Ring Bund
(06---11---2010)



Tribunal at Fakhar Flood Bund Mithan Kot (natives) (06---11---2010)



Native showing Flood water marks at Mithan Kot (06---11---2010)



Tribunal at Mishori Bund-off Fakhar Flood bund, Mithan Kot (06---11---2010)



The Secretariat L to R: **Irfan Ahmad Saeed**, Registrar **Shahid Shafi**, Staff Officer **Muhammad Zubair Chughtai**, Civil Judge Kot Adu Justice **Syed Mansoor Ali Shah**, Chairman **Iqbal Hanif**, P.A. **Muhammad Tahir**, P.A. **Syed Zubair Hussain Shah** P.S. **Farukh Ameen**, Qasid



Chairman Flood Tribunal (centre) at Irrigation research institute (IRI) Nandipur



Tribunal at Irrigation research institute (IRI) Nandipur (23-11-2010) observing physical model of LGB breach at Jinnah Barrage.



Tribunal Members at Taunsa Barrage (05---10---2010)