DISASTROUS EFFECTS OF RAIN 2011 IN SINDH, PAKISTAN

By

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SUMMARY

Monsoon in Pakistan generally starts from July to September. Due to climate change effect the rain 2011 in Sindh started from mid August and lasted till mid of September which not only started late but was unprecedented. The most hit areas were on the left side of the Indus River where drainage system was incapable to transport the runoff timely. Due to heavy rain and inefficient drainage system, almost half of the districts of Sindh were severely affected where around 500 people died, 5.3 million people paralyzed, 1.5 million houses damaged and 1.5 million cropped area devastated.

In order to manage such unprecedented rain water and floods a holistic approach is considered the most effective that is the integrated water resources management (IWRM). IWRM is a process which promotes the coordinated management and development of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems" (GWP 2000).

GENERAL INTRODUCTION

Sindh is the second most populous province in Pakistan. With a growth rate of 2%, total population is estimated at 34.231 million in 23 districts of Sindh. The climate of the Sindh is arid and hot. Except year 2010, 2011 and 2012, the average yearly maximum rainfall was between 100-200 mm and winter rainfall is less than 25 mm. The temperature varies between minimum 6 to maximum 53^0 C. The cold season extends from December to February.

The monsoon season, July to mid September, is characterized by comparatively low daytime temperatures due to considerable increase in clouds in the coastal areas and high humidity (over 60% in the south and 50% in the north).

In Pakistan Western Disturbances mostly occur during the winter months and cause light to moderate showers in southern parts of the country while moderate to heavy showers with heavy snow fall in the northern parts of the country. These westerly waves are robbed of most of the moisture by the time they reach Pakistan. Southwest Monsoon occurs in summer from the month of June till September in whole Pakistan excluding western Baluchistan, FATA, Chitral and Gilgit-Baltistan. Monsoon rains bring much awaited relief from the scorching summer heat. These monsoon rains are quite heavy by nature and can cause significant flooding, even severe flooding if they interact with westerly waves in the upper parts of the country.

The flood 2011 in Sindh province, Pakistan began during monsoon season in mid August 2011, resulted in heavy rain in Sindh, eastern Baluchistan and southern Punjab. This heavy rain caused catastrophic flood in the province and caused damages in which approximately 500 civilian lost their lives, about 5.3 million people and 1,525,000 houses affected.

Sindh is a fertile region and often called the 'bread basket' of the country; the damage and toll of the flood on the local agrarian economy is extensive. At least 15 million acres of land was inundated as a result of the flooding.

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The 2011 flood not only caused heavy damages, but also exposed the shortcomings of existing drainage system on the left bank of river Indus in Sindh Province.

CONCEPTULIZATION OF INTEGRATED FLOOD MANAGEMENT

Integrated water resource management involves integration:

• Across the catchment

• Between land and water management

• Between the different uses and functions of water management.

This is challenging to say the least, not least because in human terms, catchments are arbitrary units, varying greatly in size and whose boundaries do not coincide with traditional cultural, religious, political and ethnic boundaries. Actually achieving IWRM will, therefore, be difficult but we can gain significant insights into flood risk management just from thinking in these terms (Technical Support Unit 2003). I argue that adopting an IWRM framework will change:

• How we think about floods

• How we make choices as to what to do

• What options we seek to adopt

• How we implement those options

Seasonal changes are the obvious example of cyclical variation and the cyclical variation in both rainfall and river flows relative to the crop demand for water are key aspects of water management. But there are also signs of other forms of cyclical variation. Kiem et al (2003) have shown that the South Pacific Oscillation has a marked influence on the risk of flooding in Australia and Werrity (2003) has found that the North Atlantic Oscillation has similar effects on the risk of flooding in Scotland.

Climate change is one trend change but others include change in land uses as well as changes in the form of the river. Moreover, in making choices we are setting out to choose the future, to change the future from that which would otherwise occur. The changes to be expected in China over the next fifty years as the economy grows are enormous; the movement of the population into urban areas being the largest migration in human history.

When a failure threatens, whether this is from an extreme flood or other reason, we do not give up but seek frantically to prevent failure. Indeed, in the case of dikes, the real choice is whether to raise them when they are built or to raise them temporarily when a flood threatens. We need therefore to think about what we will do in such an event. We are also likely to prefer interventions that fail slowly rather catastrophically and with plenty of warning, as well as it being possible to raise their performance in an extreme event (Green 2002).

CATROSTROPHIC EFFECTS OF RAIN 2011

Generally, monsoon begins in July-September which greatly supports to rain-fed areas of the province and helps to irrigated areas as additional source of water specially tail ender's which are always short of water during Kharif season. The shift of monsoon from the month of July to mid August damages to crops in canal command area and delays to crop cultivations in rain-fed areas.

Figures 1 and 2 clearly show that in Sindh there was no rain in the month of July but heavy rain fall started in mid August which ended in the mid September. However, the worst areas affected were districts Nousheroferoze, Shaheed Benazirabad, Sanghar, Mirpurkhas, Tando Mohammad Khan, Badin and Thatta. These districts received rain from 400 mm to nearly 800 mm which is exceptionally high and recorded history of 200 years. Due to incapable of drainage system the rain water stayed long time which paralyzed the human life of the province.

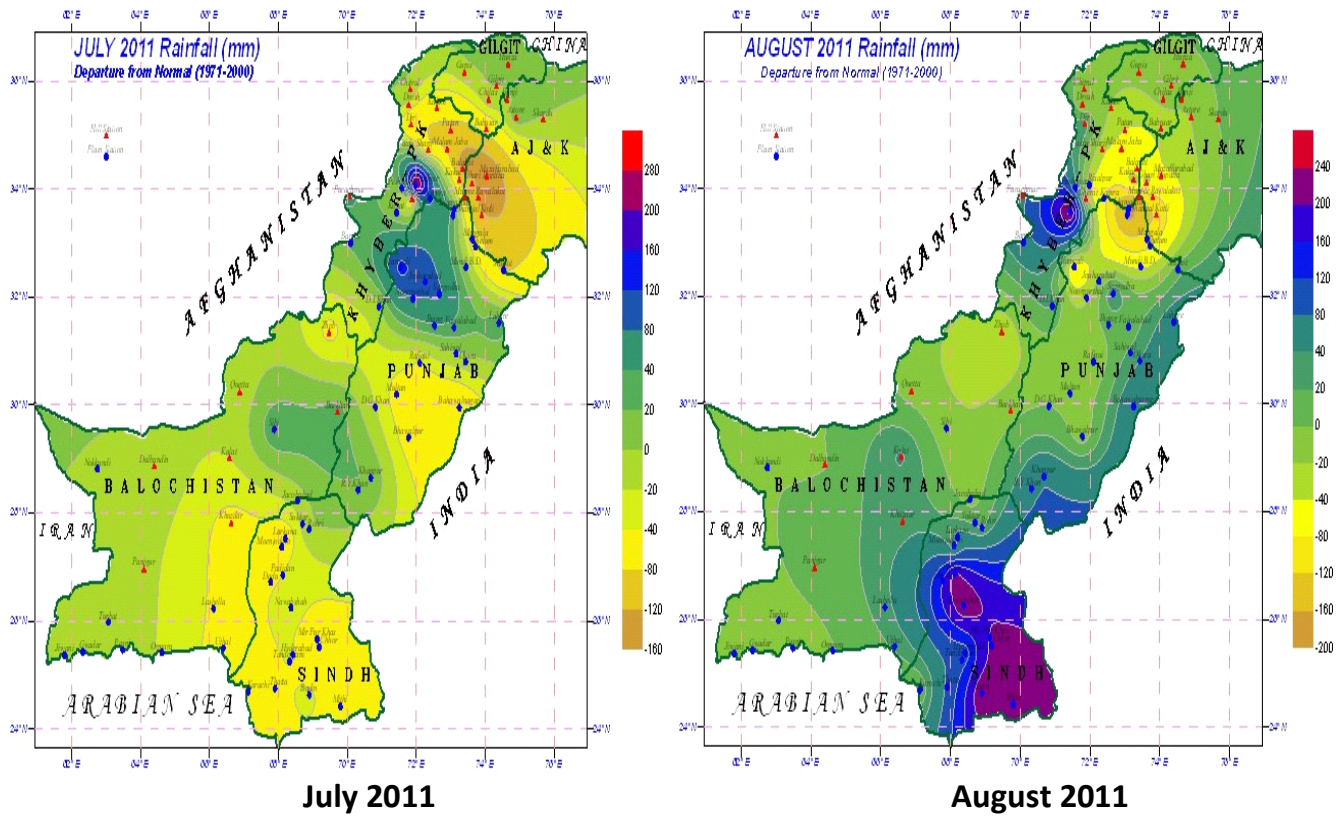

Figure 1: Monsoon rain 2011 in Sindh

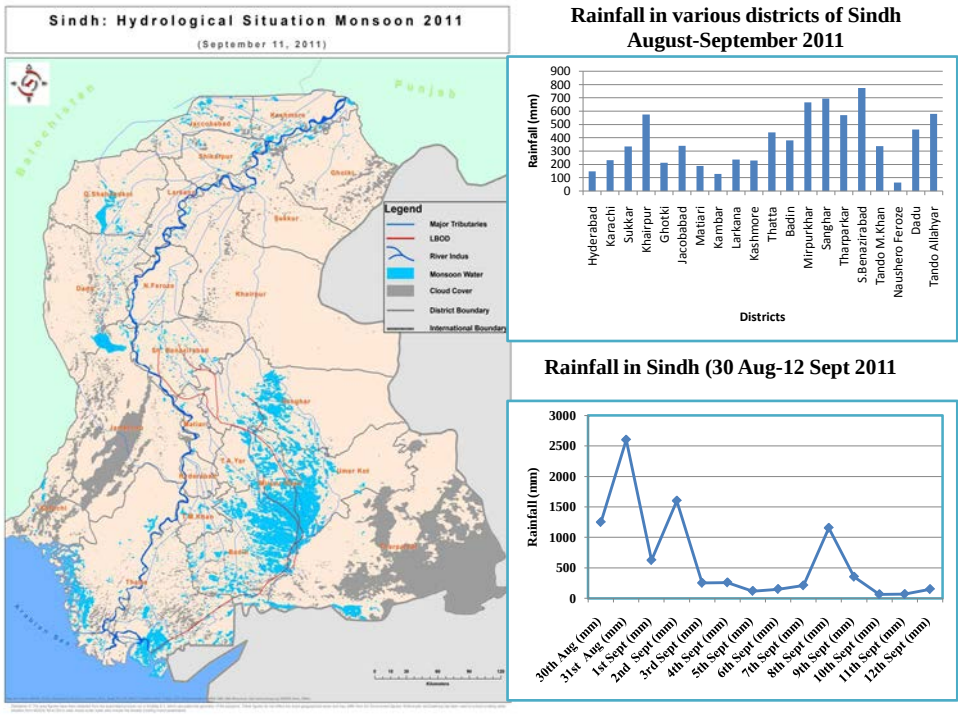

Figure 2: Monsoon water standing in lower part of Sindh.

Figure 3 explains that only area of four districts of left side of the lower Indus River area covered by the network of LBOD system and Figure 4 indicates the route of LBOD which is only source of disposed of the rain water on the left side of the lower Indus Basin – below Sukkur Barrage. The LBOD was designed based on 50 mm rainfall considering 5-year recurrence interval. Due to heavy rain fall 2011, several breaches were occurred in LBOD surface drainage system. It is imperative that such heavy rains cannot be timely disposed of through this insufficient and incapable drainage system. This is very clear indication that without agriculture drainage neither agriculture nor human life can be protected from these rain floods.

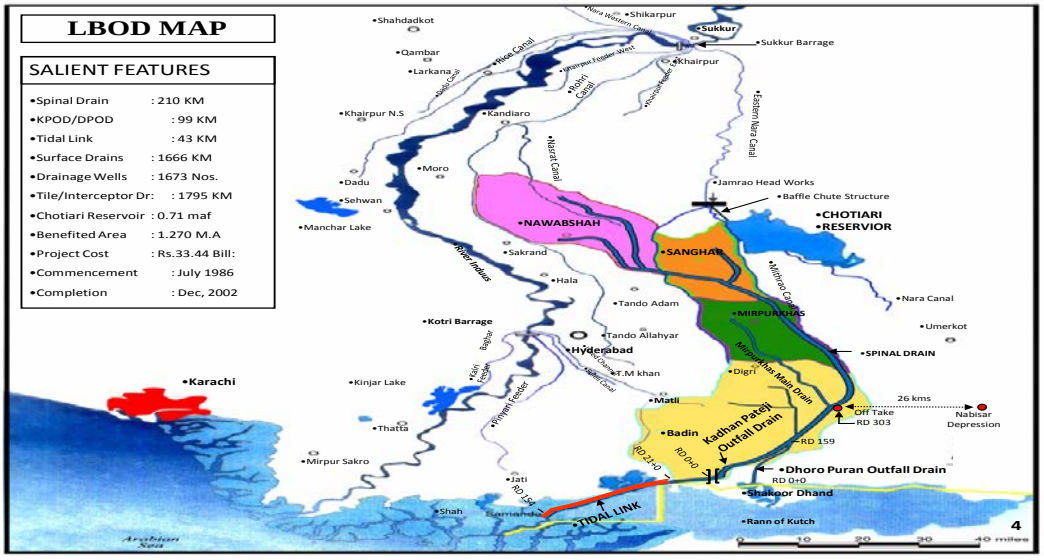

Figure 3: Left Bank Outfall Drain-the only drain on upper part of left bank of lower Indus.

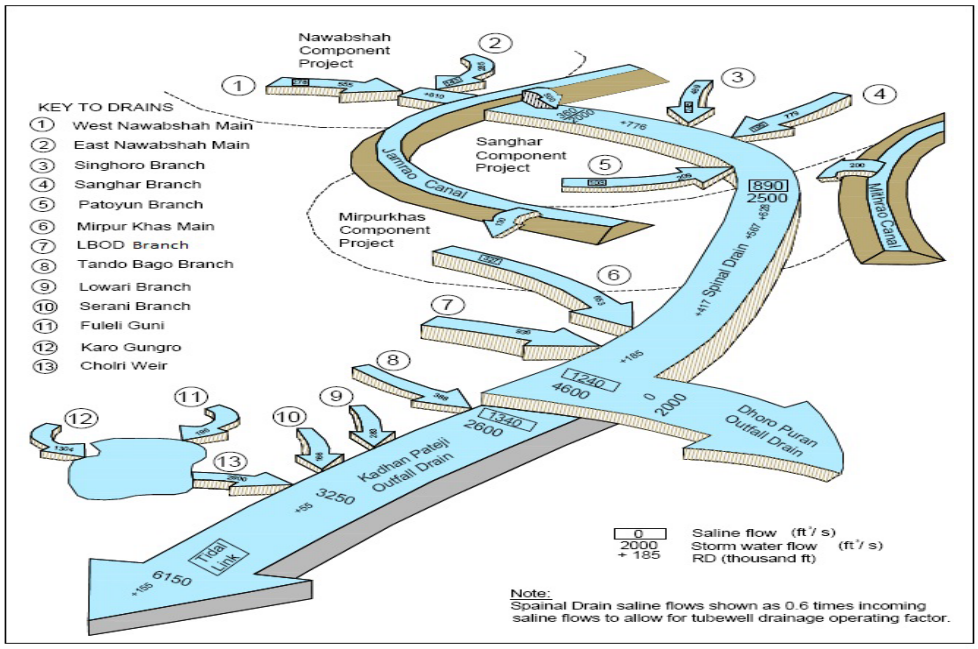

Figure 4: Drainage route of LBOD to Sea

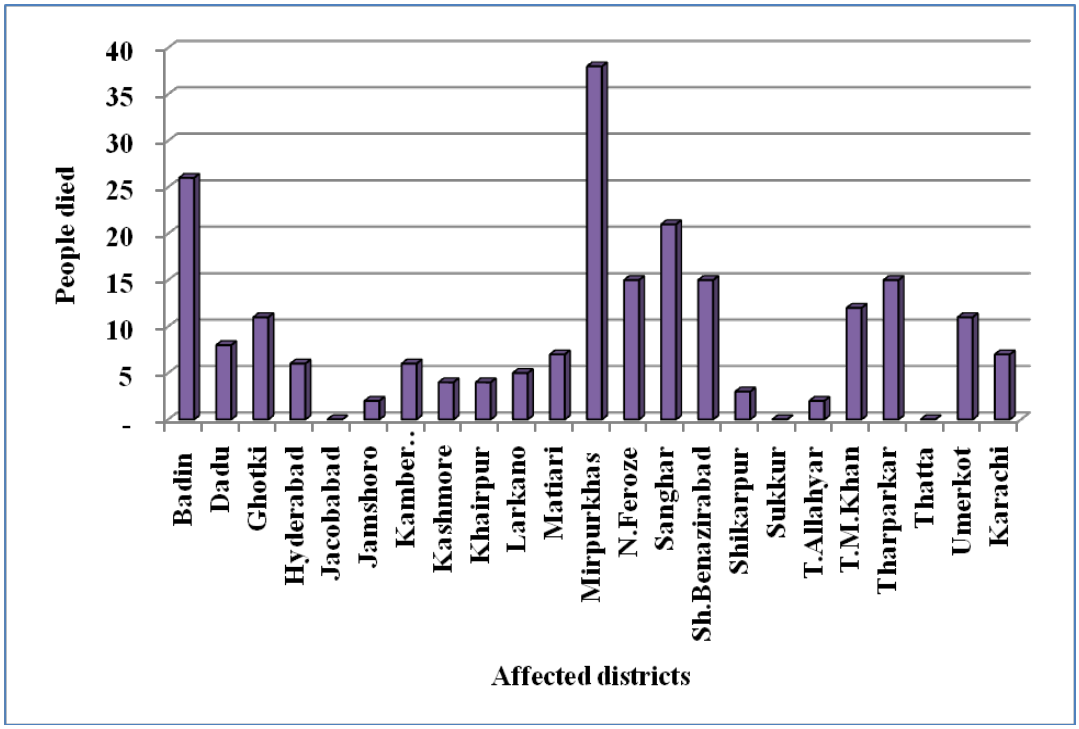

Figure 5: People died in various districts of Sindh.

Figure 5 describes the death of people in various districts of rain hit areas of Sindh. The major casualties were occurred in districts Badin, Mirpurkhas, Sanghar, Tharparkar, Benazirabad and Nousheroferoz. Badin, Mirpurkhas and sanghar were the most affected areas because the LBOD was the only source of rain water disposal line which became the dangerous way of human life due to its incapable and inefficient function.

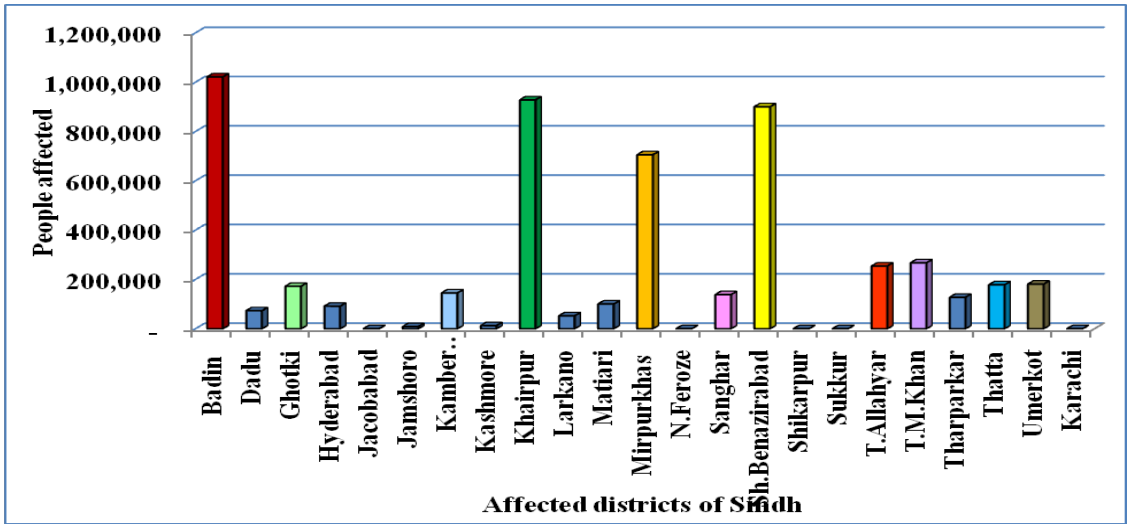

Figure 6: People affected due to disastrous rains 2011.

Figures 6 and 7 clearly show that seven districts viz-a-viz Badin, Khairpur, N/Feroz, Benazirabad, Mripurkhas, Sanghar and TandoAllahyar were seriously affected. This catastrophic flood not only hit these districts but also paralyzed whole province of Sindh. Consequently, approximately 500 civilian lost their lives, about 5.3 million people and 1,525,000 houses affected. Figure 6 also gives picture of fully and partially damaged houses and categorizes the areas severely and moderately affected due to this unprecedented rain 2011.

Sindh is a fertile region and often called the 'bread basket' of the country; the damage and toll of the flood on the local agrarian economy is extensive. At least 1.5 million acres of land was inundated which resulted in zero production from many areas of the province.

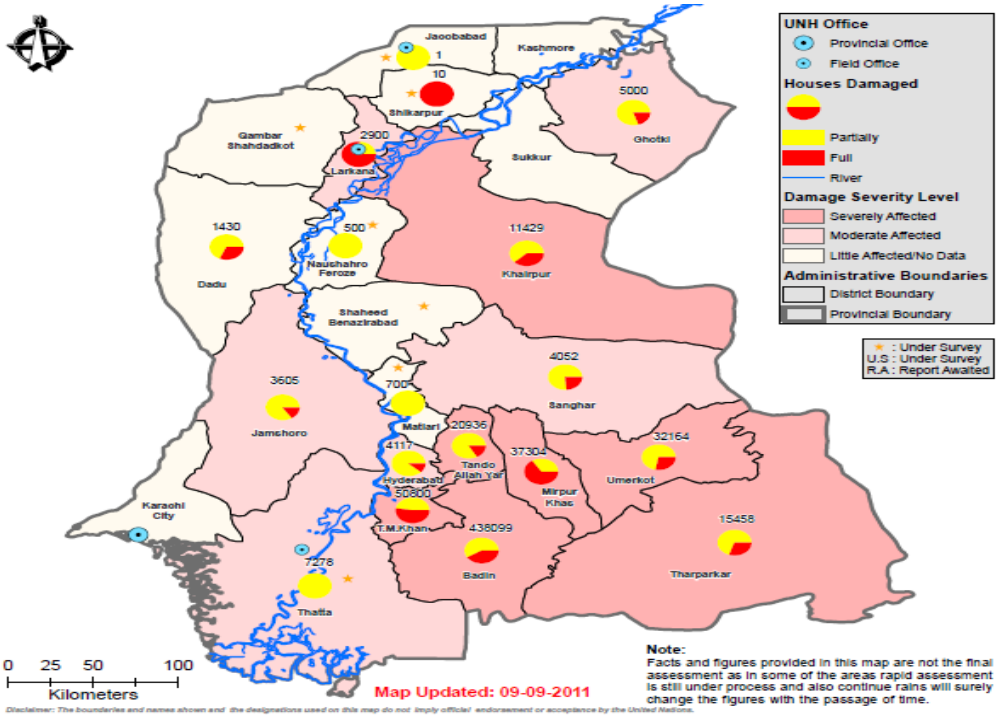

Figure 7: Damages to properties in 2011 rain of Sindh.

Rural Sindh is mostly dependent on agriculture and livestock. More than seventy percent population is directly involved in agriculture crop cultivation. Especially women are the main who work in agriculture field and give more time to the field. Rain 2011 devastated the agriculture field and the crops. Figure 8 shows that most of the area of all affected districts was directly under the influence of rain water. The most affected districts were Badin which is tail of LBOD system, Sanghar, Thatta, Khairpur, Benazirabad and Mirpukhas. Though these districts have the advantages of drainage system but it is incapable and inefficient.

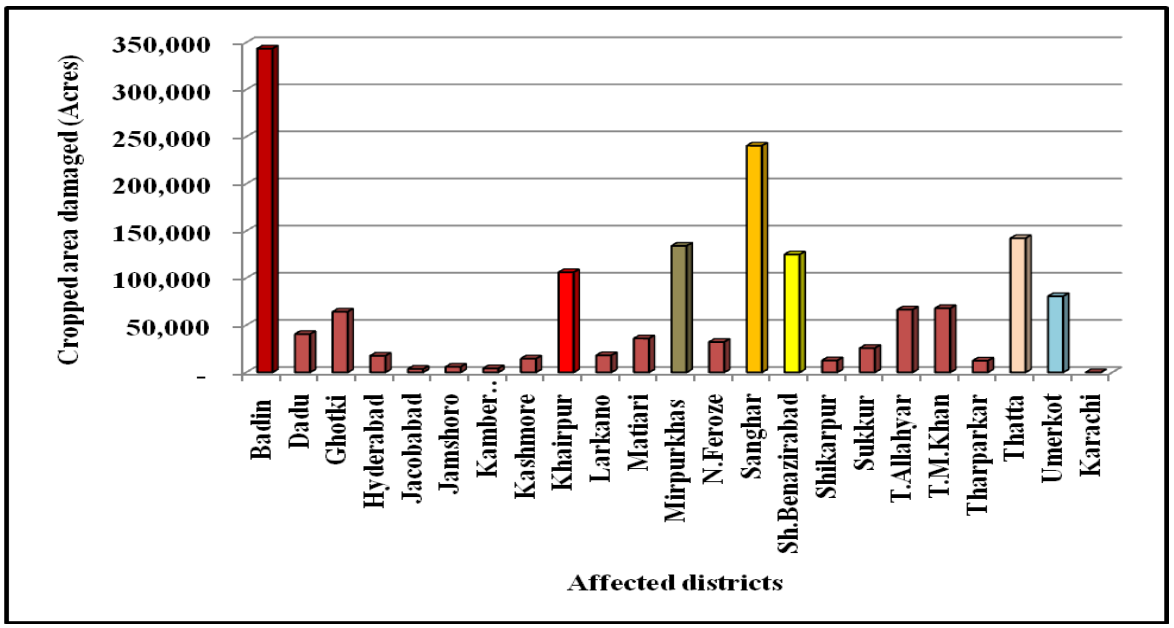

Figure 8: Cropped area damaged in various districts of Sindh.

Table 1: Estimated flood volume of water in various districts of Sindh.

District	Total Rainfall (mm)	District Total Area (Sq.km)	Inundated Area (Sq.km) (Approx)	Flood Volume (MAF) (Approx)
Shaheed Benazirabad	640	2553	700	0.5
Badin	680	6889	2800	0.8
Mirpurkhas	810	2946	600	0.25
Thatta	250	18267	3200	0.4
Hyderabad	400	5544	500	0.33
Tando M.Khan	375	1541	300	0.15
TOTAL		37740	8100	2.43

Table 1: An estimate of ponding / standing water was made for about six districts which received more rain. The total 2.43 MAF of water was calculated. To evacuate timely this huge amount of water requires effective and capable network of drainage system. This is point of concern that the sindh province lies in flat gradient and of very less drainage network. This rain fall has set the directions and lessons learnt for the engineers and planners to work on it and develop a comprehensive strategy by looking into technical, environmental and social dimensions.

CONCLUSIONS AND SUGGESTIONS

CONCLUSIONS

Due to climate change and monsoon shift pattern the 2011 rain fall in Sindh started from mid August to September; though monsoon period is July- September, which disrupted half of the area of Sindh Province. The damages to life, property and livelihood including agriculture and livestock were beyond the capacity of the people.

- The rains 2011devastated mainly left side districts of lower Indus Basin: Tharparkar, Badin, Shaheed Benazirabad, Mirpurkhas, Tando Mohammad Khan, Tando Allahyar, Badin and Khairpur of Sindh province;

- An estimated approximately 500 civilian lost their lives, about 5.3 million people affected 1.2 million houses damaged (partially/fully) and 1.6 million cropped area damaged; and

- The 2011 flood not only caused heavy damages, but also exposed the shortcomings of existing drainage system on the left bank of river Indus in Sindh Province.

The left side of the lower Indus Basin (Sukkur to Sea) consists of: Left Bank Outfall Drain (LBOD- which covers districts Benazirabad, Sanghar, Mirpurkhas and Badin) and Kotri Surface Drainage System. The capacity of these drains is to drain out runoff of only 50 mm rain water whereas the rain 2011 was above average 500 mm and the land gradient of the Sindh Province is flat. Due to insufficient and incapable drainage system, the following major problems were noticed.

- Timely flushing out of rain water from the agriculture land to disposal point and, therefore, large areas were remained uncultivated for the Rabi season;

- Overtopping and breaches on most of the surface drainage system;

- More than 32 breaches were recorded along tail reaches of irrigation canals; and

- Poor maintenance of drainage system and blockage (encroachment) of natural waterways by local community caused slow evacuation of rain water. Consequently, aggravated the situation.

It is also concluded that more uneven distribution of monsoon rains and same or even more rainfall, but in shorter more intense bursts, like August 2010 and 2011 rain in the future may occur. Thus "Rivers can't cope with all that water in such a short time. If similar type of floods comes in future – and that is uncertain – the flood misery for the people of Pakistan may be more. Thus, there is urgent need to look into the following suggestions.

SUGGESTIONS

Basin Flood management

This plan should be sustainable in terms of ecology, economic and technically. To protect life and property from flood risks and to enhance the capability of socio economic development in the flood plains to realize the development vision in a basin through Integrated Flood Management (IFM).

Therefore, Basin flood management planning should reflect the overall vision and policy of IWRM with especial attention on the management of floods. The policy has to be aligned to the water resources development and management

Integrated Flood Management Plan

The integrated flood management plan should have close relationship between:
water resource management, river management, land use management, forest management, erosion control, agriculture, Environment, Ecology, urban drainage and sewerage within a basin.

Therefore, flood management measures should take into account the entire basin from upstream to downstream.

Integrated Water Resources Management (IWRM)

Integrated water resources management is a systematic process for the sustainable development, allocation and monitoring of water resources use in the context of social, economic and environmental objectives. This promotes coordinated management of land and water, the river basin and upstream and downstream interests. Water resources are increasingly under pressure from population growth, economic activity and intensifying competition for the water among users. It also promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. Thus, simultaneous consideration should be given to: Watershed and water bodies; Hydrology, hydraulics, environment, Surface and groundwater, Quantity and quality, policy and socio-economics, Multiple sectors, stakeholders, and decision makers.

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