

## FLOOD MANAGEMENT IN PAKISTAN

### General:

By and large, prevention of floods is a universally known substantial impracticality; however, protection from floods and their management is viable and is of vital inevitability. The fury of floods can be harnessed to safeguard human life and property through proper planning and effective management of available resources. Devoid of their destructive influence, excellent floods control activities provide and ensure water resource availability for the welfare of community by way of conservation and careful use during lean periods.

### 1. FLOOD PROBLEMS IN GENERAL PERSPECTIVE:

It is recognized world over that floods are the most destructive of natural hazards and the greatest cause of large-scale damages to lives and property. Over the years, major floods have occurred in almost all the South Asian countries, causing huge loss of life and property. Despite the investment of millions, even billions of dollars in efforts to tame the rivers of the region, the frequency of occurrence of major flood disasters has actually increased over the past 25 to 30 years. Consequently there is a growing consensus that the impacts of climate change may well lead to an increase in both the frequency and the magnitude of floods. Nevertheless mankind has to live with the floods and devise measures to better manage them to minimize the losses and harness benefits.

#### 1.1 Floods in Pakistan:

Sixteen major floods that have hit the country since 1947 caused economic losses and damages estimated as US\$ 6 billion. Recorded Flood Peak Discharges between 1922 and 1992, floods of various magnitudes occurred. These floods affected the basins of the rivers in Punjab and Sindh. In NWFP, Balochistan and some areas of Punjab also, damage is caused mainly from hill torrents in which rains generate flash floods in monsoon season.

In upper to mid reaches of Indus river Basin, generally tributaries like Jhelum & Chenab are mostly the cause of flooding. River floods particularly hit Punjab and Sindh while hill torrents tend to affect the hilly areas of NWFP, Balochistan and Northern areas. Districts of Charsadda, Mardan, Nowshera and Peshawar in NWFP are exposed to risks from flooding in the River Kabul. In recent years, vulnerabilities of large cities to flooding have increased. Cities like Karachi, Lahore and Rawalpindi have experienced flooding due to inability of sewerage system to cope with heavy rains.

During the last sixty one years in Pakistan, the total losses ascribable to floods are colossal, while more than 7,963 people lost their lives besides affecting the 1,00,654 villages. Heaviest direct flood damages in Pakistan occur to infrastructure, agricultural crops, damage to urban and rural property and public utilities. Historical flood damages up to 2008 in Pakistan are given in Table-1 below:

**Table-1**  
**Historical Flood Damages in Pakistan**

Year	Value of Property Damaged (Rs in Million)		Lives Lost	Villages Affected
	Unadjusted	Adjusted		
1950	199.80	11,282.00	2,190	10,000
1956	155.50	7,356.00	160	11,609
1957	152.50	6,958.00	83	4,498
1973	5,137.00	118,684.00	474	9,719
1976	5,880.00	80,504.00	425	18,390
1978	4,478.00	51,489.00	393	9,199
1988	6,879.00	25,630.00	508	1,000
1992	34,751.00	69,580.00	1,008	13,208
1995	6,125.00	8,698.00	591	6,852
2001	450.00	450.00	219	50
2003	5,175.00	5,175.00	484	4,376
2004	15.00	15.00	85	47
2005	Not Reported		59	1,931
2006	Not Reported		541	2,477
2007	7,208.229		586	6498
2008	Not Reported		157	800
2009	Not Reported		99	89
<b>Total:</b>	<b>76,606.029</b>	<b>385,821.00</b>	<b>8,062</b>	<b>100,743</b>

In order to discuss the causes of floods in Pakistan and protection from them, it would be appropriate to first glance through the urgency of flood management in the context of South Asia and existing Indus Basin River System and Irrigation Network of Pakistan.

## 1.2 Why Flood Management is imperative:

Flood remains as an annual unwanted visitor in many countries. It often takes the shape of a disaster and badly affects people's lives as well as the economic activities in the affected areas. Even experienced administrators and engineers are often caught by surprise under the emerging situation in taking decisions concerning necessary emergency measures. Floods affect agricultural and industrial production, services, and marketing systems adversely and directly by damaging and/or destroying physical infrastructure, floods also disrupt passage/flow of goods and services to the flood affected communities.

People living in marooned areas become extremely distressed. Unfortunately, these people often do not find adequate and appropriate shelters; quality food and drinking water; adequate and hygienic sanitation; privacy for women, particularly for the lactating mothers and adolescent women etc. Floods often force the students out of academic activities since their learning centers are often used as makeshift flood shelters in affected areas. These disasters not only affect micro- and household-level activities but also have macro-economic/budgetary implications. As resources are required to address the relief and rehabilitation requirements, budgetary reallocation becomes necessary, adversely impacting on development activities from which resources are transferred. Moreover, contribution to national exchequer may be reduced, as people may be unable to pay their taxes as well as utility services. Floods also create health hazards for the affected people. Widespread water borne diseases may loom large. Paradoxically, although there is excess water, potable water becomes very short in supply. The traditional potable water sources suddenly disappear or become dangerously contaminated. After shelter, the most sought after commodity in a flood situation is the

potable water. Shelters often become congested with people of all ages, exhausted, in ill health, and suffering from water and vector-borne diseases. Sometimes due to disruption of communication, doctors are not available in the marooned villages.

In order to provide better services to flood victims during and after floods it is necessary to examine existing flood management capabilities and identify gaps with a view to develop and introduce a better flood management system. The cultural context of the affected people is an important aspect and should therefore be considered in developing the approach/ approaches to flood management.

### **1.3 Integrated Approach in Flood Management:**

In the past, floods were considered as a hydrological reality; only structural and non-structural measures were adopted to deal with this phenomenon, but now well-being of the people of the flood prone areas, their economic growth; and social urgency for alleviating poverty prevailing in these floods affected areas, are over riding concerns.

Enough hard work is required to address these concerns from both national and regional perspectives. The regional approach is of particular significance as activities undertaken in one country may affect, positively or negatively, the extent of floods in the other regional countries, particularly the downstream ones.

To make full use of the experiences gained from flood management activities in the regional countries there is pressing need for exchange of views and experiences, data and information sharing, and working together to develop approaches and methods to address pertinent flood management issues, nationally and regionally, in an open and trusting atmosphere.

## **2. INDUS BASIN RIVER SYSTEM OF PAKISTAN:**

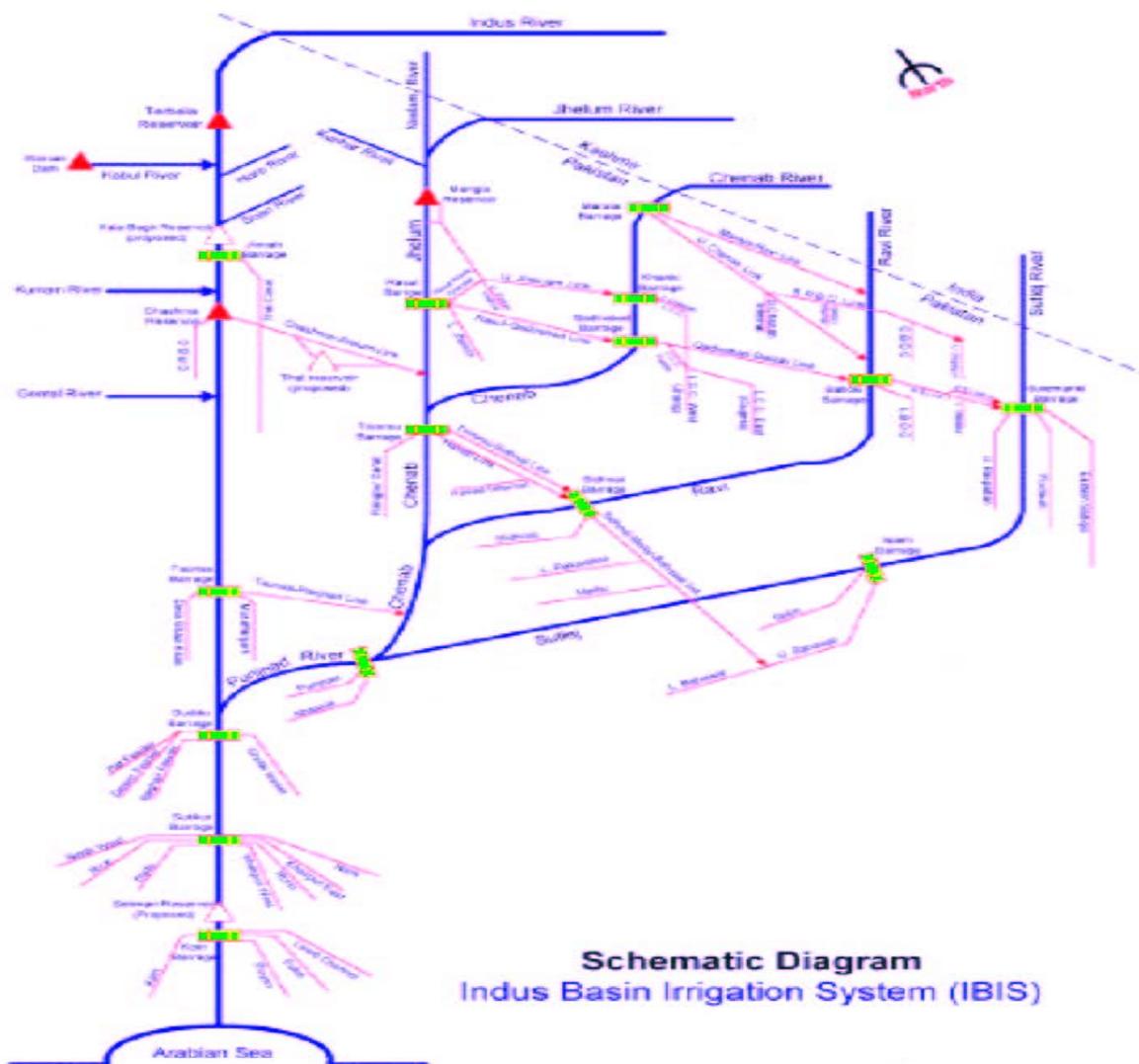
Five main rivers, namely, the Indus, Jhelum, Chenab, Ravi and Sutlej flow through the country's plains. Supplemented by a number of smaller tributary rivers and streams, these rivers supply water to the entire Indus Basin Irrigation System. The rivers have their origin in the higher altitudes and derive their flows mainly from snowmelt and monsoon rains. The catchment area of Indus is most unique in the sense that it contains seven (7) of the world's highest-ranking peaks, after Mount Everest. These include K-2 (28,253 ft), Nanga Parbat (26,660 ft), Rakaposhi (25,552 ft) etc. Likewise, barring the polar areas, seven (7) glaciers situated in the Indus catchment are amongst the largest in the world, namely, Siachin, Hispar, Biafo, Batura, Baltoro, Barpu and Hopper.

### **2.1 The Irrigation Network of Pakistan:**

The Irrigation System of Pakistan is the largest integrated irrigation network in the world, serving 42 million acres of contiguous cultivated land. The system is fed by the waters of the Indus River and its tributaries. The salient features of the Irrigation Network are summarized in Table-2 below:

**Table-2:  
Salient Features of Irrigation Network of Pakistan**

Structure	No.
Major Storage Reservoirs	3
Barrages	19
Inter-River Link Canals	12
Independent Irrigation Canal Commands	45
Large Dams (Approx. 3.00 MAF) of height 15 meter and above	143



The major storage reservoirs include Tarbela (existing Live Storage Capacity = 6.948 MAF against original 9.70 MAF), Chashma (existing Live Storage Capacity = 0.435 MAF against original 0.70 MAF) on River Indus and Mangla (existing Live Storage Capacity = 4.542 MAF against original 5.30 MAF) on River Jhelum. The total length of main canals/ distributaries and minors is 64,000 KM. Watercourses comprise another 1,621,000 Kilometers.

Diversion of river waters into off taking canals is made through barrages, which are gated diversion weirs. The main canals in turn deliver water to branch canals, distributaries and minors. The watercourses get their share of water through outlets in the irrigation channels. Distribution of water from a watercourse is effected through a time-schedule river called “warabandi”.

Annual water availability is 142 MAF whereas the annual canal withdrawals are 104 MAF. Water availability at farm gate is 106 MAF comprising 62 MAF of surface water and 44 MAF of groundwater. Supplemented by an annual groundwater withdrawal of some 42 MAF, the average depth of water available at the farm gate is 3.07 feet per acre. Approximately 3 million individual farms with an average size of about 12 acres benefit from this system. Indus River System Authority (IRSA) created in consequence of 1991 Water Accord between the provinces makes the inter-provincial water allocations.

## 2.2 Causes of Floods in Pakistan:

The major cause of floods in Pakistan is heavy concentrated rainfall in the river catchments, which sometimes augmented by snowmelt flows, generally result into floods in rivers during the monsoon season. Occasionally, Monsoon currents originating in the Bay of Bengal (India) and resultant depressions often result in heavy downpour in the Himalayan foothills additionally affected by the weather systems from the Arabian Sea (Seasonal Low) and from the Mediterranean Sea (Westerly Wave) cause destructive floods in one or more of the main rivers of the Indus System. However, in some cases exceptionally high floods have occasionally been caused by the formation of temporary natural dams due to land sliding or glacial movement and their subsequent collapse. There are large seasonal variations in almost all the river discharges, which further aggravate the river course and morphology.

The major rivers cause flood losses by inundation of areas along their banks, by damaging irrigation and communication facilities across or adjacent to the rivers, and by erosion of land along the riverbanks. In the upper part of the Indus Basin System, floodwater spilling over the riverbanks generally returns to the river. However, in the lower part of Indus River, which is primarily flowing at a higher elevation than adjoining lands, spills do not return to the river. This phenomenon largely extends the period of inundation resulting in even greater damages. Although flood protection by embankments has been provided along almost the entire length in the Sindh Province and at many locations in the upper areas, the bund breaches can still occur. Such breaches often cause greater damage than would have occurred without the bunds because of their unexpected nature and intensification of land use following the provision of flood protection.

The inadequate existing discharge capacity of some of the important structures (Barrages and Rail or Road Bridges) on Rivers Indus, Chenab and Ravi are another major reason. During exceptionally high floods this results in afflux on the upstream side, which sometimes results in breaches in the flood embankments. At times, the flood embankments have to be deliberately breached at pre-selected locations to save the main barrage structures and other vital settlements and installations in the vicinity. The encroachment of village abadies in riverine areas has also increased the quantum of flood damages and losses to humans and livestock. As there is no proper regulatory frame work in the country regarding the settlement in riverine areas, most of the poor people have constructed their shelters along the vulnerable river banks and become victims to devastating floods. Some people are making the most of these areas for business purpose through promoting agriculture and cattle Ghats/dairies. All such activities are extending beyond the safe limits of riverine areas to achieve more economic benefits but in fact are posing a great threat to unprecedented and unruly flood; the losses due to which may be in hundred multiples of such small scale economic profit. The river catchments and flood plains are to be kept as prohibited area for the riverine community especially during the flood season.

In recent years, vulnerabilities of large cities to flooding have increased. Cities like Karachi, Lahore and Rawalpindi have experienced flooding due to inability of sewerage system to cope with heavy rains.

## 3. FLOOD CONTROL OBJECTIVES & NEED:

Flood management planning and practices in Pakistan aim at achieving the following objectives:

- i. Reduction of flood losses in an economically sound manner;
- ii. Prioritizing of areas of greater economic hazards;
- iii. Protecting the cities and vital infrastructural installations;

- iv. Exploring the possible use of existing flood control facilities;
- v. Promoting appropriate land use in flood hazard areas;
- vi. Minimizing adverse effects on national ecosystem and environment; and
- vii. Creating flood awareness and adaptability in the riverine areas.

### **3.1 Relation between Flood Problem and Physiography:**

Flood Control planning in Pakistan is a complex problem and calls for greater ingenuity and experience on the part of the planners. The nature of problems varies at locations due to varying physiographic, climatic, demographic and socio-economic conditions. Even the characteristics of catchment areas of various rivers differ from each other. Flood problems relating to the four Provinces in relevance to their physiography are depicted as under:

### **3.2 Flood Problems relating to the Four Provinces in relevance to their Physiography:**

#### **Punjab:**

The flood protection work in Punjab have generally been constructed either to protect Headworks and other irrigation structures, or to safeguard certain towns and villages. Due to general topography of the area sloping towards the South-west, the embankments along Headworks and irrigation structures have been constructed in such a way that breaching sections are provided on the Right Marginal Bunds to give relief to water heading up against the Left Marginal Bunds and keep the flow through the Barrages within safe limits for the hydraulic structures. The above is done to avoid breaches in the Left Marginal Bunds, which can cause widespread devastation, as most of the development is on the left side of the rivers. In order to protect areas from erosion, spurs have been constructed. These spurs have protected the areas and in some cases even the eroded lands have been reclaimed.

#### **Sindh:**

The Indus River flows on a ridge in Sindh Province, and surrounding areas are generally lower than the riverbed. Hence, water once spilling over the bunds does not return back. Escaped water thus causes greater damage to widespread areas, and it persists for a longer period even after the flood peaks are over. Sindh is situated on a receiving end of drainage of all the rivers and if flood protection measures adopted in the upper reaches are not properly planned, severe damages are likely to occur in the Province. To minimize such eventualities, Double Line of Flood Embankments has been constructed along almost both the banks in Sindh from Guddu Barrage to few kilometers short of Arabian Sea. The embankments are often threatened by active erosion by the river flows and due to poor soils in some reaches. The embankments have been further compartmentalized to contain widespread inundation.

#### **NWFP:**

In NWFP, the floods are mainly due to flashy hill torrents having steep bed slopes, which greatly increase flood velocity and severely erode the river/nullah banks. To address above problems mostly spurs have been constructed to save the areas from erosion. In D.I.Khan, a battery of spurs has been constructed on the Right Bank of Indus River to protect from erosive action on account of flashy flows. Large numbers of spurs and a few embankments have also been constructed on Rivers Swat, Kurrum, Kabul etc including their tributaries to account for the erosive action.

**Balochistan:**

Due to peculiar physiographic and climatic characteristics in Balochistan, mostly embankments and floodwalls have been constructed to protect orchards and abadies from flood damages. Some bunds have also been constructed to serve as flood diversion/abatement measures to delay the devastating affects of torrential rains & the consequent floods.

**4. ESTABLISHMENT OF FEDERAL FLOOD COMMISSION:****4.1 Historic Perspective:**

After creation of Pakistan, a Central Engineering Authority was constituted under Chief Engineering Adviser to deal with the issues of water, power and allied engineering matters at National level. It was re-designated as Chief Engineering Advisor's Office after establishment of Water & Power Development Authority (WAPDA) in 1959.

Up to the end of 1976, the Provincial Governments were responsible for the planning and execution of flood 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. Heavy losses sustained to the economy were discussed at an Inter-Provincial Conference in 1977 and subsequently in January 1977 it was decided to establish Federal Flood Commission to manage the issue of flood management on country-wide basis. Federal Flood Commission was established for the purpose of integrated flood management at national level.

In 1982 a Federal Coordination Cell (now re-designated as FID Cell) was established to coordinate activities of the Provincial Irrigation Departments, in particular, in the drainage sector. In 1987 Dam Safety Council was established to carry out inspection of existing dams through DSO WAPDA and plans for new dams etc.

**4.2 Major Sections of the Office of Chief Engineering Adviser/Chairman Federal Flood Commission (CEA/CFFC) and their functions:**

- Flood Cell (For Federal Flood Commission);
- Civil Engineering Advisory Cell;
- Dam Safety Council Secretariat;
- Power Engineering Cell;
- Federal Irrigation & Drainage Cell (FIDC);
- Pakistan National Committee on Irrigation and Drainage (PANCID)/ Pakistan National Committee on Large Dams (PANCOLD) Secretariat; and
- Management & Administration Cell

**4.2.1 Flood Cell (For Federal Flood Commission)**

- I. To implement the functions of Federal Flood Commission (FFC);
- II. To run Flood Communication Cell during Flood Season for effective dissemination of river flows and weather related information to President's and Prime Minister's Secretariat besides Ministry of Water & Power and other important high ranking officials;
- III. To implement structural and non-structural flood control measures under different programmes as envisaged in the National Flood Protection Plan (NFPP); and
- IV. To monitor the implementation of flood protection works under different programmes as envisaged in NFPP.

#### **4.2.2 Functions of Engineering Advisory Cell:**

- I. Scrutiny of feasibility reports, PC-Is, Conceptual/Inception/Interim Reports, etc., prepared by WAPDA, Provincial Governments and other agencies;
- II. Watch daily operations of major reservoirs (Tarbela, Mangla & Chashma) and inform senior offices accordingly; and.
- III. Exchange of technical data and general liaison with international organizations, namely: International Commission on Irrigation and Drainage (ICID), IIMI, FAO, WMO, UNEP, UNDP, UNESCO etc.

#### **4.2.3 Functions of Dam Safety Council:**

- I. To carry out periodic inspections of dams through D.S.O WAPDA and advise WAPDA regarding repairs and maintenance of dams and reservoirs;
- II. To review the plans of new dams and monitor the implementation of such projects;
- III. To review the plans and specifications for enlargement, modifications, major repairs, revival or otherwise of dams/reservoirs;
- IV. To supply technical data and general liaison with World Bank International Commission on Large Dams (ICOLD) and U.N. Organizations; and
- V. To keep close liaison with International Commission on Large Dams (ICOLD).

#### **4.2.4 Functions of Power Cell:**

- I. To scrutinize power projects prepared by WAPDA and KESC and render expert advice to the Ministry;
- II. To monitor and evaluate performance of WAPDA and KESC and suggest improvements in operational procedures;
- III. To coordinate hydel power development activities between GTZ, federal and provincial governments; and
- IV. Exchange of technical data and general liaison with international and national bodies on Power Engineering, namely, World Engineering Council (WEC), Energy Working Groups of Asia Pacific Economic Cooperation (APEC), etc.

#### **4.2.5 Federal Irrigation & Drainage Cell (FIDC):**

- I. Act as Secretariat for Federal Programme Steering Committee for National Drainage Programme (NDP) headed by Secretary Water & Power;
- II. Inter-provincial conflict resolution relating to NDP;
- III. To evolve National Water Policy; and
- IV. To oversee and monitor NDP.

#### **4.2.6 PANCID/PANCOLD Secretariat:**

- I. Exchange of technical data and general liaison with International Organizations, namely: International Commission on Large Dams (ICOLD) and International Commission on Irrigation and Drainage (ICID);
- II. To arrange seminars, symposiums and workshops in collaboration with ICOLD/ICID; and
- III. To act as the Secretariat of Pakistan National Committee on ICOLD and ICID.

#### **4.2.7 Management & Administration Cell:**

- I. Administrative coordination of trainings (both local as well as foreign);
- II. General services management;
- III. Annual budgeting of office and development projects, utilization, control and audit; and
- IV. Maintenance of project accounts, processing of consultancy services bills, internal inspection of accounts and financial monitoring of development projects.

### **5. FFC AND INTEGRATED FLOOD CONTROL PLANNING:**

After creation of Pakistan, a Central Engineering Authority was constituted to deal with vast water, power and allied engineering matters at the National level. It was also an Executive Body for the execution of several projects. After creation of WAPDA in 1959 reorganization was done with a reduced organization at the federal level. The Central Engineering Authority was re-designated as Chief Engineering Adviser's Office with a redefined role.

Up to the end of 1976, the Provincial Governments were responsible for the planning and execution of their respective flood 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. Heavy losses sustained to the economy were discussed at an Inter-Provincial Conference in 1977 and in January 1977 it was decided to establish Federal Flood Commission to undertake broadly the following functions/ mandate:

The country-wide flood management planning is geared to essentially achieve flood control objectives as discussed in section 3 above. After the extreme floods of 1992, efforts have been made to follow an integrated flood management approach. These efforts include structural measures (spur bunds, flood protection walls, flood embankments etc) as well as non-structural measures. The non-structural measures include a comprehensive flood forecasting and warning system with weather radars, a high-frequency radio communication system and effective river inflow/outflow data reception and dissemination, besides interprovincial and inter-agency coordination at the federal and provincial level.

#### **5.1 Federal Flood Commission and its Achievements:**

Up to the end of 1976, the Provincial Governments were responsible for the planning and execution of flood 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. Heavy losses sustained to the economy were discussed at an Inter-Provincial Conference in 1977 and subsequently in January 1977 it was decided to establish Federal Flood Commission to manage the issue of flood management on country-wide basis. Major functions under the charter of duties for FFC as given in para-2 of resolution dated 04-01-1977 are enlisted as below;

- I. Preparation of National Flood Protection Plans;
- II. Approval of flood control schemes prepared by Provincial Governments and concerned federal agencies;
- III. Review of flood damages to public sector infrastructure and review of plans for restoration and reconstruction works;
- IV. Measures for improvements in Flood Forecasting and Warning System;
- V. Standardization of designs and specifications for Flood Protection Works;
- VI. Evaluation and monitoring relating to progress of implementation of the National Flood Protection Plans (NFPPs);
- VII. Preparation of a research program for Flood Control and Protection; and
- VIII. Recommendations regarding principles of regulation of reservoirs for flood control.

Office of CEA acts as Secretariat for FFC. The provincial governments undertake the implementation of the National Flood Protection Plans. The Federal Government, however, provides the resources for meeting the capital costs of projects under NFPPs. Flood management plans formulated and executed by the respective Provincial Irrigation Departments and Federal Agencies had a number of shortcomings. Apart from technical shortcomings, the availability of adequate financial resources had been a major constraint in the proper flood management planning. Provision of funds for flood works in the annual ADP of the provinces was always grossly insufficient. Establishment of Federal Flood Commission greatly helped in integrating the planning measures at the national level and furnishing financial resources for the flood projects. Federal funding through Federal Flood Commission proved a vehicle for quick execution of flood management projects. Though, the Federal funding has provided impetus for flood management planning in Pakistan, the available financial resources have been gradually declining in terms of actual funding as well as in the real terms due to inflation.

### **5.1.1 Preparation of National Flood Protection Plans**

Since its establishment, Federal Flood Commission has so far executed three Ten Years each National Flood Protection Plans covering periods from 1978-1987 (NFPP-I), 1988-1997 (NFPP-II) and 1998-2007 (NFPP-III).

Brief details of projects executed/completed under NFPP-I, NFPP-II and NFPP-III are presented as under:

#### **National Flood Protection Plan-I (1978-87) – NFPP-I:**

- Normal Annual Development Program
- Cost actually spent (Need Based) Rs 1,630 million
- No. of Flood Protection schemes completed 350  
(In four provinces, AJ&K, FATA and NA)
- Funding agency 100% by GOP

Under NFPP-I, mostly the emphasis was given on the implementation of structural flood protection measures. Pakistan Meteorological Department and WAPDA undertook localized improvements/revamping of existing flood telemetry & forecasting system.

#### **National Flood Protection Plan-II (1988-97) – NFPP-II:**

Programs executed under above plan are as under:

##### **Normal Annual Development Program:**

- Cost (Need Based) Rs 2,541 million
- No. of Schemes completed 170
- Funding Agency 100% by GOP

##### **Flood Protection Sector Project-I (FPSP-I):**

- Approved cost Rs 4,860 million
- No. of schemes completed 257
- Foreign funding (ADB) US \$ 131.07 million  
80% by ADB, 20% by GOP

Prime Minister's River Management Programme 1994-1996

- Project Cost	Rs. 613.384 million
- No. of schemes (in Sindh & Punjab)	10
- Funding Agency	100% by GOP

Under NFPP-II, following improvements were undertaken in the non-structural management side

- Procurement & installation of 1<sup>st</sup> phase of Meteoroburst Telecommunication System including one Master Station and 24 remote site stations.
- Installation of 10-CM Quantitative Precipitation Measurement (QPM) Weather Radar for Flood Forecasting Division (FFD) at PMD, Lahore.
- Pre-feasibilities studies for four barrages towards increasing their design discharge capacity within a view to ensure increased flood carriage owing to the experience of 1992 floods.
- Preparation of Flood Plan Maps of Indus River (3-reaches).
- Establishment of National Flood Forecasting Bureau (NFFB) now FFD, at PMD premises in Lahore.

National Flood Protection Plan – III (1998-2007) – NFPP-IIINormal/Emergent Flood Program:

- Cost actually spent	Rs. 3,415 million
- No. of Flood Protection Schemes (In four provinces, AJ & K, FATA, ICT and NA)	362
- Funding Agency	100% by GOP

Second Flood Protection Sector Project:

- Cost actually spent	Rs. 4,165 million
- No. of Flood Protection Schemes	101
- Funding Agency	80% by ADB, 20% by GOP
- Including Flood Forecasting & Warning System	Rs. 432.123 million

Flood Forecasting & Warning System for Lai Nullah Basin in Islamabad– Rawalpindi:

- Approved Cost	Rs. 360 million
- Cost actually spent	Rs. 348 million
- Funding	-Japanese Grand –in-Aid
	-GOP share
	Rs. 337 million
	Rs. 11.00 million
- Facilities provided include	
	<ul style="list-style-type: none"> <li>▪ Two No. Telemetry rainfall gauging stations at Golra, Islamabad and Bokra, Islamabad</li> <li>▪ Two No. water level gauging stations at Kattarian Bridge, Rawalpindi and Gawal Mandi Bridge, Rawalpindi.</li> <li>▪ Master control station in PMD, Islamabad.</li> <li>▪ Two monitoring stations at FFC and TMA/Rescue-1122-Rawalpindi respectively.</li> <li>▪ Executive Warning Control room in Rawalpindi Fire Brigade, and</li> <li>▪ Nine (9) No. warning posts at various locations.</li> </ul>

Apart from above, non-structural interventions undertaken on country-wide basis include;

- Procurement & installation of 24 No. HF-Radio Sets, also covering Kabul River & Swat River.
- Procurement & installation of 20 additional remote stations under existing Meteoroburst Telecommunication System (Phase-II)
- Upgradation of Lahore 10-CM Quantitative Precipitation Measurement Weather Radar.
- Upgradation of 5.36-CM Sialkot Weather Radar into 10-CM Quantitative Precipitation Measurement Weather Radar.
- Procurement & installation of new 10-CM Quantitative Precipitation Measurement Weather Radar at Mangla, Jhelum.
- Development of initial/1st version of Computer Based Early Warning System through NESPAK, PMD & Delft Hydraulics, Flood Early Warning System (FEWS).
- Expansion of Flood Plain Mapping activity covering remaining reaches of River Indus, alongwith rivers Jhelum, Chenab, Ravi, Sutlej etc.
- Bathymetric Survey and flow managements in the Indus River and its major tributaries (i.e. Sutlej, Ravi, Chenab and Jhelum) for improvements in the discharge rating curves and to collect data for FEWS Model & Flood Plain Mapping Activity.

#### **National Flood Protection Plan -IV (NFPP-IV 2008-2017)**

Keeping in view the level of investment made under NFPP I, II & III and the spending capacity of the executing agencies, it was decided to propose Rs 30,000 million for 10-Year comprehensive and integrated Flood Management Plan i.e. **NFPP-IV**. In formulating the financial strategy for the next 10 – year’s Comprehensive & Integrated Flood Management Plan (NFPP-IV 2008-2017), following main components have been considered:

- Leftover works (including left over works under FPSP-II), for which Pre-Feasibility Studies have already been carried out;
- Implementation of physical works, as indicated by the Provinces & Federal Line agencies under Priority-I (works are proposed to be implemented under FPSP-III & FPSP-IV)
- Implementation of Need Based schemes under Normal Annual Development Programme/ Emergent Flood Protection Plan on yearly basis.
- Implementation of Flood Forecasting & Warning System Improvements (under FPSP-III & FPSP-IV)
- Institutional strengthening of Federal Flood Commission & all related departments.

The proposed plan costing Rs 30 billion has been prepared in consultation with concerned stakeholders and envisages construction of flood protection works (spurs, embankments, retaining walls, dykes etc.) in all the four provinces and federal line agencies besides implementation of flood forecasting & warning system improvements with emphasis on flash flood monitoring.

Over all investment proposed under Ten Years Comprehensive Flood Management Plan (National Flood Protection Plan-IV, 2008-2017) was as under:

Table-3:

Sr. No	Province/Agency	Estimated Cost (Rs. in Billion)
I.	Punjab	11.250
	Sindh	7.750
	NWFP	2.750
	Balochistan	2.000
	FATA	0.750
	Northern Areas	0.250
	AJ&K	0.250
	Sub total-I	25.000
II.	WAPDA	0.586076
	PMD	2.200
	Sub Total-II	2,786.076
III.	FFC, Consultancy, Monitoring & Evaluation, Institutional Strengthening. Capacity Building, Training etc	2.213924
	Sub Total - III	2.213924
	<b>Grand Total: I+II+III</b>	<b>30.000</b>

### 5.1.2 Approval Process of Flood Control Schemes Prepared by Provincial Governments and Concerned Federal Agencies

The role of FFC is to examine, approve the schemes technically and recommend them for consideration at higher forums i.e.; DDWP/CDWP/ECNEC for formal approval (Administrative) as well as sanctioning of the funds in line with PSDP provisions. In this context FFC has a Scrutinizing Committee (SC) which was established for Inter-Provincial Coordination and to technically review the flood schemes prior to implementation. Further in the past, SC had been delegated powers by ECNEC also to approve schemes, which were implemented through ECNEC's approved Umbrella PC-I. In this regard FFC's Scrutinizing Committee had cleared (approved technically as well as administratively) schemes of FPSP-I, FPSP-II, 1988-Flood/Rain Damages Restoration Project and 1992-94 Flood/Rain Damages Restoration Project (FDRP) as detailed under item (i) above & item (iii) in the following section. For individual flood control schemes, under Normal/ADP/Emergent Flood Programme (Need Based) following criteria for selection & scrutiny is applied.

- i. The scheme will benefit areas where floods have resulted in high economic losses and/or human suffering;
- ii. For schemes with predominantly public goods nature, preference will be given to those which will benefit areas where the majority of the population belongs to the low income group;
- iii. Resettlement of affected population will not constitute a cost effective and socially achievable solution to the flood problem than the contemplated physical measures;
- iv. The proposed physical development represents the least cost alternative for the scheme;
- v. For schemes involving flood dispersion for secondary rivers, the beneficiaries in the area are maintaining existing flood dispersion facilities; and
- vi. The scheme will not adversely affect areas designated as nature reserves (wildlife sanctuary or other protected areas).

For foreign aided projects, schemes that meet the above criteria can then be grouped (on case to case basis) into subprojects, based on river reaches in the case of major rivers, and based on river basins in the case of secondary rivers. For the final selection of a sub projects under aided project following criteria is applied:

- i. The subproject forms part of a master plan for the concerned river to be developed in pursuance of country's long-term strategy for flood protection and river management;
- ii. The permanent and temporary measures proposed under the subproject are technically sound and that such measures will effectively mitigate flooding without causing significant adverse effect;
- iii. The subproject has an economic internal rate of return (EIRR) of at least 12 percent;
- iv. For schemes under the subproject that have the character of private goods, providing localized benefits to distinctly identifiable beneficiaries, the willingness of the beneficiaries to share in the investment cost and assume responsibility for maintenance has already been ascertained

On the above matter, it may also be added that schemes under Normal ADP/Emergent Flood Programme upon clearance from SC, are forwarded to DDWP/CDWP, ECNEC whereas the SC finally approves schemes under ECNEC's approved umbrella PC-I.

### **5.1.3 Review of flood damages to public sector infrastructure and review of plans for restoration and reconstruction works**

During the last sixty one years in Pakistan, the total losses ascribable to floods are colossal, while more than 7,963 people lost their lives besides affecting the 1,00,654 villages. Heaviest direct flood damages in Pakistan occur to infrastructure, agricultural crops, damage to urban and rural property and public utilities. Historical flood damages up to 2008 in Pakistan have already been provided in Table 1 under section 1.1 above.

After the establishment of FFC and upto 2000, Pakistan had faced severe floods of 1988, 1992, & 1994. Immediately after the above floods, Federal Flood Commission ascertained through National Consultants (NESPAK) the scale of damages to public property (Irrigation & flood control infrastructure, primary & secondary health units, Primary & secondary education centres in remote & riverine areas) and based an authentic data, 1988 & 1992-1994 Flood Damages Restoration Projects were conceived and implemented on war footing basis through foreign assistance of ADB, IDA-World Bank & KFW (Germany) in addition to GOP funding. Brief details of above projects are as under:

#### 1988-Flood/Rain Damages Restoration Project:

- Cost	Rs 2,300 million
- No. of schemes completed	2,065
- Foreign Funding (ADB)	US \$ 200 million

#### 1992-94 Flood/Rain Damages Restoration Project (FDRP):

- Total expenditure incurred	Rs 6659.22 million
- No. of Contracts Completed	1980
- Foreign Funding (IDA, EU, KFW & ADB)	US \$ 193 million

#### 5.1.4 Measures for improvements in flood forecasting and warning system

Already discussed under item 5.1.1 above

#### 5.1.5 Standardization of designs and specifications for flood protection works

Under NFPP-I standardization of flood works design was carried out. These designs were further re-examined based on their behaviours during the plan period and were modified during NFPP-III period.

#### 5.1.6 Monitoring and Evaluation of ongoing Flood Protection Works

Federal Flood Commission plays a key role in project planning and monitoring of flood protection works on countrywide basis. Over the years, it had been experienced that there is a dire need for effective monitoring and evaluation of development projects to ensure that funds are properly utilized through timely completion of projects and quality assurance as per design specifications. In pursuance to the decision made in the Mid Year Review meeting held on February 3, 2005, under the chairmanship of Deputy Chairman Planning Commission, it was accordingly decided to introduce a New System of Monitoring. In pursuance to the decision of Planning and Development Division, Islamabad, Federal Flood Commission has also constituted a monitoring team, which is responsible for monitoring all flood schemes throughout the country.

In addition to the Provinces/ Federal Line Agencies own monitoring arrangement, the following committee is responsible for monitoring the projects during their course of implementation.

- |  |                  |
|--|------------------|
| a. Chief Engineer (Concerned Zone)                                       | Convener         |
| b. Representative of concerned Corps Engineer                            | Member           |
| c. Representative of Federal Flood Commission                            | Member           |
| d. Representative of P & D Division (subject to availability)            | Member           |
| e. Representative of Ministry of Water & Power (Subject to availability) | Member           |
| f. Executive Engineer (Irrigation) of concerned Division                 | Secretary/Member |

#### 5.1.7 Preparation of a research program for flood control and protection

FFC, since its inception, had also undertaken a number of research studies under different programmes aiming at effective structural measures on ground. These include:

- i. National Flood Protection Plan-I, 1978 to 1987 (NFPP-I)
- ii. National Flood Protection Plan-II, 1988 to 1997 (NFPP-II)
- iii. Study on Comprehensive flood unitization and Environmental Improvement Plan of Lai Nullah
- iv. National Flood Protection Plan/ Comprehensive Flood Management Plan 1998-2007 (NFPP-III)
- v. Perspective Five Year Plan For Flood Control, Development and Management (2005-06 to 2009-10)
- vi. Ten year Comprehensive and Integrated Flood Management Plan (NFPP-IV) (2007-2018)
- vii. River Regime Study
- viii. Escapages downstream Kotri Barrage

- 
- a. Study on water Escapages below Kotri Barrage to check sea water intrusion (Study -I)
  - b. Study on water Escapages below Kotri Barrage to address environmental concerns (Study -II)
  - c. Environmental concerns of all the four provinces excluding the areas covered in study I & II (Study -III)
  - ix. Master Feasibility Studies for Harnessing of Flood Flows of Hill Torrents of Pakistan
    - a. Feasibility study of NWFP Core Project- Flood management of D.I Khan Hill torrents
    - b. Feasibility study of Punjab Core Project- Flood management of D.G Khan Hill torrents
    - c. Feasibility study of Sindh Core Project- Flood management of Khirther Range Hill torrents
    - d. Feasibility study of Balochistan Core Project- Flood management of Indus basin Component & Quetta Region Hill torrents

Apart from above, research studies have been conducted under NGO component of FPSP-II, in which fieldwork was conducted and first-hand data was collected directly from the respondents who were mainly flood affectees. The purpose of these studies was to accumulate local knowledge, on community flood preparedness and mitigation during floods, which would be helpful in the policy decision. These studies also include the recommendations based on the responses and suggestions of the community. The studies conducted in different flood prone areas are mentioned as under: -

- i. Impact of Riverine Flooding on Housing/Shelter and Livelihood/Income Sources in Multan/Muzaffargarh districts
- ii. Impact of Riverine Flooding on Food & Nutrition and Health & Healthcare in Multan/Muzaffargarh districts
- iii. Impact of Riverine Flooding on Housing/Shelter and Livelihood/Income Sources in Sargodha district
- iv. Impact of Riverine Flooding on Food & Nutrition and Health & Healthcare in Sargodha district
- v. Survey Research on Politics of Relief as experienced by people of Badin after 2003 Rainfall/Flood Disaster

#### **5.1.8 Recommendations Regarding Principles of Regulation of Reservoirs for Flood Control**

Tarbela, Mangla and Chashma reservoirs play an effective role in flood mitigation provided their operation is optimized, within permissible dam safety criteria. It was realized for the first time after the flood of 1992 that flood management to some extent is possible, if timely decisions are taken on the basis of rising inflows. After detailed discussions among concerned stakeholders and studies taken thereafter flood management guidelines were prepared to gradually absorb the incoming flood by restricting the outflows to the extent possible. However, because of limitations of flood forecasting facilities and real time information obtained from flood warning stations, lowering of the reservoir in advance of flood was not considered.

In the light of experience gained in routing of 1997 flood using 1993 guidelines for flood routing, Standard operating procedures (SOPs) of Mangla reservoir were revised and implemented from 1998-Flood Season onwards. These SOP's provided depletion of reservoirs in advance of Category

II & III floods on the basis of qualitative/ quantitative forecast and remained in operation upto and including 2002 flood season.

After 2002 monsoon season it was decided to raise the maximum operating level to 1206 ft. SPD. The office of CEA/CFFC accordingly modified SOPs after detailed discussion with Provincial Irrigation Departments, WAPDA and all concerned including FFD and Pakistan Army. The approval of these guidelines by the Government of Pakistan, Ministry of Water & Power was given in August 2003. Lowering of reservoir to a pre-determined level on the basis of qualitative and quantitative forecasts had been included in these guidelines.

## 5.2 Studies Undertaken at the National Level & Projects Executed:

Major studies for flood protection at the national level that have been completed since 1977 and those in progress and at inception stage are given in **Table-4**:

**Table-4**

### **MAJOR STUDIES/ PLANS ON FLOOD PROTECTION**

<b>Name of Study /Plan</b>	<b>Period of completion</b>	<b>Investment Cost (Rs in million)</b>
National Flood Protection Plan-I, 1978 to 1987 (NFPP-I)*	1987	1,942.000
National Flood Protection Plan-II, 1988 to 1997 (NFPP-II)**	1998	11,568.000
Master Feasibility Studies for Harnessing of Flood Flows of Hill Torrents of Pakistan	1998	24,950.00
Study on Comprehensive flood unitization and Environmental Improvement Plan of Lai Nullah	2003	200.00
National Flood Protection Plan/ Comprehensive Flood Management Plan 1998-2007 (NFPP-III)***	2007	11,703.00
Perspective Five Year Plan For Flood Control, Development and Management (2005-06 to 2009-10)	2009-2010	14,500.00
10-year Comprehensive and Integrated Flood Management Plan (NFPP-IV) (2007-2016)	2007-2016	30,000.00

\* Includes Normal Annual Development Program

\*\* Includes Normal Annual Development Program and Flood Protection Sector Project (FPSP-I), Prime Minister's River Management Program

\*\*\* Includes Normal Annual Development/Emergent Flood Program

**6. SUMMARY OF FEDERAL INVESTMENT ON FLOOD PROTECTION WORKS:**

Given below in Table-4 is the Summary of Federal Investment on flood protection works in Provinces since 1977 under NFPP-I, II & III periods.

**Table-5****Summary of Federal Investment on Flood Protection Works (1977- JUNE 2009)**

(Rs in million)		
<b>Name of Province/Federal Line Agency</b>	<b>Investment</b>	<b>Percentage of Total Investment</b>
Punjab	5561.228	43.76%
Sindh	4379.416	34.46%
NWFP	1352.258	10.64%
Balochistan	957.753	7.54%
FATA	196.745	1.55%
Gilgit-Baltistan (NA)	119.921	0.94%
Azad Jammu & Kashmir	118.456	0.93%
ICT	22.395	0.18%
<b>Total</b>	<b>12708.172</b>	<b>100.00%</b>

\* GOP Funding

Foreign Funding US \$ 578.7

**7 PROJECTS UNDERTAKEN DURING THE YEAR 2009****7.1 Normal/Emergent Flood Program**

Normal/Emergent Flood Program is a need-based program started in 1978 after establishment of Federal Flood Commission. Under this program, all the four provinces and Federal Line Agencies (AJ&K, FATA & Northern Areas) submit their flood related schemes based on their needs keeping in view allocation of budget under Public Sector Development Programme (PSDP) each year. The primary objectives of the program are to construct flood protection works along the main rivers and hill torrents in order to minimize damages caused by floods and to create public awareness for prevention and flood adaptability amongst the masses and enhance beneficiary participation.

An amount of Rs. 1000.00 million was allocated under PSDP 2008-09. Out of this, Rs. 815.317 million funds were released to the executing agencies. The emergent schemes requested by Provincial Irrigation Departments (PIDs), FATA & Gilgit-Baltistan were accommodated keeping in view their respective allocated share. Overall progress of all flood protection schemes being executed by four provinces, FATA, AJ&K and Gilgit-Baltistan was 65%. Financial liabilities of previous years were created due to non-release of 2<sup>nd</sup> half funds under PSDP 2007-08. Consequently, most of the approved schemes of FY 2008-09 are at various stages of completion.

Till the end of last financial year (2008-09) a total of Rs. 7542.747 million have been spent under this program towards implementation of need based flood protection schemes throughout Pakistan. (List of schemes is attached at **Appendix-I**)

## 7.2 Strengthening of Flood Risk Management in Lai Nullah Basin in Islamabad-Rawalpindi

In response to the request from the Government of Pakistan, the Preparatory Study Team of Japan International Cooperation Agency (JICA), conducted the Preparatory Study from 13 August to 1 September, 2007, as a follow up of recently completed Flood Forecasting & Warning System Project for Lai Nullah Basin, for the purpose of working out the details of the Technical Cooperation Program concerning the Project for Strengthening of Flood Risk Management in Lai Nullah Basin in Islamabad-Rawalpindi. During the study, the team exchanged views and had a series of discussions with the Pakistan authorities concerned with respect to desirable measures to be taken by JICA and the Government of Pakistan represented by Federal Flood Commission (FFC), City District Government of Rawalpindi (CDGR), Pakistan Metrological Department (PMD) and other organizations concerned, for the successful implementation of the above mentioned Project.

The Project has been initiated with the Grant-in-Aid of Government of Japan and aims to mitigate flood damages and victims through providing a system and structure to enable and facilitate mass evacuation at the event of floods. The project duration is 24 month from December 2007 to November 2009. The project covers following purposes:

- Capacity of PMD is strengthened enough to utilize flood early warning system effectively and issue flood warnings properly;
- Capacity improvement of Evacuation Activity (through CDGR, Rescue 1122, TMA-Rawalpindi, Civil Defence, Rawalpindi & Fire Fighting Department); and
- Capacity improvement of Flood risk Management for related organizations (FFC, MPD, CDGR, Rescue 1122).

## 7.3 Capacity Building & Strengthening Monitoring Capability of Federal Flood Commission: (*Monitoring System*)

Over the years, it had been experienced that there was a dire need for effective monitoring and evaluation of development projects to ensure that funds are properly utilized through timely completion of projects and quality assurance as per design specifications. In pursuance to the decision made in the Mid Year Review Meeting held on February 3, 2005, under the chairmanship of Deputy Chairman Planning Commission, it was decided to introduce a *New System of Monitoring*. In pursuance to the decision of Planning and Development Division, Islamabad, Federal Flood Commission constituted a Monitoring Team.

Federal Flood Commission plays a key role in project planning and monitoring of flood protection works on countrywide basis. Monitoring Cell of FFC effectively performs its functions for monitoring of flood projects as well as other federally funded water sector projects. A monitoring web site has also been established at FFC to share data with concerned National and International Organizations, including in particular Ministry of Water & Power, WAPDA, PIDs, PMD, FFD, ISRIP, IWASRI, PCRWR, NDMA, ERC Cabinet Division, P&D Division, PIDAs, Small Dam Organization Punjab, Small Dam Organization NWFP, Consultants, ICID, ICI MOD, ICOLD etc. In addition to the establishment of web site, customized trainings (local) for technical staff has also been proposed.

With the implementation of envisaged objectives of this project, Federal Flood Commission would be able to develop capability for monitoring and evaluation of all development works/projects in the water sector.

## 8. FLOOD MANAGEMENT WORKS IN PAKISTAN:

The nature and need of flood protection works vary due to physiographic characteristics and local conditions in different parts of Pakistan as discussed earlier under section 3.1. Flood protection embankments have been constructed wherever over bank flooding is the major problem, while spurs have been constructed to encounter the land erosion where this phenomenon is predominant.

### 8.1 Existing Flood Management Works:

Existing flood management facilities in the four provinces of Pakistan are given in Table-6.

**Table-6**  
**Existing Flood Protection Facilities in Pakistan**

<i>Name of Province</i>	<i>Embankments (KM)</i>	<i>Spurs (No)</i>
Punjab	3,332.09*	496*
Sindh	2,422**	46***
NWFP	352.24*	186*
Balochistan	696.85^	682^
<b>Total</b>	<b>6,803.18</b>	<b>1,410</b>

Source:

- \* Govt. of Punjab letter No. D&F/2006/1875, dated 06.05.2006
- \*\* Ref: Figure given by Secretary, I & P Deptt, Sindh during Pak Army Pre Flood Season Coordination Conference held in GHQ dated 27.05.2006
- \*\*\* Ref: previous years' Annual Flood Report (i.e. 2004)
- \* Annual Flood Report 2005
- \*\* Figures given by Chief Engineer, Mr. Wazir Khan of I & P Department, NWFP.
- ^ I & P Deptt. Balochistan letter No. DB-557/1203-08, dated 26.02.2009
- & Table 7 given below

#### 8.1.1 Ongoing/Completed Flood Management Works:

There are a number of flood protection schemes undertaken this year under Normal/ Emergent Flood Program. The details are given in Table-7.

**Table-7**  
**Ongoing/Completed Flood Management Works of F.Y 2008-09 in Pakistan**

Name of Provinces	Nature of Flood Management Works	Normal Development Program	Annual Development Program
Punjab	No. of Spurs		03
	No. of Bunds/Embankments/Studs		12
Sindh	No. of Spurs		01
	No. of Bunds/Embankments		-
NWFP	No. of Spurs		8
	No. of Bunds/Embankments/RW		2
Balochistan	No. of Spurs		12
	No. of Bunds/Embankments/RW		31
FATA	No. of Spurs		1
	Retaining Walls		4
Gilgit-Baltistan	No. of Spurs		-
	No. of Bunds/Embankments/RW		-
A J & K	No. of Spurs		-
	Retaining Walls		2
<b>Total</b>			<b>76</b>

## 8.2 ANTICIPATED FUTURE PROJECTS:

Following three projects are anticipated to be undertaken by the Federal Flood Commission:

- I. Normal Emergent Flood Program
- II. Flood/ Disaster Protection Works for Disaster Risk Reduction (DRR) in Pakistan
- III. Development of Multi-Hazards Early Warning Systems in Pakistan

### 8.2.1 Normal Emergent Flood Program:

Normal/Emergent Flood Program is an annual program under which, all the four provinces and Federal Line Agencies (AJ&K, FATA, Northern Areas, ICT) submit their flood related schemes each year. The program aims at providing flood protection works along the main rivers and hill torrents in order to minimize damages caused by floods besides creating public awareness for prevention and flood adaptability amongst the masses.

For the Year 2008-2009, Federal Flood Commission requested Planning & Development Division through M/O Water & Power for allocation of funds to the tune of Rs. 3,500 million in respect of Normal Annual Development Program based on the priority list of schemes received from the Provinces and Federal Line agencies. Against the original request, Planning & Development Division allocated Rs. 1,000 million for completion of on-going approved schemes of financial year 2007-08 and new schemes proposed during current financial year 2008-09.

### 8.2.2 Flood/ Disaster Protection Works for Disaster Risk Reduction (DRR) in Pakistan

Flood is a natural disaster and demands continuous improvement in our existing structural and non-structural measures in order to reduce losses from such eventualities. In order to fulfill Government of Pakistan's commitment to save fertile lands and adjoining abadies from recurring floods and to fully incorporate the aspect of Disaster Risk Reduction (DRR) in the planning, site selection & implementation in the flood protection and river training infrastructure, there is a need to launch a flood protection project with emphasis on safe construction accounting for DRR strategies to better fight/mitigate flood hazard.

The project envisages construction and provision of structural and other non-structural interventions for flood mitigation on various rivers and streams spread throughout the country. The proposed river training and flood control works for major rivers are located mainly in the provinces of Punjab, Sindh and NWFP along river Indus and its major tributaries i.e. Sutlej, Ravi, Chenab and Jhelum including some other secondary and tertiary rivers. Flood Protection works along the hill torrents have been located in the provinces of NWFP and Balochistan. The entire country is, thus the "Project Area" for the proposed project. Following reasons warrant launching of project.

- i. The top priority works were included in the three plans; however, none of the plans was fully financed by GOP. Meanwhile, other critical locations have developed which pose threat to abadies, national economy as well as other public infrastructure;
- ii. Global environmental impact on temperature and resulting high flood flows in the Indus River System;
- iii. Change in flood flows pattern during the draught season;
- iv. Medium Term Development Framework (2005-2010) issued by the Planning Commission, Government of Pakistan also indicated tentative allocation of Rs. 6.519 Billion for flood control programme by the Federal Government; and
- v. High priority assigned to the implementation of Flood Protection measures by the federating units including PMD & WAPDA.

### 8.2.3 Development of Multi-Hazards Early Warning Systems in Pakistan

Pakistan is also vulnerable to many risks emanating from a number of natural and man-made hazards. The exposures to these hazards and the subsequent disaster situations have inflicted enormous losses upon human lives, natural resources base and the overall economic growth in the past six decades. For instance, the accumulative damages and losses caused by 14 major floods since 1947 stand at US\$6 billion. Similarly, the drought spells of 1998-2001 reduced the economic growth rate to 2.6 percent as compared to an average growth rate over 6 percent. The earthquake of October 2005 not only claimed more than 73,000 lives but also caused an estimated loss of US\$5.2 billion, which was much higher than the total allocations for social sector development for the same year.

The establishment of proposed Multi-Hazard Early Warning System in Pakistan based on this Technical Study will serve as a country-based early warning and response system. Such a system is needed not only for the protection of citizens and national assets but also provides the building blocks of the global early warnings system through Flash Flood Monitoring Systems, floods, tsunamis, weather radar systems, medium and long range weather forecasting center for the optimal protection of the lives, property and the national assets of the country.

The project aims at predicting flood events in upper parts of Pakistan thereby providing a valuable lead time that will allow the development of mitigation works and, in severe events, evacuation of public and mobilization of emergency works crew in flood prone areas. This project is a part of the overall measures being adopted by the Government of Pakistan to make further improvement of the following activities:

- i. Enhancing the weather forecasting capabilities from the short range to medium & long range weather forecasting;
- ii. Establishing of flash flood forecasting system in Pakistan;
- iii. Up-gradation of existing river flood forecasting system in Pakistan;
- iv. Up-grading existing radar network;
- v. Establishment of new weather radars in Northern Areas, FATA, AJ&K, Sindh, Punjab and Balochistan Province;
- vi. Establishment of Tsunami Early Warning System in Pakistan;
- vii. Establishment of meteorological and flood management information dissemination system for mass-media, TV, Radio, newspapers, etc.;
- viii. Assessment of environmental flashpoints on a sub-national level for use in preparedness and spatial planning and disaster risk reduction;
- ix. Development of socio-economic activities including activities of hydrological sector;
- x. Capacity building & institutional strengthening of FFC, PMD, M/O Water & Power, NDMA, P&D Division, PIDs & related federal executing agencies.

To strengthen Disaster Risk Management system in Pakistan, the Japan International Cooperation Agency (JICA) dispatched a series of missions from year 2008 to 2009 based on the request from Government of Pakistan. JICA studies the whole legal and administrative system of DRM in Pakistan and held meeting with all stakeholders including Pakistan Meteorological Department (PMD) and Federal Flood Commission (FFC) to identify the needs and requirements to enhance the capacity of DRM in Pakistan.

After thorough consultation as mentioned above, this project has been finally approved by the Government of Japan with the official title as “The project for National Disaster Management Plan”. Similarly, NDMA prepared PC-II namely “Study on Capacity Development of Disaster Risk

Management in Pakistan” and got approved form Central Development Working Party (CDWP) in its meeting held on November, 2009.

## **9. SCRUTINIZING COMMITTEE (SC):**

The Federal Flood Commission established the Scrutinizing Committee for Inter-Provincial Coordination and to critically review the flood schemes prior to implementation. SC was delegated the powers by ECNEC to approve projects within the framework of Umbrella PC-I. For GOP financed flood schemes, the role of SC is to technically examine and recommend the schemes for consideration at higher forums i.e.; DDWP/CDWP/ECNEC.

### **9.1 Composition of Scrutinizing Committee:**

Scrutinizing committee of FFC is composed of:

#### **CHAIRMAN**

Chief Engineering Advisor/  
Chairman Federal Flood Commission Islamabad

#### **MEMBERS**

Chief Engineer (Floods), Federal Flood Commission, Islamabad  
Member (Water), WAPDA, Lahore  
Chief (Water) Water Resources Section, Planning & Development Division, Islamabad  
Deputy Financial Adviser, Ministry of Water & Power, Islamabad  
Assistant Chief (Water /Development), Ministry of Water and Power, Islamabad  
Secretary, Irrigation & Power Department, Government of the Punjab, Lahore  
Secretary, Irrigation & Power Department, Government of Sindh, Karachi  
Secretary, Irrigation & Power Department, Government of NWFP, Peshawar  
Secretary, Irrigation & Power Department, Government of Balochistan, Quetta  
Director (Irrigation), Civil secretariat FATA, warsak road Peshawar  
Director General, Pakistan Meteorological Department (PMD)  
Consultants (for Foreign Aided Projects only)

### **9.2 Selection/Analysis/Scrutiny of Provincial Flood Control Schemes:**

For individual flood control scheme, following criteria for selection/technical scrutiny is applied:

- I. The scheme will benefit areas where floods have resulted in high economic losses and/or human suffering;
- II. For schemes with predominantly public goods nature, preference will be given to those which will benefit areas where the majority of the population belongs to the low income group;
- III. Resettlement of affected population will not constitute a cost effective and socially achievable solution to the flood problem than the contemplated physical measures;
- IV. The proposed physical development represents the least cost alternative for the scheme;
- V. For schemes involving flood dispersion for secondary rivers, the beneficiaries in the area are maintaining existing flood dispersion facilities; and
- VI. The scheme will not adversely affect areas designated as nature reserves (wildlife sanctuary or other protected areas).

Schemes that meet the above criteria can then be grouped into subprojects (for an umbrella project), based on river reaches in the case of major rivers, and based on river basins in the case of secondary

ivers. Schemes under Need based/ Normal/Emergent Flood Program are taken up individually. For the final selection of a sub projects (for an umbrella project) following criteria is applied:

- I. The subproject forms part of a master plan for the concerned river to be developed in pursuance of country's long-term strategy for flood protection and river management;
- II. The permanent and temporary measures proposed under the subproject are technically sound and that such measures will effectively mitigate flooding without causing significant adverse effect;
- III. The subproject has an economic internal rate of return (EIRR) of at least 12 percent; and
- IV. For schemes under the subproject that have the character of private goods, providing localized benefits to distinctly identifiable beneficiaries, the willingness of the beneficiaries to share in the investment cost and assume responsibility for maintenance has already been ascertained

## **10. FLOOD PREPAREDNESS AND ACTIVITIES DURING THE FLOOD SEASON:**

Every year flood season starts from July 1st and ends on September 30. However, all the flood forecasting & warning related agencies and data collection departments start functioning from June 15th every year and continue their rainfall and river flow data collection and flood forecasting activities up to October 15th. During this period effective interaction and communication between various flood related provincial as well as federal departments/agencies is maintained on round-the-clock basis in order to counter any eventuality due to rain/flood.

### **10.1 Functions and Responsibilities of Flood Related Government Organizations:**

Flood management is a multifunctional process involving different organizations. The Government Organizations which play major role in the flood management are PIDAs /PIDs, WAPDA, Provincial Relief Organizations, Pakistan Army, PCIW, Emergency Relief Cell (ERC) of the Cabinet Division, Federal Flood Commission (FFC), Flood Forecasting Division (FFD) and National Disaster management Authority (NDMA) alongwith its provincial office established in April 2007. Proper understanding of functions of these organizations is a necessary pre-requisite for close coordination between them. Functions of these organizations are briefly described below:

#### **10.1.1 Provincial Irrigation and Drainage Authority (PIDA)/PIDs:**

PIDA/PIDs play a front line role in the process of flood management as well as flood mitigation. Major flood related functions include:

- i. Flow measurement at specific sites on rivers, canals and nullahs;
- ii. Planning, design, construction and maintenance of flood protection works;
- iii. Maintenance of data communication network to provide the river flow data to FFD, Lahore;
- iv. Supervision of the Flood Warning Centre (on behalf of Relief Commissioner, D.G, respective provincial Disaster Management Authorities) to ensure timely dissemination of the flood forecasts/warnings;
- v. Director (Floods), PIDA, in his capacity as member FFD maintains close coordination with Chief Meteorologist FFD for the issuance & dissemination of the flood forecasts/warnings;
- vi. Occasional updating of the flood fighting plans and execution of such plans during flood emergency; and
- vii. Implementation of the flood fighting plans for the actions required to be taken before, during and after the flood emergency.

### **10.1.2 WAPDA**

WAPDA is actively involved in the flood forecasting process by providing the much-needed river and rain data from its telemetric gauge sites within the upper catchments of Indus and Jhelum rivers. The system had been replaced with a new set of equipment using the meteoroburst based communication system. WAPDA supports another hydrometric data measurement and transmission system through its Surface Water Hydrology Project. An overlap of the two systems also exists at a number of sites, most of which are within the Mangla Dam catchment.

WAPDA's telemetric network is directly linked to FFD, Lahore, and is looked after by an officer of the level of Research Officer whose office is located within the premises of FFD, Lahore. Besides WAPDA's involvement in providing the hydrometric flood data, it is also involved in providing the data from such hydraulic structures as Mangla and Tarbela dams and the Chashma barrage.

Coordination between FFD and WAPDA has considerably improved after the 1992-flood disaster. Daily meetings in the office of General Manager (Planning & Design) are held during floods and as a result suitable advice is rendered to Tarbela and Mangla Dam Flood management Committees. Such coordination is necessary especially when a serious flood situation is feared.

### **10.1.3 Provincial Relief Organizations/ Provincial Disaster Management Authorities:**

Ultimate aim of flood warnings is to reduce the potential loss to the life and property of the community living in the flood liable areas. Provincial Relief Organizations (now Provincial Disaster Management Authorities) are charged with the responsibility pertaining to disaster preparedness, emergency response, and post disaster activities pertaining to all disasters including floods. Consequently, under the present set up the Flood Warning Centre had been placed under the Relief Commissioner, who is the Member, Board of Revenue, and is assigned the functions of Relief Commissioner in addition to his normal duties. Relief Department primarily functions through control and coordination of the personnel and resources of other Government Departments generally organized as committees like Flood Commission and Flood Warning Centre. Relief functions at the district and tehsil level are now performed through the District Disaster Management Authorities, who coordinate with the other departments to execute the flood mitigation functions at the district level.

Flood preparatory actions required to be taken by the Relief Commissioner include:

- i. Arranging inspection of the flood protection works by the Irrigation Department and Pakistan Army to ensure that all vital flood protection bunds etc are in a satisfactory state of maintenance;
- ii. To establish Flood Warning Centre and the flood warning centers at the district and tehsil levels;
- iii. To ensure that all flood related agencies/departments involved in the process of flood mitigation are fully geared to perform the functions pertaining to their respective areas in the process of the flood mitigation; and
- iv. To ensure that flood forecasts/warnings are disseminated without loss of time to all concerned and that they are fully aware of the actions to be taken under each situation.

These are some of the major actions required to be taken by the Relief Commissioner before the onset of the flood season every year. During the flood emergency however he is to supervise the flood relief functions carried out by the district administration with the help of Pakistan Army and other Government Departments.

#### **10.1.4 Pakistan Army:**

Pakistan Army's Corps of Engineers under the command and control of Engineer-in-Chief (E-IN-C) is charged with the responsibility to provide necessary help to the civil authorities to carry out the rescue and relief operations during and after the floods. It is the responsibility of the Provincial Governments to provide all the support equipment (boats, life jackets, vehicles, tents etc) to the Army for such operations.

Pakistan Army's flood related functions encompass all the three phases of flood operations from the pre-flood to post flood phases including the important flood phase. Pre-flood phase is the flood preparatory phase during which the adequacy and the serviceability of the flood fighting equipment is ensured. Pre-flood meeting is held at the level of E-IN-C to help coordinate the activities of the other organizations/agencies in providing the required support to the Army. Since Punjab is the most flood prone province, it is the Relief Commissioner Punjab/Provincial Disaster Management Authority, who provides the bulk of the flood fighting equipment to the Army. The CC Engineers 4 Corps of the Army, which is stationed at Lahore, acts as a Liaison Officer for the purpose. Pre-flood inspections of the flood protection structures are also carried out by the respective commander corps of engineers for their respective areas to ensure that the structures (bunds, barrages, spurs etc.) are in satisfactory state of maintenance. Weaknesses, if any, are brought to the notice of the Relief Commissioner and PIDAs. Availability of sufficient stock of explosives to activate the breaches, where required, is ensured.

An officer of the 4 Corps Engineers is placed on duty in the Flood Warning Centre, Lahore, to keep a close watch on the flood situation. All flood forecasts and warnings are communicated to the CC Engineers 4 Corps in time to be transmitted to the D.G. Engineers and all other CC Corps of the Engineers. As the flood arrives, units of the Army move out to their respective areas of responsibility and carry out the relief and rescue operations in coordination with the respective civil administration. A post flood meeting is held under the chairmanship of E-IN-C to discuss the performance of all the flood related agencies with the view to bring about the necessary improvement in future.

#### **10.1.5 Pakistan Commissioner for Indus Waters (P.C.I.W):**

Pakistan has a unique flood-forecasting problem in the sense that greater part of the flood producing upper catchments of Rivers Sutlej, Ravi, Jhelum and Chenab lie across the border in India/held Kashmir. Furthermore a number of control structures like dams and barrages etc exist over the rivers across the border with the result that the free flow conditions are destroyed making the operation of the rainfall/runoff model extremely difficult. The situation underlines the need for the acquisition of river flow data from across the border in respect of important sites over the rivers in India/held Kashmir. Consequently, an agreement had been signed between the two countries in 1989 through their respective Commissioners for Indus Waters, which includes a provision to receive from India such river flow and rain data as is considered important for flood forecasting in Pakistan. A number of river flow stations are specified for this purpose.

The Pakistan Commissioner for Indus Waters receives the data normally once a day. The data is then passed on to the Chief Meteorologist, FFD, Lahore. Frequency of data reception is increased to six hourly and even to hourly in relation to the prevailing flood situation. Pakistan Commissioner for Indus Waters is thus responsible to provide to the Chief Meteorologist, FFD, Lahore, the much-needed data from India for use in the flood forecasting models to ensure accurate forecasts especially Rivers Sutlej, Ravi, Jhelum & Chenab. Pakistan Commissioner for Indus Waters is the

only forum through which any clarification or further information can be obtained from India with regard to flood data or the flood control structures in India or allied information.

#### **10.1.6 Emergency Relief Cell (ERC), Cabinet Division:**

Emergency Relief Cell (ERC) has been established under the Cabinet Division and is controlled by the Cabinet Secretary. The Cell is headed by the Director General Relief. Main functions of the Emergency Relief Cell include:

- Planning and assessment of relief requirements for major disasters;
- Stock piling of basic necessities needed during emergency such as dry ration, blankets etc;
- Establishing emergency fund upon declaration of any part of the country as calamity affected; and
- Maintaining contact with UNDP and other international aid giving agencies

#### **10.1.7 Federal Flood Commission (FFC) and Its Role in Flood Management/Mitigation:**

During the recent past FFC has played a pivotal role in remodeling the flood mitigation policy of the country on modern lines. The policy being implemented by the FFC encompasses both the structural as well as the non-structural measures. Non-structural measures mainly pertain to establishment of a modern flood forecasting and warning system to provide timely and reliable flood information to the concerned flood mitigation agencies and the public in general. One big step towards this end is establishment of 10 cm QPM Doppler Weather Radar one each at FFD, Lahore and Mangla besides on upgraded weather radar at Sialkot to afford the acquisition of the much needed rainfall data from cross the border over Rivers Sutlej, Beas, Ravi, Chenab and Jhelum catchments through the process of remote sensing. The other important step is the establishment of improved flood forecasting models. Improvement in the measurement and transmission of the hydrometric data based upon the meteoroburst a physically based model accounting for the hydro dynamical changes in the flood wave. The model calls for the survey of the channel geometry to determine the channel parameters at suitable intervals of the channel length. It has, therefore, built-in discharge/elevation relationship, which should readily yield the flood levels at any point along the channels. This is of great advantage in the area of flood warning since it allows the estimation of the areas of inundation along the channel. In turn Flood inundation maps have been prepared to facilitate the identification of the villages and other public & private property and installation are likely to be inundated as against those considered safe, for a specific level of flood to be determined on the basis of running the Hydrodynamic model.

A large number of flood protection works have so far been executed and some are in the process of implementation by the provinces through financial and technical support provided by FFC.

#### ***Daily Flood Situation Report:***

In the context of flood warning dissemination, Chairman FFC (being also the Chief Engineering Advisor to the Federal Government) renders suitable reports to the President and the Prime Minister as and when the situation so demands. A Daily Flood Situation Report on Weather & River Discharges (Specimen at Annexure-I) is prepared and issued to important Government officials on daily basis during the flood season every year containing the following:

- i. Actual river flow position of major rivers in a tabular form;
- ii. Prevailing weather system situation;
- iii. Concise forecast relating to the movement of various weather systems and river flow condition for the next 24 hours including likely inundation /flooding of nullahs etc.

- iv. Damage details in the event of flood emergency in a certain area. In case of exceptionally High Floods/unprecedented emergency situation, two & more flood situation reports are issued on daily basis.

#### **10.1.8 Flood Forecasting Division (FFD), Lahore:**

FFD, Lahore, of the Pakistan Meteorological Department plays a pivotal role in the flood forecasting & warning process. Hydro meteorological data from the various national and international sources is received in this Division, which is then processed to produce flood forecasts and warnings to be disseminated outwards to various national organizations.

#### **Major Responsibilities of FFD, Lahore during and after the Flood Season:**

Major responsibilities required to be fulfilled by the Division before, during and after the flood season are summarized as under:

#### **Flood Preparatory Measures:**

- i. Ensure serviceability of the meteorological equipment including various weather radars, Teleprinter Network, FAX, APT, RTT and MDD Equipment.
- ii. Ensure availability of the following items in sufficient quantity to last for the whole of the flood season:
  - Surface and upper air meteorological charts;
  - Isohytal maps;
  - Various forecast forms;
  - Data tabulation sheets; and
  - Stationery etc.
- iii. Regularly update the calibration of radars and flood forecasting models;
- iv. Ensure availability of sufficient staff strength to maintain round-the-clock roster of duties for the meteorological and hydrological work;
- v. Liaison with PTCL's Coordination Officer to provide 24 hours maintenance services for the teleprinters, internet and the office and residential telephones of all the flood related functionaries; and
- vi. Conduct a familiarization training of the senior cadre and junior cadre Govt. functionaries involved in the process of flood mitigation.

#### **Flood Categorization and Functions of FFD during the Flood Season:**

It would be appropriate to discuss the various flood categories before actually taking FFD's functions during the flood season:

#### ***Category-I Floods***

This is the situation when the Seasonal Low, which is a semi permanent weather system generally situated over south eastern Balochistan, south western Punjab and adjoining parts of Sindh gets occasionally intensified (due to the passage of a Westerly Wave) and thus causes the moisture from the Arabian Sea to be brought up to the upper catchments of Rivers Chenab and Jhelum resulting in heavy downpour along the windward slopes of the mountain ranges. Rainfall is generally short lived and occurs either in the late afternoon/evening or during the early morning lasting for a max: period of about six (6) hours. Floods under this condition are the Category-I floods, which may cause a short peak ranging from 3 to 5 lac cusecs under extreme conditions. This should pose no serious flood management problem for the Mangla reservoir due to short duration & thus less volume. Tarbela is affected to a much lesser degree.

***Category-II & III Floods***

This meteorological situation is the one linked with a monsoon low/depression. Such monsoon systems originate in the Bay of Bengal (India) and then moving across India in a general west/north westerly direction arrive over Rajasthan (India) or any of the adjoining states of India. After this the monsoon depression may take any one of the following three courses:

- a. Continue moving straight west causing heavy widespread rains over Sindh/Balochistan. However, no river flooding shall occur in this case;
- b. Re-curve in the northeast direction towards the upper catchments of Rivers Sutlej, Ravi and Chenab causing extremely heavy rainfall and consequently the flood first across the border in India and then (within hours) at the Rim Stations in Pakistan. This is Category-II Flood. Under this situation, floods first occur in Rivers Chenab, Ravi and Jhelum, followed by River Sutlej. Generally the flood peak at Mangla is limited to below 5 lac cusecs, but may reach 7 lac cusecs under an extreme condition; and
- c. Continue moving in the northerly direction (under the effect of a strong Westerly Wave) over the plains of Lahore/ Gujranwala Divisions to finally end up over Rawalpindi/ Hazara Divisions. The upper catchments of Rivers Chenab, Jhelum and Indus come under its influence. Extremely heavy rains may occur over Mangla and/or Tarbela catchments under this meteorological situation depending upon the final position of the depression. Floods generated due to this situation are extremely heavy and are taken as Category-III floods. The Probable Maximum Flood (PMF) is an extreme case of Category-III flood. These are most threatening for Mangla Reservoir, a typical example of such floods was the 1992 flood. Chief Meteorologist, FFD, Lahore, is personally responsible for the issuance of timely and reliable flood forecasts/warnings to afford pre-flood mitigation measures to reduce damage to the life and property due to floods. He is required to remain in touch with his office even outside the working hours to maintain a close watch on the flood generating weather situations. In case situation for Category-II or Category-III floods develop he is to give advance verbal briefings to Relief Commissioner, Chairman FFC, D.G. Engineers (Army), D.G. MET, Islamabad and Member (Water) WAPDA. In order to avoid undue public panic, flood forecasts to the public should be given, only when the possibility of floods has positively developed, in which case suitably tailored flood forecasts must be provided to the press and the electronic media in time.

The argument that the false alarm to the public need be strictly avoided, must not be construed to mean that even the reliable flood forecasts, (when the flood situation becomes imminent) should be denied to the public. The benefit of the improved flood forecasting system must go to the public by way of more reliable and more advanced flood information to them. It is also important that the necessary trust be placed in the forecasts issued by Chief Meteorologist, FFD, Lahore, and under no circumstances the forecasts issued by him allowed to amend without his consent. Under a serious pre-flood situation Chief Meteorologist, FFD, Lahore, may invite other members of the FFD (which include Director Floods of Irrigation Department, Chief Engineer (H&WM) of WAPDA and a representative of PCIW) to an emergency meeting in his office to discuss the necessary flood related actions. Additionally, the R.C. Punjab or the Minister of Revenue & Relief Government of Punjab may conduct daily press briefings. In case of Category-III flood situation a forecast of PMF in respect of Mangla/Tarbela be issued in yes/no terms and Member (Water) WAPDA be personally informed of it by Chief Meteorologist, FFD, Lahore.

**11. FLOOD WARNING DISSEMINATION SYSTEM DURING FLOOD SEASON:****11.1 Prevailing Flood Warning Dissemination System:**

The earlier weaknesses in the flood warning dissemination system called for the following remedial actions: -

- a. Police communication system (for the reception of flood data and the dissemination of flood forecasts/warnings) be replaced with some advanced automatic data communication system. However, until such a system becomes available the police operators posted on flood duties be given

- 
- some training to enable detection of simple data errors and also to understand the urgency and importance of timely data and flood forecast communications.
  - b. Dissemination of the flood/warning at least to the important recipients be done by the Flood Forecasting Centre to ensure timely dissemination under the overall supervision of the Chief Meteorologist, FFD, Lahore.
  - c. Some mechanism to ensure proper coordination between the various departments/agencies involved in the flood mitigation process be established. This may be done by an authority having the full legal jurisdiction over all the concerned agencies.

The problems and the possible remedies were frequently discussed in flood meetings at Provincial and Federal Government levels. As a result of such efforts the earlier flood warning dissemination system underwent gradual changes as reflected in the system currently in vogue. Salient features of current flood warning dissemination system are as follows:

- i. Pre-flood familiarization training has been started since the last few years to acquaint the newly inducted people of Irrigation and WAPDA with the commonly used hydromet terms.
- ii. Flood Forecasting and Warning Centre, Lahore, has been re-designated as the Flood Forecasting Division (FFD).
- iii. FFD has taken in hand the dissemination of the flood forecasts/warnings to considerably large number of recipients directly or indirectly concerned with the flood mitigation process, over and above the dissemination being done by the FWC.
- iv. Press briefings have been started in the office of Chief Meteorologist FFD as a regular feature to ensure correct and authentic flood and weather information to the public. Such briefings are arranged through the representative of the Punjab Information Department on duty at the FWC, only when the flood situation is or is likely to become serious enough to call for such briefings.

Considerable improvement has been made in the dissemination system since the time that it was initially started. Most of the discrepancies stated above have been removed. A much better coordination now exists with WAPDA as regular meetings or verbal advice is given by Chief Meteorologist, FFD, Lahore to G.M (Planning & Coordination) WAPDA.

## **11.2 Updated Flood Warning Dissemination Procedure:**

The existing dissemination process has been reviewed and lists of the recipients of flood information have been streamlined. Basically there are two types of flood information required to be provided for use by the appropriate recipients: i) the flood forecasts and ii) the flood data. Whereas the flood forecasts are disseminated by FFD as well as the FWC, the flood data is disseminated by the FWC only.

### **11.2.1 Flood Forecasts:**

Some of the salient features of each type of the forecast are as under:

#### ***a. Color Coded Qualitative Flood Forecast:***

The colour-coded forecasts are meant to forewarn the frontline flood mitigation authorities regarding the possibility of floods due to the arrival of monsoon low/depression in the vicinity of the Pakistan. The forecasts are issued in three colour codes relating to the position and movement of the depression. Such forecasts constitute precautionary information only. Further, most of such information is also included in the Weather/Flood situation forecasts as well.

***b. Weather/Flood Forecasts:***

Such forecasts give descriptive information on the current and the next 24 hours weather and flood situation. The forecast was introduced to facilitate the understanding of the flood situation for those recipients who are highly placed Government functionaries (mostly at the federal level) and thus need to know the Weather/Flood situation in general (easily understandable) terms and are not concerned with detailed river forecast. The forecast is issued once in 24 hours and is passed via fax to the recipients (mostly located in Islamabad).

***c. Routine Daily Flood Forecasts:***

Routine daily flood forecasts contain current and the next 24 hours weather and flood situation. It gives the quantitative information of the magnitude of prevailing and the forecast flood flows at maximum number of directly or indirectly concerned recipients. The forecast is disseminated both by FFD, Lahore, as well as by FWC, Lahore.

***d. Significant Flood Forecast:***

Significant flood forecast is the forecast of occurrence of a flood of 'High' or higher level at a specific site/sites over a river and/or nullah within the Indus basin river system. The forecast is commonly issued for the rim station but can be issued for any other downstream site as well expected flood is expressed in terms of Flood Levels (Low/Medium/High etc.) as well as a quantitative flood range, which is kept as narrow as possible. This is the most important flood forecast and thus calls for the immediate action by the concerned authorities. Significant forecast needs to be disseminated to those agencies/authorities, which have the most direct involvement in the flood mitigation process.

***e. Areal Inundation Flood Forecast:***

This forecast is issued only when the exceptionally high flood occurs and the areal inundation is forecast on the basis of the hydrodynamic model.

This forecast needs to be provided to the concerned Government authorities and also to the print and electronic media so that the flood prone population gets adequate and timely information to afford pre-flood evacuation and/or other similar flood mitigation measures.

**11.2.2 Dissemination of Flood Data:**

Besides the flood forecasts, the flood data are also disseminated to such Government functionaries as are required to closely monitor the flood levels at various headworks. This consists of gauge and discharge data measured every six hours.

**11.3 National Disaster Management Authority (NDMA):**

Government of Pakistan has embarked upon establishing appropriate policy to minimize risks and vulnerabilities and passed NDMA ordinance 2006. National Disaster Management Authority (NDMA) has been established to serve as the focal point and coordinating body to facilitate implementation of disaster risk management strategies. This necessitates NDMA to directly interact/ communicate with all stakeholders, including Ministries, Divisions, and Departments in relaxation to normal communication channel. NDMA aims to develop sustainable operational capacity and professional competence to undertake the following tasks:

- i. Coordinate complete spectrum of disaster risk management at national level;
- ii. Act as Secretariat of the NDMC to facilitate implementation of DRM strategies;
- iii. Map all hazards in the country and conduct risk analyses on regular basis;
- iv. Develop guidelines and standards for national and provincial stakeholders regarding their role in disaster risk management;
- v. Ensure establishment of DM Authorities and Emergency Operations Centers at provincial, district and municipal levels in hazard-prone areas;
- vi. Provide technical assistance to federal ministries, departments and provincial DM authorities for disaster risk management initiatives;
- vii. Organize training and awareness raising activities for capacity development of stakeholders, particularly in hazard-prone areas;
- viii. Collect, analyze, process and disseminate inter-sectoral information required in all the hazards management approach;
- ix. Ensure appropriate regulations are framed to develop disaster response volunteer teams;
- x. Create requisite environment for participation of media in DRM activities;
- xi. Serve as the lead agency for NGOs to ensure their performance matches accepted international standards, e.g. the SPHERE standards;
- xii. Serve as the lead agency for international cooperation in disaster risk management; This will particularly include, information sharing, early warning, surveillance, joint training, and common standards and protocols required for regional and international cooperation;
- xiii. Coordinate emergency response of federal government in the event of a national level disaster through the National Emergency Operation Center (NEDC);
- xiv. Require any government department or agency to make available such men or resources as are available for the purpose of emergency response, rescue and relief;
- xv. Declare a National Disaster Awareness Day (to commemorate 08 October Earthquake) and conduct awareness raising activities at the occasion;
- xvi. Establish a National Disaster Management Fund, and
- xvii. Perform any other function as may be required by the NDMC.

In addition to above, pre-flood and post flood season conferences, which were earlier conducted by Pak Army at national level, will now be arranged by National Disaster Management Authority in future.

## **12. YEAR 2009 - FLOOD SEASON FORECAST:**

### **12.1 Official Seasonal Monsoon Rainfall Forecast:**

Pakistan Meteorological Department predicted Below Normal monsoon rains during the period from July to September 2009. The official prediction of seasonal monsoon rainfall by Pakistan Meteorological Department, issued in this context, is reproduced herewith:

GOVERNMENT OF PAKISTAN  
PAKISTAN METEOROLOGICAL DEPARTMENT  
(Headquarters Office)  
SECTOR H-8/2, P.O BOX 1214  
ISLAMABAD

16<sup>th</sup> July 2009

### **PRESS RELEASE**

### **UPDATE: MONSOON SEASONAL FORECAST**

#### **BELOW NORMAL MONSOON RAINS PREDICTED**

In consideration of rapidly changing meteorological conditions over Pakistan and keeping in view World Meteorological Organization's advisory about the development of El Nino phenomenon in Pacific Ocean, PMD has updated its seasonal forecast.

According to revised estimates the average monsoon rains in Pakistan are expected to be 30% below normal/ this shortfall has the potential to affect agriculture and water resources. MET. Office has advised about the judicious use of available water resources.

El Nino phenomenon is the abnormal warming of Pacific Ocean during some of the years. El Nino phenomenon when occurs, disturbs the normal weather pattern around the globe. In Pakistan's context El Nino generally suppresses the monsoon rainfall.

El Nino has developed very rapidly in June 2009 and is likely to further strengthen in coming months and is likely to continue till next winter.

Many countries around the globe, including India, have revised their seasonal weather forecast.

(Spokesman)  
Pakistan Meteorological Department

### **12.2 44<sup>th</sup> Annual Meeting of Federal Flood Commission:**

In order to stream line the flood preparedness and review the flood fighting arrangements made by various agencies i.e., All the four provincial Irrigation & Power Departments/PIDAs, Pakistan Meteorological Department (PMD/FFD), WAPDA and PCIW a high level meeting (44<sup>th</sup> meeting of FFC) was held on **June 17, 2009**. Federal Minister for Water & Power chaired the meeting. Main items of discussion included:

- Confirmation of Minutes of 43<sup>rd</sup> Meeting of Federal Flood Commission;
- Review the present status of Flood Forecasting and Warning System and Flood Gauging & Telemetry System including performance of the System during 2008 Monsoon Season.

- Review the status of strengthening of Flood Protection Network by the Provinces for the Flood Season 2009, Identification of Areas of Weaknesses, Flood Fighting Plans for Flood Season-2009 and preparedness of Provincial Irrigation Departments (PIDs/PIDAs) including liaison with Pakistan Army.
- Arrangements planned by the PCIW for procurement of river flow data from India during the 2009 Flood Season.

### **12.3 Other measures taken by Federal Flood Commission:**

Apart from organizing 44th Annual Meeting of FFC, discussed above and the decisions given in **Table-8**, following important actions were taken at the level of FFC in order to ensure fulfillment of strict the preparedness measures towards 2009-Floods Season.

- i. Pakistan Telecommunication Corporation was requested for smooth working and maintenance of important telecommunication links relating to the dissemination of rain/floods related information;
- ii. All the four Provincial Chief Secretaries were requested to issue instructions to all concerned provincial agencies so that any outstanding arrangements for combating contingency situations must be completed in all respects, alongwith effective monitoring of all flood related activities throughout the flood season;
- iii. Provincial Relief Departments were advised to ensure all necessary material help in case of an emergency in the shape of provision of tents, life jackets, life boats etc through a well coordinated plan with Pakistan Army;
- iv. All the four Provinces were advised to ensure full participation of all the District Coordination Officers in flood management activities during the 2008-Flood Season and that they would have the overall responsibility for effective interaction between various agencies;
- v. All the four Provincial Irrigation & Power Departments were requested for a joint reconnaissance of all the important flood bunds/embankments with respective Pakistan Army Corps of Engineers;
- vi. Letters were issued to AJ&K, NA, FATA and ICT Administration for maximum warning and relief arrangements during 2009 flood season;
- vii. Flood Communication Cell of Federal Flood Commission remained in operation on round-the-clock basis for the entire flood season and Flood Situation Report was issued on daily basis to all concerned;
- viii. During the unprecedented flood days (June- mid August 2007) in Balochistan & Sindh round-the-clock and continuous reporting of the situation was done by the Flood Communication Cell;
- ix. Regular site visits of flood affected areas were made by the monitoring team of Federal Flood Commission (FFC) both during and after the flood season to assess scale of damage to irrigation and flood infrastructure;
- x. Daily briefing was given to National Disaster Management Authority (NDMA) both in the morning and evening on flood situation in the country during 2007-flood season to help liaison among concerned authorities to control disaster effects.

Table –8

## Decisions of 44th Annual Meeting of FFC

S #	Decisions	Action by	Status of Compliance
1.	Time frame already decided for submission and processing of flood related works from relevant forums must be strictly adhered to by all the four provinces and federal line agencies. Cut-off date for receipt of PC-Is of flood protection schemes to FFC is November 30 of every year.	All the four PIDs, FATA, Northern Areas, AJ&K, ICT, FFC.	Partially complied
2.	M/o Water & Power will hold a meeting to review the time frame of approval and execution of flood protection works and simplification of fund release process and shall accordingly prepare recommendations for the approval of competent authority.	FFC, M/o Water & Power	M/o Water & Power was requested to facilitate in the matter.
3.	As per practice all the four I&P Departments & Federal line agencies will ensure that inspection of all important bunds and flood works are completed well ahead of the forthcoming flood season of 2009	All the four PIDs, FATA, AJ&K, Northern Areas.	Complied.
4.	All the four I&P Departments & Federal line agencies will ensure well organized monitoring system for the safety of bunds, especially along the vulnerable/high risk locations of river in coordination with Pak Army	All the four PIDs, FATA, AJ&K, Northern Areas.	Complied.
5.	Flood Warning Center at Lahore and all other places shall start round-the-clock operations throughout the Flood Season.	FFC, PIDs and all concerned	Complied.
6.	P&D Division will expedite approval of the PC-II for Development of Multi Hazard Early Warning System and Concept Clearance for Flood/ Disaster Protection Works for Disaster Risk Reduction (DRR) in Pakistan to help expedite arrangement of funds.	P&D Division, GOP	PC-II is being amended in the light of decision of CDWP meeting held on 19.11.2009.
7.	PMD/FFD will ensure submission of Official Forecast for 2009 Monsoon Season to all provincial and federal agencies.	PMD/FFD	Complied
8.	All provinces and federal line agencies shall ensure awareness activities and participation of local communities in flood fighting activities to avert any mishap/casualty as a consequence of emergency	All the four provinces, federal line agencies	Ongoing and complied during 2009 flood season
9.	For all future release of funds to provinces and federal line agencies shall ensure timely submission of utilization accounts of previous releases	All the four provinces, federal line agencies	Partially complied.
10.	All the four provinces and federal line agencies shall improve their disaster combating capabilities under the auspices of NDMA and assistance of Pak Army shall be sought as a last resort.	All the four provinces, federal line agencies, NDMA, Pak Army	Continued.

11.	Provinces and federal line agencies shall ensure adequate provision of funds within their respective provincial budgets to ensure timely repair and maintenance activity of the flood related infrastructure.	All the four provinces, federal line agencies	Provinces and federal line agencies have been requested to comply with the decision.
12.	FATA will submit to FFC its modified Comprehensive Plan, if any, in addition to their schemes under Normal/ Emergent Flood Programme for consideration of their additional requirement for flood works.	FATA	FATA authorities have been requested to comply with the decision.
13.	NDMA will issue on an urgent basis requisite authorization to Engineering Directorate, GHQ, Rawalpindi for the provision of services of Pak Army to meet any emergent flood situation/ rescue & relief operation.	NDMA	NDMA has been requested to facilitate in the matter.
14.	As per prevailing practice and four authenticity of information dissemination Flood Forecasting Division (FFD), Lahore shall be the official spokesman on the issue of flood forecasts	FFD, Lahore	Complied.
15.	In order to fight any flood situation, PIDs/ EAs shall use machinery of respective Agriculture Departments during flood season through mutual arrangements.	All the four provinces, federal line agencies.	Four provinces & federal line agencies have been requested to comply with the decision.
16.	NDMA need to prepare and update periodically the list of private contractors of machinery required during flood season.	NDMA	NDMA has been requested to take further action.
17.	PMD in collaboration with PCIW/ FFC shall build its capacity for obtaining/ collection of flood/ rain data pertaining to eastern rivers and Indian catchments in case India refuses to supply the same	PMD, PCIW, FFC	Complied and continued at institutional level.
18.	As annual PSDP had been curtailed during last two fiscal years from its original size to 1/3 <sup>rd</sup> on account of cash flow problems and financial crunch, all executing agencies need to reprioritize their requirements to fit well within the available/ released funds.	All the four provinces, federal line agencies.	Partially complied.
19.	Gilgit-Baltistan will furnish details of its requirement of machinery/ equipment to FFC for incorporation in the PC-II being prepared at the level of FFC.	Gilgit-Baltistan	GB-PWD has been requested to comply with the decision.
20.	NDMA will arrange Mock Exercise/ Drills for handling the flood related disasters on rotation basis in different provinces, before the start of the flood season.	NDMA	NDMA has been requested to take further action.
21.	All the stakeholders will update NDMA on monthly basis, regarding the implementation of decisions made in NDMA's pre-monsoon season meeting held on April 29, 2009.	All concerned stakeholders	Continued.
22.	Ministry of Railways and Ministry of Communication who were tasked, in April 29, 2009 meeting of NDMA to conduct surveys of the bridges and vital infrastructure to assess their soundness with regard to the flood situation shall respond back to NDMA at the earliest.	Ministry of Railway and Ministry of Communication	Complied by the Ministry of Railway.

### **13. FFC's ACTIVITIES DURING THE YEAR 2009-FLOOD SEASON:**

#### **13.1 Setting up of a Flood Communication Cell in Federal Flood Commission (FFC)**

On the advent of the 2009-Flood Season, a Flood Communication Cell was set up in the Federal Flood Commission, which started functioning with effect from June 15, 2009, and continued functioning till October 15, 2009.

The main objective of the Flood Communication Cell was to obtain information from the Flood Forecasting Division (FFD), Lahore, and other Flood Warning Centers set up in the Provincial Headquarters. Also data relating to river discharges at Rim stations and other important control points and information with regard to rainfall at important stations were received. In addition to the special duty staff (for round-the-clock collection of data), one officer remained available during all working days as well as on Sundays and National Holidays for collection of necessary information regarding rain/flood damages and bund breaches.

#### **13.2 Flood Monitoring Situation Report on Weather & River Discharges:**

A Flood Situation Report on weather & river discharges was prepared and issued on daily basis to important Government officials including in particular the following:-

- i. Federal Minister for Water & Power, Islamabad.
- ii. Chief of Staff to the President, Aiwan-e-Sadar, Islamabad.
- iii. Principal Secretary to the Prime Minister, Prime Minister's Secretariat, Islamabad.
- iv. Military Secretary to the Prime Minister, Prime Ministers Secretariat, Islamabad.
- v. Secretary, Ministry of Water & Power, Islamabad.
- vi. Additional Secretary, Ministry of Water & Power, Islamabad.
- vii. Adviser, Ministry of Water & Power, Islamabad.
- viii. Chairman, National Disaster Management Authority, Prime Ministers Secretariat, Islamabad.
- ix. Director General (ERC), Cabinet Division, Islamabad.
- x. General Staff Branch, Engineering Directorate, GHQ, Rawalpindi.

The report based on information received from WAPDA and FFD's Weather Forecast contained actual river flow position of major rivers in a tabular form with prevailing weather system situation (including Seasonal Low from the Arabian Sea, Westerly Wave System from the Mediterranean Sea and Monsoon System from Bay of Bengal-India). The report also reflected concise forecast relating to the movement of various weather systems and the river flow condition for the next 24 hours including likely inundation/flooding of nullahs etc besides giving an update on the reported damages. Apart from above, Special Flood Reports were issued relating to floods in River Kabul and Chenab. Senior Officers of FFC also presented regular briefings on the national electronic media relating to current flood situation. Specimen of Flood Situation Report is attached as Annexure-I. A comparison of Historic Maximum Flood Peaks Vs 2009 Flood Maximum Flood Peaks is given in Table-9.

Table-9

**HISTORIC MAXIMUM VS 2009 MAXIMUM PEAK DISCHARGES OF  
MAJOR RIVERS OF PAKISTAN**

(In cusecs)

River	Barrages/ Headworks	Designed Capacity	Historic Maximum Peak		Maximum-2009 Peak	
			Flood	Date	Flood	Date
Indus	Tarbela	15,00,000	5,10,000	31-7-89	3,06,300	16-8-09
	Kalabagh	9,50,000	9,50,000	14-7-42	3,48,300	17-8-09
	Chashma	9,50,000	7,86,600	3-8-76	3,80,800	19-8-09
	Taunsa	11,00,000	7,88,646	22-7-58	3,20,300	21-8-09
	Guddu	12,00,000	11,99,672	15-8-76	2,32,300	25-8-09
	Sukkur	15,00,000	11,66,574	15-8-76	1,34,600	26-8-09
	Kotri	8,75,000	9,81,000	14-8-56	1,15,800	31-8-09
Jhelum	Mangla	10,60,000	9,33,000	10-9-92	81,300	16-8-09
	Rasul	8,50,000	9,32,000	10-9-92	56,800	17-8-09
Chenab	Marala	11,00,000	11,00,000	26-8-57	93,200	28-7-09
	Qadirabad	8,07,000	9,48,530	11-9-92	76,400	29-7-09
	Trimmu	6,45,000	9,43,225	8-7-59	43,800	21-8-09
	Panjnad	7,00,000	8,02,516	17-8-73	17,800	26-8-09
Ravi	Balloki	2,25,000	3,89,845	28-9-88	14,000	31-7-09
	Sidhnai	1,50,000	3,30,210	2-10-88	8,500	24-8-09
Sutlej	Sulemanki	3,25,000	5,97,000	8-10-55	3,400	03-8-09

Attached as **Annexure-II**, is river discharge data from July 01, 2009 to September 30, 2009 for all the major rivers of Pakistan along with their graphical representations besides comparisons of levels of Tarbela and Mangla reservoirs at **Annexure-III & IV** respectively.

### 13.3 Rain/Flood Damages & Relief Measures Report:

Keeping in view the instructions of Federal Minister for Water & Power, FFC also issued on daily basis, from June 27, 2009 to September 30, 2009, up-to-date information on rain/flood damages and relief measures based on data received from Provincial Relief Commissioners.

### 13.4 Guidelines for Mangla Flood Management:

Guidelines for Mangla Dam Flood Management remained in operation for the 2009-Flood Season also. Besides this Tarbela & Mangla Dam Flood Management Committee and the High Level Flood Management Committee at the federal level remained active during the entire flood season.

### 13.5 Public Sector Development Program 2008-2009

For the Year 2008-2009, Federal Flood Commission requested Planning & Development Division through M/O Water & Power for allocation of funds to the tune of Rs. 3,500 million in respect of Normal Annual Development Program based on the priority list of schemes received from the Provinces and Federal Line agencies. Against this request Planning & Division allocated Rs. 1,000 million.

Table-10 depicts the PSDP 2008-2009 allocations made by the Government of Pakistan for Normal/Emergent Flood Program.

Table –10

**PSDP 2008-2009 ALLOCATIONS UNDER NORMAL/EMERGENT FLOOD PROGRAMME**

(Rs. in Million)			
Name of Province/Federal Line Agency	Original Allocation 2008-09	Revised Allocation 2008-09	Actual Releases
Punjab	382.50	266.005	245.500
Sindh	263.50	277.625	263.500
NWFP	93.50	98.512	93.500
Balochistan	68.00	71.645	68.00
FATA	25.50	26.867	25.50
AJ&K	8.50	8.956	8.956
Gilgit-Baltistan	8.50	8.956	8.956
Priority of Flood Works in Provinces & Federal Line agencies to be carried out as decided by Federal Minister for W&P	100.00	100.00	100.00
FFC-Monitoring, evaluation, overall management & supervision	50.00	1.405	1.405
<b>Total:</b>	<b>1000.00</b>	<b>859.971</b>	<b>815.317</b>

**14. OVERALL ASSESSMENT OF 2009-MONSOON SEASON:**

2009-Monsoon Season can be termed a relatively less wet monsoon season. Number of rivers experienced flood situations. As may be seen from Table-9 maximum discharge experienced by River Indus was at Chashma i.e. 3,80,800 cusecs, which is a medium flood stage. River Jehlum experienced a maximum discharge of 81,300 cusecs at Mangla, River Chenab 93,200 cusecs at Marala and River Ravi 14,000 cusecs at Balloki respectively.

**14.1 Country-wide Losses/Damages:**

The details of country-wide losses/damages caused due to rain/flood 2009 as reported by the Provincial Departments and Federal Line Agencies are given in Table-11.

**Table-11**  
**Country-wide Losses/Damages Due to Rain/Flood 2009**

PROVINCE	Village Affected	Persons Affected	Area Affected (Acres)	Cropped Area Affected (Acres)	Houses Damaged		Person Died	Persons Injured	Cattle Heads Perished	Relief Camps Established	Persons in Relief Camps
					Partially	Fully					
Punjab	59	208	474	770	4	80	2	NR	NR	10	NR
Sindh	30	NR	NR	NR	1071	191	83	47	104	150	NR
NWFP	NR	NR	NR	NR	NR	NR	14	7	3	0	NR
Balochistan	NR	NR	50	25	3	NR	NR	NR	NR	NR	NR
FATA	NR	NR	NR	NR	NR	94	14	NR	NR	NR	NR
NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
AJ & K	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
<b>G. TOTAL</b>	<b>89</b>	<b>208</b>	<b>521</b>	<b>795</b>	<b>1078</b>	<b>271</b>	<b>99</b>	<b>54</b>	<b>107</b>	<b>160</b>	<b>0</b>

NR: Not reported

**15. COMPREHENSIVE 10-YEAR FLOOD PROTECTION PLAN:**

In view of the fact that FFC would be completing the National Flood Protection Plan-III (NFPP-III, 1998-2007), FFC prepared Comprehensive 10-Year Flood Protection Plan (NFPP-IV, 2008-2017). The proposed plan, which has been prepared in consultation with concerned stakeholders and costing Rs 30 billion, envisages construction of flood protection works (spurs, embankments, retaining walls, dykes etc.) in all the four provinces and federal line agencies besides implementation of flood forecasting & warning system improvements.

**15.1 Over all proposed Investment for Comprehensive 10 year Flood Protection Plan (National Flood Protection Plan-IV, 2008-2017):****Table-12**

<b>Sr. No</b>	<b>Province/Agency</b>	<b>Estimated Cost (Rs. in Billion)</b>
I.	Punjab	11.250
	Sindh	7.750
	NWFP	2.750
	Balochistan	2.000
	FATA	0.750
	Northern Areas	0.250
	AJ&K	0.250
	Sub total-I	25.000
II.	WAPDA	0.586076
	PMD	2.200
	Sub Total-II	2,786.076
III.	FFC, Consultancy, Monitoring & Evaluation, Institutional Strengthening.	
	Capacity Building, Training etc	2.213924
	Sub Total - III	2.213924
	Grand Total: I+II+III	30.000

**ANNEXURE-I**



Plot No. 6, Near Old MNA Hostel,  
G-5/I, Islamabad Fax No.051-9244621  
www.ffc.gov.pk

Government of Pakistan  
Ministry of Water and Power  
Federal Flood Commission

**DAILY FLOOD SITUATION REPORT**  
**WEDNESDAY, SEPTEMBER 30, 2009**

There is no flood situation in the country and all the rivers are flowing with normal discharge. Today's actual river flows and reservoir elevations may be seen at **Annexure-I**. Today's combined live storage position of Tarbela, Chashma & Mangla reservoirs is 7.962 MAF as compared to last year's 7.130 MAF.

2. According to Flood Forecasting Division (FFD), Lahore, continental air continues to prevail over the country. On account of the existing meteorological situation, **mainly dry weather will prevail over most parts of the country during the next 24 hours**. No rainfall event has been reported by FFD, Lahore, for the past 24 hours. Nevertheless, all concerned agencies are being kept informed by the Flood Warning Center, Lahore.

3. **In view of the fact that all of our main rivers are currently flowing normal with persistent reduced flows, the Daily Flood Situation Report of Federal Flood Commission shall be discontinued effective from Thursday, October 01, 2009. All the monitoring arrangements shall, however, remain in position till October 15, 2009 and the Flood Situation Report shall be revived in case a situation arises due to any wet spell.**

(Ahmed Kamal)  
Chief Engineer (Floods)  
Tel: 051-9244613/  
051-9244621

1. Minister for Water & Power, Islamabad.
  2. Principal Secretary to the President, Aiwan-e-Sadar, Islamabad.
  3. Principal Secretary to the Prime Minister, Prime Minister's Secretariat, Islamabad.
  4. Secretary, Ministry of Water & Power, Islamabad.
  5. Adviser, Ministry of Water & Power, Islamabad.
  6. Additional Secretary, Ministry of Water & Power, Islamabad.
  7. Chairman, National Disaster Management Authority, Prime Minister's Secretariat, Islamabad
  8. Director General (ERC), Cabinet Division, Islamabad.
  9. Flood Cell, General Staff Branch, Engineer Directorate, GHQ, Rawalpindi.
- U.O. No. FC-I (31)/2009-XXV dated 30-09-2009

**Discharges at Important River Sites  
September 30, 2009 at 0600 Hours**

(Cusecs)

Structures	Designed Capacity	Actual Flow		Comparative Danger (VHF) classification	Actual Flood Classification **
		In Flow	Out Flow		
<b>River Indus</b>					
▪ Tarbela Reservoir *	15,00,000	<b>75,000</b>	<b>1,00,000</b>	6,50,000	Normal
▪ Kalabagh	9,50,000	<b>1,24,000</b>	<b>1,17,000</b>	6,50,000	Normal
▪ Chashma Reservoir	9,50,000	<b>1,19,000</b>	<b>1,04,000</b>	6,50,000	Normal
▪ Taunsa	11,00,000	<b>96,000</b>	<b>72,000</b>	6,50,000	Normal
▪ Guddu	12,00,000	<b>85,000</b>	<b>66,000</b>	7,00,000	Normal
▪ Sukkur	15,00,000	<b>61,000</b>	<b>18,000</b>	7,00,000	Normal
▪ Kotri	8,75,000	<b>19,000</b>	Nil	6,50,000	Normal
<b>River Kabul</b>					
▪ Warsak	5,40,000		<b>11,000</b>	2,00,000	Normal
▪ Nowshera			<b>16,000</b>	2,00,000	Normal
<b>River Swat (Tributary of Kabul)</b>					
▪ Amandra	40,000		<b>3,000</b>		Normal
▪ Munda	50,000		<b>2,000</b>		Normal
▪ Khiali (Charsadda Road)	50,000		<b>4,000</b>		Normal
<b>River Jhelum</b>					
▪ Mangla Reservoir *	10,60,000	<b>18,000</b>	<b>45,000</b>	2,25,000	Normal
▪ Rasul	8,50,000	<b>37,000</b>	<b>16,000</b>	2,25,000	Normal
<b>River Chenab</b>					
▪ Marala	11,00,000	<b>25,000</b>	<b>6,000</b>	4,00,000	Normal
▪ Khanki	8,00,000	<b>8,000</b>	Nil	4,00,000	Normal
▪ Qadirabad	8,07,000	<b>20,000</b>	Nil	4,00,000	Normal
▪ Trimmu	6,45,000	<b>16,000</b>	Nil	4,50,000	Normal
▪ Panjnad	7,00,000	<b>12,000</b>	Nil	4,50,000	Normal
<b>River Ravi</b>					
▪ Jassar	2,75,000		<b>1,000</b>	1,50,000	Normal
▪ Shahdra	2,50,000		<b>1,000</b>	1,35,000	Normal
▪ Balloki	2,25,000	<b>19,000</b>	Nil	1,35,000	Normal
▪ Sidhnai	1,50,000	<b>14,000</b>	Nil	90,000	Normal
<b>River Sutlej</b>					
▪ Suleimanki	3,25,000	<b>9,000</b>	Nil	1,75,000	Normal
▪ Islam	3,00,000	Nil	Nil	1,75,000	Normal

**Live Storage (MAF)**

<b>Reservoir Elevation (Feet Above Sea Level)</b>		<b>2009</b>	<b>2008</b>	<b>2007</b>	<b>Maximum</b>	<b>Today</b>	<b>Last Year</b>	
Tarbela	(Maximum Conservation Level	1550.00)	<b>1503.68</b>	1486.40	1526.08	6.849 <sup>+</sup>	<b>4.354</b>	<b>3.520</b>
	(Dead Level	1369.00)						
Chashma	(Maximum Conservation Level	649.00)	<b>643.60</b>	641.90	645.20	0.263 <sup>+</sup>	<b>0.100</b>	<b>0.075</b>
	(Dead Level	637.00)						
Mangla	(Maximum Conservation Level	1210.00)	<b>1182.30</b>	1182.85	1190.45	<u>5.072<sup>++</sup></u>	<b>3.508</b>	<b>3.535</b>
	(Dead Level	1040.00)			<b>Total:</b>	12.184	<b>7.962</b>	<b>7.130</b>

**Today's Skardu Temperature:**Maximum: **25.6 °C**Minimum: **10.0 °C****NOTES:**

\* For Reservoirs, discharges (Inflows/Outflows) are averages of 24 hours.

\*\* Flood Classification: (applied on downstream discharge/Outflow)

"Mild" Categories

Low Flood: River flowing within deep (winter) channel(s) but about to spill threatening only river islands/belas  
 Medium Flood: River partly inundating river islands/belas  
 High Flood: River almost fully submerging islands/belas and flowing upto high banks/bunds but without encroachment on the freeboard

"Danger" Categories

Very High Flood: (VHF) River flowing between high banks/bunds with encroachment on the freeboard  
 Exceptionally High Flood: (EHF) imminent danger of overtopping/breaching, or the high bank areas have become inundated

\*\*\* (R) Signifies "Rising" Flood, (F) Signifies "Falling" Flood,

(S) Signifies "Stable" Flow Condition

NR stands for Not Received

+ Based on IRSA's Daily Hydrological Data, ++ For MCL of 1210.00 ft.

**APPENDIX-I: List of On-Going/ Completed Approved Schemes Undertaken During Financial Year 2008-09 under Normal/Emergent Flood Program**

(Rs in Million)

Sr. #	Name of Schemes	Estimated Cost	Approval Status
<b>PUNJAB</b>			
1.	Construction of Guide Head Spur at RD 165+000 Link No.1	51.489	Approved by CDWP on April 30, 2009.
2.	Constructing J-Head Spur # 2 of Pir Adil Minor & I-L Disty of Link No.1	137.376	Approved by CDWP on April 30, 2009.
3.	Providing protective measures Muhammad Shahwala Flood Bund and Burala Branch against erosion by River Ravi (Guide Spur at RD 419+000 of Burala Branch)	48.925	Approved by CDWP on April 30, 2009.
4.	<b>PM Directive</b> Construction of Sloping Studs/Lunda Bund against erosion action of Chenab River to protect Tombs of Ameer Shah, Wali Ullah Bhoray Shah and Abadies etc.	10.723	Approved by DDWP on April 16, 2009
	<b>Sub-Total</b>	<b>248.513</b>	
<b>SINDH</b>			
1.	Extension of stone apron and pitching along K.K Bund mile 11/3 to 12/4 & Recoupment of damaged apron pitching from mile 10/7+550 to 11/1+110 in Begari Sindh Feeder Circle	234.549	Approved by CDWP on April 30, 2009.
2.	Raising/strengthening, providing stone pitching along F.P bund RD 169 to 263.5 & RD 502 to 120 <b>(Ongoing)</b>	492.236	Approved by CDWP on March 01, 2008
3.	Raising/strengthening, providing stone pitching along Suprio bund RD 0 to 95 <b>(Ongoing)</b>	253.181	Approved by CDWP on January 12, 2008.
	<b>Sub-Total</b>	<b>979.966</b>	
<b>NWFP</b>			
1.	River Survey and model Study of River Indus D/s of Dera Darrya Khan bridge district D.I Khan	6.339	Approved by DDWP on September 04, 2008
2.	Construction of Flood Protection work for village Mohib Banda, Banda Sheikh Ismail and Adjoining Area District Nowshera.	19.00	Approved by DDWP on April 16, 2009
3.	Construction of Flood Protection works along Panjkora River & Maidan kuhnai Khawar in District Dir Lower.	7.36	Approved by DDWP on April 16, 2009
4.	<b>PM Directive</b> Construction of Spur No. 34 along right bank of River Indus, District D.I. Khan	186.252	Approved by CDWP on April 30, 2009.
	<b>Sub-Total</b>	<b>218.951</b>	
<b>Balochistan</b>			
1.	Constriction of Flood Protection Bund for Agriculture coconut Farm Tehsil Utahla, District Lasbela	12.00	Approved by DDWP on April 16, 2009
2.	Construction of Koshk River Flood Protection near Cotton Factory Khuzdar, District Khuzdar	2.00	Approved by DDWP on April 16, 2009
3.	i) Flood Protection of Agriculture Land & Abadies of Kach Khari Muhammad & other in Nasai area Tehsil Muslim Bagh ii) Flood Protection of Agriculture Land & Abadies of Haqdad Awara Alozai & other in Alozai area killa Saifullah.	1.400	Approved by DDWP on April 16, 2009
4.	i) Protection of Tora Deraga for Protection of Agriculture Lands of Muhammad Ibrahim Awara & others, district Zhob ii) Protection of new Abadies of Sheikhan Town Zhob (Right Bank of Zara Ghounddai Stream) District Zhob iii) Flood Protection of Agriculture Land / Houses of Wouchaba & Killi Tore Shah in Badinzia area, District Zhob iv) Flood Protection of Agriculture Lands of Kach Mir Adam & others in Kapip Shrani area, Distt Zhob.	4.300	Approved by DDWP on April 16, 2009
5.	i) Flood Protection of agriculture Land D/S of Seakle Flood Irrigaiton Scheme District Barkhan. ii) Flood Protection of People Colony & F.C. Colony Kohlu Town, District Kohlu	3.876	Approved by DDWP on April 16, 2009

6.	Extension of Mohamoadani Flood Protection Bund Bela District Lasbela.	1.500	Approved by DDWP on April 16, 2009
7.	Khalique-abad Flood Protection Bund, Mangocher area District Kalat.	2.500	Approved by DDWP on April 16, 2009
8.	Protection Bund for Agriculture land Mouza Machina District Kharan.	3.600	Approved by DDWP on April 16, 2009
9.	Flood Protection of Lasbella Canal at RD 76+200 District Lasbella	1.500	Approved by DDWP on April 16, 2009
10.	Construction of Gabion Spurs Garuk, Nal area District Khuzdar.	3.211	Approved by DDWP on April 16, 2009
11.	Gualoo Jhal Chamrok Flood Protection Khuzdar Town, District Khuzdar.	0.700	Approved by DDWP on April 16, 2009
12.	i) Construction of Flood Protection Scheme Kamalzai District Pishin ii) Construction of Flood Protection Scheme Killi old Shakarazai, District Pishin iii) Construction of Flood Protection Scheme Orchards/Lands Killi Abdullah Jan Takari Manda Toba Achakzai, District Killa Abdullah.	3.000	Approved by DDWP on April 16, 2009
13.	i) Flood Protection of Agriculture Land of Killi Azam Abad Mahool Tehsil Bori District Loralai ii) Flood Protection of Agriculture Land of Killi Abdul Wahab & Others Toisar area District Musakhail	2.000	Approved by DDWP on April 16, 2009
14.	i) Flood Protection of Houses & orchards in Margat area in Quetta, District Quetta ii) Flood Protection of Killi Asianwan area in District Nushki iii) Flood Protection of Dalbandin Airport in District Chaghi.	3.000	Approved by DDWP on April 16, 2009
15.	i) Flood Protection of Mitheri Village Distt kachi ii) Flood Protection of Dopasi Village Distt Kachi	4.000	Approved by DDWP on April 16, 2009
16.	Construction of Gabion Spurs of Adjoining Villages of Harnai Area and Flood Protection of Raisani Bund District Ziarat	5.450	Approved by DDWP on April 16, 2009
17.	Flood Protection of Khaddal for agricultural land of Killi Haji Noor Mohammad Guldad and others Killi Sherra Tehsil Droog Distt Musa Khel	2.481	Approved by DDWP on April 16, 2009
	<b>Sub-Total</b>	<b>56.518</b>	
<b>FATA</b>			
1.	Flood protection scheme near Lashta Mir Kot from the action Nungar Algad (Phase-1) F.R. Lakki	2.50	Approved by DDWP on September 04, 2008
2.	Flood protection scheme for protection of culturable land and village of Zarif Koroona Killi Tehsil Ekkaghuand Mohmand Agency	2.668	Approved by DDWP on September 04, 2008
3.	Flood protection scheme at Qalandar Gurbaz F.R. Bannu	3.50	Approved by DDWP on September 04, 2008
	<b>Sub-Total</b>	<b>8.668</b>	
<b>AJ&amp;K</b>			
1.	Protection & Checking of erosion against flood on the left Edge of River Punch at Mandi Kotli, District Kotli.	4.100	Approved by DDWP on April 16, 2009
2.	Protection & Checking of erosion against flood on the left Bank of River Jhelum, near Government college Garhi Dupatta, District Muzaffarabad, Phase-II.	5.680	Approved by DDWP on April 16, 2009
	<b>Sub-Total</b>	<b>9.78</b>	
<b>Gilgit-Baltistan</b>			
1.	Comprehensive Hydraulic Modeling of Shayok River, District Ghanche.	4.000	Approved by DDWP on April 16, 2009
	<b>Sub-Total</b>	<b>4.00</b>	
	<b>Grand-Total</b>	<b>1,526.396</b>	