

**RAINFALL DELUGE MANAGEMENT –  
A CASE STUDY OF SINDH PROVINCE IN PAKISTAN**

By

**Muhammad Idris Rajput**

**I. INTRODUCTION**

Starting from 9<sup>th</sup> of August, 2011 and continuing upto 15<sup>th</sup> of September 2011, Sindh received unprecedented rainfall specially on left bank of Indus. The total intensity of rainfall recorded in five districts on left bank during August and September, 2011 was as under:-

|                    |   |
|--------------------|---|
| Nawabshah          | 628 m.m against old record of 208 m.m in year 2006  |
| Mirpurkhas         | 866 m.m against old record of 296 m.m in year 2006  |
| Hyderabad          | 406 m.m against old record of 375 m.m in year 2006  |
| Tharparkar (Mithi) | 1346 m.m against old record of 320 m.m in year 2010 |
| Badin              | 615 m.m against old record of 263 m.m in year 2006  |

The rain water accumulated in depth of 4-8 ft in cities, towns, villages and agricultural lands and continued to stand there resulting in loss to standing crops, disruption of communication system, displacement of people and suspension of all economic activity. The draining of rain water was very slow which not only destroyed Kharif crops but also raised fears of not sowing Rabi crops. Everybody was worried why rain water was not draining effectively even after several days of rainfall.

**II. DRAINAGE SYSTEM AVAILABLE**

The rainfall was most severe on left bank of Indus in lower Sindh. The left bank is commanded by Nara and Rohri Canals of Sukkur Barrage and Fuleli, Pinyari and Akram Wah of Kotri Barrage. The surface drainage system available in Rohri and Nara Canal commands is LBOD stage-I with three units of Nawabshah, Sanghar and Mirpurkhas, Spinal Drain, Kandhan-Pateji Outfall Drain (KPOD) which discharges into sea and Dhoro Puran Outfall Drain (DPOD) which discharges into Shakoor Dhand (lake). The surface drainage systems available in Kotri Barrage command are as under:-

- (i) Karo Gungro Outfall drain.
- (ii) Nagan Dhoro Outfall drain.
- (iii) Khui Gharo outfall drain.
- (iv) Ghora Bari outfall drain.
- (v) Jam Sakro outfall drain.
- (vi) Kadhan Pateji outfall drain.
- (vii) Jati outfall drain.

The LBOD system is designed for 125 mm rainfall over 5 days with a flood duration of 5 days generating 1.8 cusecs water per square mile and providing depth of 1 foot on lands. The Kotri barrage system is designed differently for non-perennial and perennial areas. For non-perennial areas it is designed for 200 m.m rain falling for 5 days and to be drained in 15 days. The run off generated is 2 cusecs per square mile.

For perennial areas it is designed for rain of 250 m.m falling for 5 days to be drained in 15 days. This generates 4 cusecs of water per square miles of land.

For hilly areas the design is for a 250 m.m rain falling for 5 days to be drained in 7 days. The run off works out to be 8 cusecs per square mile.

Except as mentioned above there is no surface drainage system available in canal commands on left bank.

In stage-II project of LBOD following surface drainage units are proposed:-

- (i) Tando Adam Drainage Unit.
- (ii) Tando Muhammad Khan Drainage Unit.
- (iii) Moro Drainage Unit.
- (iv) Khipro Drainage Unit.
- (v) South Khairpur Drainage Unit.
- (vi) Farash Drainage Unit.
- (vii) Digri Drainage Unit.
- (viii) Umarkot Drainage Unit.

### **III. WHY THE SYSTEM FAILED TO DRAIN OUT**

There are two areas on left bank of Indus where unprecedented rainfall occurred in August/September 2011. The areas where there is drainage system and areas where there is no drainage system.

#### **AREAS WHERE THERE IS DRAINAGE SYSTEM**

As mentioned in Chapter-II above the drainage systems are LBOD Stage-I and Kotri surface drainage systems. These are designed for not more than 250 m.m rain falling in 5 days to be drained in 15 days. The rainfall this summer was excessive. In Badin the rainfall on 11<sup>th</sup> and 12<sup>th</sup> August was 297 m.m. and the spell continued for one month. The system drained the runoff to its capacity (of course reduced due to inadequate bed clearance and maintenance). But since rainfall was much more than the design and duration was long it breached, drained water but took more time. Thus the system did not fail, but took more time to drain because of low design capacity and impairment due to improper maintenance. Even if the impairment was not there, it could not drain water in design time as it was not designed for unprecedented rainfall this year (2011).

#### **AREAS WHERE THERE IS NO DRAINAGE SYSTEM**

In areas where there is no drainage system, water got accumulated and did not drain out. This was the situation in Sanghar, Umarkot and Mirpurkhas districts where there was no drainage system. The only possibility to drain these areas was to put the water into existing canals and

connect them to existing drainage system or put into old abandoned natural drainage routes. However, canals are at higher level than lands these feed and water had to be pumped into them and connecting channels were dug to put them into abandoned drainage routes. Pumping and excavating connecting channels took time. This delayed rainwater evacuation from these areas.

#### **IV. CAUSES OF DELAY**

1. The disaster was unprecedented.
2. It was beyond the capacity of the organizations in-charge i.e. SIDA and Sindh Irrigation Department.
3. Because of absence of this type of disaster since long, system was not maintained properly.
4. Drainage system was designed for not more than 250 m.m of rain falling for 5 days to be drained in 15 days. The rainfall was much more than designed so disposal time increased.
5. Timely arrangements were not made.
6. Influential people inter-fered with new disposal arrangements, by not allowing cuts through their lands.
7. Delay occurred in deciding who should evacuate water from fields.
8. Delay occurred in deciding who should provide pumps, who should operate them and who should provide POL.

#### **V. MITIGATION MEASURES**

Rainfall deluge of August / September 2011 created an emergency situation which could not be managed properly. There should have been a “Contingency Plan” and an “agency” to implement this plan. There are NDMA and PDMA but these are organizations having contingency plan inadequate to implement it. SIDA, the in-charge organization, lacks management skills and expertise to face the emergency situation. SIDA should prepare a more specific contingency plan and should be responsible for its implementation. Similarly district administration should have their own contingency plan in line with PDMA and SIDA so that they have not to wait for instructions further.

The drainage tubewells in LBOD drainage area should be maintained and operated as per design criteria of keeping sub soil water level 5-7 feet below ground so that some quantity of standing rain water is absorbed through infiltration.

Carrying capacity of existing drainage system should be enhanced to take care of increased rainfall intensity. Existing escapes on canal system should be maintained properly and their capacities be increased for increased discharges in canals. Ring bunds should be constructed around towns which are likely to be inundated by flow of rain water from adjoining areas.

Gates should be provided in sub-drains and branch drains which outfall into LBOD to control back flow. Abandoned natural waterways should be reactivated to dispose rainwater through them to sea.

Drainage cover should be provided in areas where there is no drainage at present.

**VI. REVIVAL / ACTIVATION OF ABANDONED NATURAL WATERWAY (DHOROS)**

The present drainage system is of recent origin, whereas monsoon rains have been falling prior to construction of present drainage system. How rain water used to be drained then?

Prior to development of weir controlled irrigation system in Sindh and river bunds, River Indus used to meander at its sweet will through various branches in Sindh.

These river branches were curtailed / blocked after development of weir controlled Irrigation system and river bunds. However, these formed natural drainage routes for disposal of rain water. With development of society and increase in population, these natural drainage routes were encroached upon or blocked by people for extension of existing towns, construction of villages and agricultural development etc. Parts of Digree, Naukot and Jhuddo towns are constructed in these natural waterways.

The drainage system developed is not rain specific. It is meant for disposal of excess irrigation water and rain water disposal is for very meager amount. Thus rain water disposal is a side benefit of drainage system.

The type of rainfall deluge we are having now, requires us to activate these old drainage routes. The main waterways are Dhoro Puran, Sohni Dhoro, Hakro Dhoro and Dhoro Naro.

**VII. RECOMMENDATIONS**

Short term and long term measures should be taken. Short term measures mean actions to be taken before next rainy season. Long term measures mean actions to be taken beyond next rainy season.

**SHORT TERM MEASURES**

- (i) Drainage system should be revamped.
- (ii) Contingency plan should be prepared by SIDA and Irrigation Department.
- (iii) Agency to implement the plan should be identified.
- (iv) Agency identified should be given authority and funds to implement the plan.

**LONG TERM MEASURES**

- (i) Present drainage system should be augmented to face present rainfall deluge.
- (ii) Blocked natural drainage routes should be reactivated.
- (iii) Drainage cover should be provided to areas where there is no drainage system.



