

**UNPRECEDENTED 2011 RAINS / FLOODS IN PAKISTAN
AND ACTIONS NEEDED**

By

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Abstract

Pakistan is facing many risks emanating from a number of natural and man-made hazards and flood is the most devastating natural disaster among these hazards. Floods have caused enormous losses to human lives, property, infrastructure, and has affected the overall economic growth in past six decades. The catchment areas of main rivers of the country did not receive heavy precipitation during Monsoon Season 2011, hence, none of the major rivers attained danger flood level. That is why no serious riverine flooding was observed during 2011-Flood Season. However, the torrential monsoon rains of 2011 hit the Sindh Province, especially the southeastern parts of the province, which were historical events of about 150 years return period. The rains/floods affected an area of about 6.812 million acres (23 Districts in Sindh, 12 in Punjab and 1 in AJK) affecting 38,700 villages, claiming about 516 lives, damaging 1,598,629 houses and cropped area of about 2.311 million acres and population of about 9.303 million had been affected.

Key words: Unprecedented rains, Pakistan, Monsoon, 2011-flood season, damages.

1. Introduction

The rains started in 2nd week of August and continued till mid September with short intervals. The first spell of heavy rainfall started from 10th August and continued till 17th August 2011 with short intervals, which caused more than 300mm precipitation in Districts Badin, Mirpurkhas, Hyderabad, Tando Muhammad Khan, Shaheed Benazirabad (Nawabshah), Sanghar and generated surface run-off of more than 14000 cusecs in LBOD System against its designed discharge capacity of 4440 cusecs. Average rainfall recorded was 8-10 times more than the land drainage capacity of LBOD and Kotri Barrage Drainage System. The 2nd spell of monsoon rains started from 29th August 2011, which caused averagely 200 mm and in some areas more than 400 mm rains were recorded. The cumulative rainfall recorded in the region was averagely 600 mm. The LBOD System (already flowing full) attained its maximum water level and overtopped at several locations, which badly affected the abadies, standing crops, private and public infrastructure of Districts Mirpurkhas, Badin, Shaheed Benazirabad (Nawabshah) and Sanghar, Tando Muhammad Khan, Umerkot, Tharparker, Tando Allayar Khan and adjoining areas. As the land was already saturated, hence, the 2nd spell rains caused more damages to abadies, private and public infrastructure, besides standing crops. The continued rains created flood like situation in the entire lower parts of Sindh.

2. Seasonal Rainfall Forecast for Monsoon Season 2011 issued by PMD

Pakistan Meteorological Department predicted 10% below Normal monsoon rains during the period from July to September 2011. The official prediction of seasonal monsoon rainfall by Pakistan Meteorological Department, issued on 13th June, 2011, is reproduced hereunder ;

“Pakistan Summer Monsoon rainfall is invariably affected by the global, regional and local climatic conditions prevailing prior to the season. Analysis of their combined effect indicates that total amount of rainfall averaged over Pakistan during monsoon season (July – September) 2011 will remain 10% below normal”.

However, there are chances of about 10% above normal rainfall in northern parts of Pakistan including Punjab, Khyber Pakhtunkhwa provinces and Kashmir. At occasions, the interaction of easterly and westerly systems may result in heavy downpour causing localized urban/flash flooding. This outlook is prepared at 80% confidence interval and meant for the planning purpose. The area weighted normal rainfall of Pakistan for monsoon season is 137.5 m. m.

1. Office of the Chief Engineering Advisor / Chairman, Federal Flood Commission, Islamabad, 44000, Pakistan.

3. Floods / Rains 2011

The catchment areas of main rivers of the country did not receive heavy precipitation during Monsoon Season 2011, hence, none of the major rivers attained danger flood level. That is why no serious riverine flooding was observed during 2011-Flood Season. However, the torrential monsoon rains of 2011 hit the Sindh Province, especially the southeastern parts of the province, which were historical events of about 150 years return period. The rains started in August and continued till mid September with short intervals. The first spell of heavy rainfall started from 10th August and continued till 17th August 2011 with short intervals, which caused more than 300 mm precipitation in Districts Badin, Mirpurkhas, Hyderabad, Tando Muhammad Khan, Shaheed Benazirabad (Nawabshah) and Sanghar, generated runoff of more than 14,000 cusecs in LBOD System against its designed discharge capacity of 4,440 cusecs. Average rainfall recorded was 8-10 times more than the land drainage capacity of LBOD and Kotri Barrage Drainage System.

The 2nd spell of monsoon rains started from 29th August 2011, which caused averagely 200 mm and in some areas more than 400 mm rains were recorded. The cumulative rainfall recorded in the region was averagely 600 mm. The LBOD System (already flowing full) attained its maximum levels and overtopped at several locations, which badly affected the abadies, standing crops, private and public infrastructure of Districts Mirpurkhas, Badin, Shaheed Benazirabad (Nawabshah), Sanghar, Tando Muhammad Khan, Umerkot, Tharparker, Tando Allayar Khan and adjoin areas. As the land was already saturated, hence, the 2nd spell rains caused more damages to abadies, private and public infrastructure, besides standing crops. The continued rains created flood like situation in the entire lower parts of Sindh.

The rains / floods affected an area of about 6.812 million acres (23 Districts in Sindh, 12 in Punjab and 1 in AJK) affecting 38,700 villages, claiming about 516 lives, damaging 1,598,629 houses and cropped area of about 2.311 million acres and population of about 9.303 million has been affected.

4. Strategy for restoration/rehabilitation and improvement works

Irrigation and Power Department, Government of Sindh with the help of donor agency (Asian Development Bank) has estimated damages occurred to irrigation, drainage and flood protection infrastructure and their restoration/reconstruction cost as Rs 6.00 billion. Irrigation and Power Department, Government of Sindh has evolved strategy for restoration/rehabilitation and improvement works in the following two (2) categories;

4.1 Emergent Nature Restoration Works:

The following activities have been planned to be carried out before start of Monsoon Season 2012 ;

- Procurement of earth moving machinery under Chinese Loan worth US \$ 32 Million and Provincial Share of Rs 1.60 Million ;
- Restoration of Existing main drains and sub-drains including rehabilitation of banks ;
- Re-sectioning of Dhoro Puran and rehabilitation of banks including removal of encroachments near Jhudo Town ;
- Bank protection with stone pitching of vulnerable sections, bridges and crossings ;
- Construction of Temporary pumping station to drain out rain / storm water from stagnant areas ;
- Identification of encroachments along existing Dhoras and their removal ;
- Identification of obstacles along road network and railways crossings etc.
- Engagement of Consultants and detailed design works for Master Planning as Long-Term Measures.

4.2 Long-term Measures:

- Remodeling and enhancing the discharge capacity of existing drainage network on the basis of 20 years frequency period ;
- Construction of additional drains including towns / cities to discharge into existing Dhoras ;
- Construction of an independent natural Dhoras Network and Syphons across Main Drain for diversion of flows into Dhora Puran (Shakoor Dhand) in order to off-load LBOD System.
- Construction of out-fall structure along KPOD to control tidal impact and sea water intrusion.
- Remodeling of weirs and increasing size of inlets and culverts etc.
- Diversion of storm-water to Dhands of Thar desert such as Kakao, Kalankar and abandoned Dhoro Puran and like others.
- Identification of natural depressions, their strengthening and construction of raised platforms to settle displaced people.
- Other essential necessary works.

5. Meteorological Causes of 2011-Rains / Floods

During Monsoon Season 2011, the Area Weighted Rainfall all over the country was recorded as 236.5 mm against the Normal figure of 137.5 mm (72% increase). Sindh received 444 mm against the average/normal rainfall of 127.5 mm. Punjab experienced 349 mm rainfall against the average normal figure of 236 mm. Similarly, Khyber Pakhtunkhwa got 249 mm rainfall against the average normal rainfall of 225 mm, whereas Balochistan received averagely 82 mm rains against average figure of 59 mm. In the month of July, 2011, the country received below normal monsoon rains. However, in 2nd week of August a strong weather system entered in the southeastern parts of Sindh Province from the Indian states of Rajasthan and Gujarat and gained further strength with the passage of time, which caused heavy downpours. The four weeks of continuous rains created severe flood situation in Sindh, especially southeastern parts of the province.

The abadies, private and public property and standing crops in Sindh province were badly damaged. The unprecedented monsoon rains from 10th August to 2nd September 2011 caused loss of human lives, standing crops, houses, infrastructure, etc. The highest ever recorded monsoon rains in Sindh displaced hundred thousands of people, besides destroying million of acres of cropped land. The District Badin received record breaking rainfall of 615 millimeters during the monsoon spell breaking earlier recorded 121 millimeters in Badin in 1936. The area of Mithi also received record rainfall of 1,290 millimeters against the previous maximum rainfall of 114 millimeters in 2004.

The heavy rainfalls recorded in Sindh province in the months of August and September 2011 are given in **Table-1**.

**Table-1
Torrential rainfall recorded in August and September, 2011 in Sindh**

City	Rainfall in mm		
	August 2011	September 2011	Total
Mithi	530*	760*	1290*
Mirpur Khas	263.1*	603*	866.1*
Shaheed Benazirabad	275.2*	353.2*	628.4*
Badin	331.2*	284.1	615.3*
Chhor	276	268	544*
Dadu	134.1	348.1	482.2*
Padidan	251.2	172	423.2*
Hyderabad	162.2	244.2	406.4
Karachi	61.2	212.2	273.3

* Indicates new record.

Source: PMD

6. Country-Wide Losses / Damages due to 2011 Rains / Floods

The 2011-rains/floods affected an area of about 6.812 million acres (23 Districts in Sindh, 12 in Punjab and 1 in AJK) affecting 38,700 villages, claiming about 516 lives, damaging 1,598,629 houses and cropped area of about 2.311 million acres and population of about 9.303 million has been affected. Province wise detail of losses / damages is given in **Table-2**. District-wise detail of flood damages caused due to 2011 Rains/Floods in Sindh Province is also given in **Table-3**.

Table-2
COUNTRY-WIDE LOSSES/DAMAGES DUE TO RAIN/FLOOD 2011

Province/ Region	Villages Affected	Persons Affected	Area Affected (Acres)	Cropped Area Affected (Acres)	House Damaged	Persons Died	Persons Injured	Cattle Heads Perished
Punjab	335	26393	136758	125513	1284	4	17	Nil
Sindh	38347	9275568	6674859	2184951	1596807	497	753	116529
Khyber Pakhtunkhwa	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Balochistan	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
FATA	15	671	439	310	534	3	Nil	1209
Gilgit- Baltistan	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
AJ and K	3	170	4	Nil	4	12	Nil	Nil
G. Total	38700	9302802	6812060	2310774	1598629	516	770	117738

Table-3
LOSSES/DAMAGES IN SINDH PROVINCE DUE TO RAIN/FLOOD 2011

District	Villages Affected	Persons Affected	Area Affected (Acres)	Cropped Area Affected (Acres)	House Damaged	Persons Died	Persons Injured	Cattle Heads Perished
T.M Khan	2835	585411	390997	78038	72935	17	24	187
Sh. Benazir Abad	4104	900000	-	290000	200000	41	82	22646
T. Allahyar	1609	569829	369685	81645	70163	3	5	197
Mirpur Khas	3178	705151	819833	171522	118110	61	230	12280
Thatta	901	178011	225738	64293	15693	23	15	131
Hyderabad	681	377992	113333	26227	20644	17	27	32
Badin	6395	1021301	984805	375,718	382562	73	10	10060
Matiari	415	109629	160970	83739	32803	25	28	1101
Umerkot	3769	821,581	927966	108303	122103	31	7	18824
Tharparker	2284	907179	51782	12647	178356	28	9	30623
Shikarpur	0	0	0	20218	0		0	0
Khairpur	2075	384137	323924	182891	29023	25	65	327
Dadu	1454	325000	187811	97,248	18594	19	51	161
Jamshoro	614	97350	30,086	39,133	43950	16	11	83
Sanghar	5182	1237432	927201	356473	213928	39	93	19040
Jacobabad	0	0	0	3594	0		0	0
Karachi	0	4	0	0	5	25	8	9
N' Feroze	437	671499	698434	73660	31455	26	50	512
Ghotki	1361	172067	258661	68,679	31630	11	19	1
Kamber	543	145030	150600	4192	7439	6	15	219
Kashmore	102	12610	40240	14532	1620	4	3	4
Larkana	408	54355	12793	5396	5794	6	1	92
Sukkur	0	0	0	26803		1	0	0
G. Total	38347	9275568	6674859	2184951	1596807	497	753	116529

Source: Sindh Provincial Disaster Management Authority

7. 2011-Rains / Flood Damages Need Assessment

The post rains/flood damages need assessment report-2011 related to Irrigation, Drainage and Flood Protection Infrastructure as received from PID Sindh indicates that around Rs. 6.00 billion would be required for restoration of Irrigation Drainage and Flood Control Structures damaged during 2011-Flood season. Sector wise summary of damages assessment for Sindh province is given in **Table-4** below.

Table-4
SECTOR WISE SUMMARY OF DAMAGES ASSESSMENT FOR SINDH

Currency Exchange Rate; 1US\$= Rs 87.00

Structure Description							
Divisions	Canal / Water Channels	Drains and Appurtenant Structures	Flood Protection Embankments	Building etc	Others	Division Wise Total	
						(M.Rs)	US Dollars
Rohri	189	-	83	65	-	337	3.9
Nasrat	229	-	-	21	-	250	2.9
Dad	155	-	13	13	-	181	2.1
Hala Irr	41	-	110	10	-	161	1.9
Nasir	318	-	-	21	64	403	4.6
Barrage	50	-	-	58	-	107	1.2
Khairpur West	298	-	-	35	-	333	3.8
Khairpur East	362	-	-	40	-	402	4.6
Mirpur	117	15	-	40	-	172	2.0
Ghotki	154	33	-	75	-	263	3.0
Tubewell	-	15	-	120	-	135	1.5
Jamrao	245	370	-	13	-	628	7.2
Mithrao	159	-	-	28	-	187	2.1
Thar	173	85	10	51	-	318	3.7
Drainage Sang	-	233	-	32	-	264	3.0
Warah	72	-	16	15	-	102	1.2
Saifullah Magsi	41	-	11	6	-	57	0.7
Shahdad Irr	46	-	-	30	-	76	0.9
Rice Canal	102	-	13	4	-	119	1.4
Northern Dadu	24	-	32	-	-	55	0.6
Southern Dadu	60	-	132	27	-	219	2.5
Shahbaz Irr	5	-	4	1	-	9	0.1
Akram Wah	118	-	-	43	-	161	1.8
Fulleli	190	-	-	26	-	216	2.5
Guni	129	-	-	24	-	153	1.8
Drainage Badin	0	702	-	19	-	721	8.3
Structure Wise Total	3,278	1,453	422	812	64	6,029	69.3

8. Actions Needed

Provincial Irrigation Departments and Federal Line Agencies may execute the remaining 2010-Floods damages rehabilitation/remodeling works on top priority basis, so as to ensure completion well before the start of monsoon season 2012. All urgent nature new flood projects as well as O and M works of flood protection infrastructure may be completed on priority basis before start of Flood Season 2012.

SIDA / PID Sindh may carry out the restoration and strengthening work of irrigation, drainage and flood protection infrastructure damaged during Monsoon Season 2011 on fast track basis to make the system ready for next monsoon season. The encroachments in flood plains and waterways / drains may be removed by the PID Sindh / SIDA with the help of Districts Administration in order to enhance the discharge capacity of drains and minimize the loss of human lives and damages to the property in future floods. SIDA/PID Sindh may also carry out feasibility studies for long-term measures / permanent solution of drainage problem in order to avoid 2011 like situation in future. The following options may be given due consideration, while formulating proposal ;

- Remodeling and enhancing the discharge capacity of existing drainage network on the basis of torrential rains experienced during Monsoon Season 2011;
- Construction of additional drains, wherever needed;
- Construction of an independent natural Dhora Network and Syphons across Main Drain for diversion of flows into Dhora Puran (Shakoor Dhand) in order to off-load LBOD System.
- Construction of out-fall structure along Kadhan Pateji Outfall Drain (KPOD) to control tidal impact and sea water intrusion.
- Remodeling of weirs and increasing size of inlets and culverts etc. constructed across drains;
- Diversion of storm-water to Dhands of Thar desert such as Kakao, Kalankar and abandoned Dhoro Puran etc.
- Identification of natural depressions, their strengthening for enhancing their storage capacities and identification of accessible high elevation areas for settlement of rain/flood affectees in future floods.

References:

The information provided in the paper has been received from the following key stakeholder organizations:

1. Pakistan Meteorological Department, Islamabad.
2. Water and Power Development Authority, WAPDA house, Lahore.
3. National Disaster Management Authority, Islamabad.
4. Irrigation Department, Government of the Punjab, Lahore.
5. Irrigation and Power Department, Government of Sindh, Karachi.
6. Irrigation Department, Government of Khyber Pakhtunkhwa, Peshawar.
7. Irrigation and Power Department, Government of Balochistan, Quetta.
8. Public Works Department, Gilgit-Baltistan, Gilgit.
9. Directorate of Irrigation and Small Dams, Government of Azad Jammu and Kashmir, Muzaffarabad.
10. Director, Irrigation and Hydel Power, Civil Secretariat, FATA, Peshawar.