

# Pakistan: Flood Impact Assessment

Severe monsoon rains triggered floods in southern Pakistan of an unprecedented scale, both in terms of volume and amount of land flooded. Despite forecasts of below-average rainfall, heavy downpours began in mid-August, engulfing all 23 districts of Sindh province<sup>1</sup> and adjoining areas of northern Balochistan province causing damage to crops, infrastructure and human settlements, thus affecting the national economy. The maximum rainfall during the year was from 1<sup>st</sup> July to 30<sup>th</sup> September, 2011. The peak rainfall was received in Mithi, Sindh. Being sandy area the rate of soil infiltration was very high and rate of runoff water was minimal.<sup>2</sup>

In Balochistan, flash flooding as well as overflowing local rivers and irrigation and drainage channels caused damages in 14 districts, the worst of which (5 districts) were confined in the southern and northern parts of the province

According to the World Bank and Asian Development Bank (ADB) Damage and Needs Assessment (DNA) report, approximately, 9.6 million people have been affected in Sindh and Balochistan as a result of the floods; 520 people were killed and more than 1,180 people were injured. The impact of the flooding in 2011 cannot be seen in isolation. In 2010, 20 million people

were affected by the largest floods in living memory<sup>3</sup>, many of the victims of the 2010 floods were still in the recovery phase when the 2011 floods struck. The 2011 floods compounded the damage of the previous disaster.

In severely affected areas, food insecurity and malnutrition were already at critical levels before this year's new wave of rains and flooding. Continuing rains and damaged infrastructure impeded the delivery of aid. Essential infrastructure including roads, bridges and markets had been severely damaged and many remained impassable. A large number of farmers lost their livestock on way to safe havens and through non-availability of fodder and exertion. There was hardly a place in the severely affected area that was free of standing water.

The sector wise breakdown of flood damages and respective reconstruction cost estimates are given in Table-1. These indicate that the agriculture sector received a major blow followed by housing, education, and financial, private sector and industries; economic growth is likely to decline. The minimum reconstruction cost amounts to a total of Rs. 239 billion (US\$ 2747 million).

<sup>1</sup> where cumulative rain fall varied from 400mm to around 1300mm [Source: Rapid Crop Damage Assessment,FAOand Supparco]

<sup>2</sup> The other areas that received excessive rainfall were Mirpur Khas (866mm), Badin (647mm), Shaheed Benazir Abad (650mm), Umerkot (552mm), Dadu (485mm) and Padidan (423mm).

<sup>3</sup> In comparison, the 2011 floods were driven by high intensity unprecedented rainfall on the eastern side of the Indus River. Both events demonstrate changing climate and weather pattern in the region and their intensity of recurrence.

**Table 1: Flood Damages and Reconstruction Cost by Sectors**

Sectors	Damages		Reconstruction Cost	
	Rs. million	US\$ million	Rs. million	US\$ million
Irrigation and Flood Management	4,763	55	9,526	109.5
Housing	85,465	982.4	91,510	1051.8
Agriculture, Livestock & Fisheries	160,107	1840	26,590	305.6
Transport & Communication	26,468	304	33,902	388
Energy	1,240	14	292	3.4
Social & Gender	44	1	65	0.7
Financial, Private Sector and Industries	27,254	313	8,178	94
Education	12,014	138.1	22,589	259.7
Health	1,258	14	864	9.9
Water Supply & Sanitation	1,204	14	1,900	22
Governance	1,953	22	4,768	54.8
Environment	2,763	32	2,874	33
Disaster Risk Management	-	-	1,827	21
Social Protection	-	-	34,126	392.3
Total	324,533	3730	239,011	2747

Source: World Bank and Asian Development Bank (ADB) Damages and Needs Assessment Report 2011.

As mentioned above, despite being substantially lower in intensity, because of their location and timing, the 2011 floods had a significant negative effect on the economy with lingering long term impact.

### Summary of Damage and Needs by Sector Housing

The floods caused total or partial damage to an estimated 998,376 housing units in Sindh and Balochistan. An estimated 514,283 houses have been completely destroyed<sup>4</sup> and another 484,093 partially damaged<sup>5</sup>. Sindh province has suffered the overwhelming majority of damage to housing stock with 99 percent of the total affected housing stock in this province. Out of the 992,679 houses affected in Sindh, 512,462 houses [493,606 kacha houses and 18,856 pucca houses] have been completely destroyed and the remaining 480,217 houses [403,790 kacha houses and 76,427 pucca houses] have been partially destroyed. In Balochistan, the total number of houses damaged is estimated to be 5,697 kacha houses, out of which 1,827 houses have been completely destroyed and

the remaining 3,876 houses have been partially destroyed.

In general, pucca houses have withstood the floods better but have still been vulnerable to collapsing of roofs, undermining of foundations, and scouring/erosion at the base of walls and corners. Furthermore, standing water has subjected submerged portions of walls to hydraulic pressure, often causing walls to overturn or tilt laterally. At places subsidence of the ground under water-logged foundations has resulted in cracking and collapse of walls. For kacha buildings, the impact has often been extreme and irreversible.

The damage to housing structures is estimated at Rs. 85,465 million (US\$ 982.4 million) for completely destroyed and partially damaged houses. The reconstruction cost (completely destroyed and partially damaged houses) is estimated at Rs. 91,510 million (US\$ 1051.8 million).<sup>6</sup>

<sup>4</sup> This primarily includes washed away, fully collapsed, or structurally damaged houses with foundation failure or erosion of supporting walls.

<sup>5</sup> This mostly includes cases of repairable damage.

<sup>6</sup> These estimates are based on replacement of a destroyed house with a core unit of 500 sq. ft covered area, calculated on the basis of currently prevailing prices of materials and labour.

## Health

The floods caused by heavy rains in 2011 resulted in damage to the public health infrastructure in Sindh and Balochistan provinces. Basic health units and rural health centers suffered the most damage; accounting for 74 (52 percent) of the total 141 damaged facilities. In Sindh, of the total of 708 health facilities of various categories in the 11 districts where health sector facilities were affected, 113 (16 percent) were damaged out of which 28 (4 percent) were fully damaged, and 85 (12 percent) were partially damaged. In Balochistan, of the total of 193 health facilities in the 3 affected districts, 28 (15 percent) were damaged out of which 13 (7 percent) were fully damaged and 15 (8 percent) were partially damaged. The damage caused to the health sector in Sindh province constitutes 7 percent of its total health facilities (1,486). In Balochistan; 1 percent of the total health facilities (2,075) were damaged.

The total damage to this sector is estimated at Rs.1,258 million (US \$ 14.3 million). Out of which, the direct losses for all health facilities was calculated as Rs. 431.85 million (US\$4.9 million) [Sindh: Rs. 404.85 million (US\$4.6 million) and Balochistan Rs. 27 million (US\$0.3 million)]. On the other hand, there is no data available for calculating the indirect losses. However, the estimated amount required to meet short-term needs has been taken as proxy of indirect losses i.e., Rs. 826 million (US\$9.4 million). The total cost of reconstruction for this sector is estimated at Rs. 863.7 million (US \$ 9.8 million) for the fully and partially damaged health facilities.

## Education

The total number of educational institutions affected by the floods is 4,096 (Sindh: 3,892; Balochistan: 204). The damaged institutions are 6.7 percent of the total institutions in the affected districts in the two provinces. In Sindh, 1,032 schools for females are damaged (385 are fully damaged and 647 are partially damaged) or 26.5 percent of the total of 3,892 damaged schools, and a total of 2,860 schools for males are damaged (1,022 are fully damaged and 1,838 are partially damaged). This means that 73.5 percent of the total of 3,892 damaged are male schools. In Balochistan, 51 damaged schools are females

schools (3 are fully damaged and 48 are partially damaged). These make up 25 percent of the total of 204 damaged schools, while the 153 damaged schools for males (17 are fully damaged and 136 are partially damaged) make up 75 percent of the total of 204 damaged schools.

The total damage and loss in both the provinces is estimated at Rs. 12,013 million including indirect loss of Rs. 1,856 million and direct loss of Rs.10,157 million. In Sindh, total damage and loss is estimated at Rs. 11,751 million including indirect loss of Rs 1,771 million and direct loss of Rs. 9,980 million. In Balochistan, indirect and direct losses are Rs. 85.1 million and Rs. 177.1 million respectively. The total cost of reconstruction to this sector for all the damaged institutions in Sindh and Balochistan is estimated at Rs.22,589 million.

## Agriculture, Livestock, and Fisheries

Agriculture is a key sector of Pakistan's economy and accounts for 21 percent of GDP, 45 percent of employment and 60 percent of exports. Sindh has 30 percent and Balochistan 8 percent share in the national agricultural GDP. The livelihood of more than 60 percent of the total population is directly or indirectly dependent on agriculture sector. Furthermore, the agriculture sector has strong backward and forward linkages and as a result has a large impact on the overall economic performance. The sector's performance has been weak over the last few years recording a growth of around 2 percent per year, mainly due to poor performance of the crop subsector. The performance of the livestock subsector has remained healthy and its share in agriculture GDP has surpassed the crop sector standing at around 55 percent. Due to limited rainfall, less than 240 mm in an average year, crop production is dependent on irrigation and more than 80 percent of land is irrigated. There are two main cropping seasons, namely, Kharif (summer) and Rabi (winter). The Kharif season starts in April and ends in October, and the main crops during this season are cotton, rice, sugarcane, maize, pulses, fruits and vegetables. The Rabi season, which starts in October and ends in April, is dominated by wheat production which is the main staple food in

Pakistan. Other Rabi crops include fodder, vegetable, and fruits. Commercial production of fruit and vegetable, particularly for the main urban markets has increased rapidly in recent years, particularly close to major cities or where agro-climatic conditions are favorable. Important fruits include mangoes, citrus, dates and banana in the tropical and subtropical areas like Sindh, as well as a range of semi-temperate fruits like grapes, peaches, apples in Balochistan. Important vegetables include potato, tomato, chilies and onions.

Livestock is an integral part of the farming system and is the main asset for many farmers. Buffalo and cattle are mainly kept for milk, with draft power, meat and hides being other important products. Most households also have sheep, goat and poultry for domestic consumption as well as for sale. Fodder, wheat straw, maize thinnings and Stover are used for livestock. Animals are also grazed on rangelands (particularly in Balochistan), pastures and crop stubble. Concentrate feed is widely used in commercial poultry farms and for lactating cattle. In addition to the settled agricultural population, there are also a significant number of transhumants (Gujars) who move within the country as well as in the region and specialize in the rearing of sheep and goat. Their animals are mostly for sale to the large urban centers particularly during Eid times when it is traditional to sacrifice sheep or goats.

Pakistan has a significant fisheries sector producing about 1.00 million tons of fish products annually. About two thirds of this are from marine sources (70 percent from Sindh) and mostly comprise prawn and demersal species. The rest is from inland sources. Inland fisheries were largely restricted to the main rivers and canals. However, in recent years there has been a rapid increase in aquaculture with many farmers using small ponds and other water bodies. Supplies of fingerlings come from a few large government hatcheries but there has been a rapid increase in private sector activity in the area particularly in Sindh.

The heavy monsoon rains during this year caused renewed and devastating flooding in southern

Sindh and northern parts of Balochistan provinces. The subsequent breaches in the drainage canal [Left Bank Outfall Drain (LBOD)] at several locations resulted in submerging of vast areas. While it was mostly the right side of the river Indus hit by floods last year, this time it was mostly the left side. In Sindh, the central and southern districts of Badin, Dadu, Hyderabad, Kamber Shahdadkot, Khairpur, Larkana, Matiari, Mirpurkhas, Neushero Feroze, Sangar, Shaheed Benazirabad, Tando Allahyar, Tando Mohammad Khan, Thatta, Tharparkar, Umerkot have been the worst affected. The Provincial Disaster Management Authority (PDMA) and the Sindh Department of Agriculture Extension estimate that standing crops of cotton, rice, sugar cane, sorghum, vegetables and pulses have been destroyed on about 0.84 million hectares of land. Similarly the livestock sub sector also suffered heavy losses. The Directorate of Animal Husbandry, Sindh has reported that approximately 115,500 livestock have perished and about 5 million surviving livestock have been directly affected.

The floods have heavily impacted the agriculture sector, with damages to crops, livestock, fisheries, poultry and on-farm water distribution infrastructure. The total loss estimated is US\$ 1,840.3 million, of which 89 percent is in the form of direct damage and 11 percent is in the form of indirect losses. Sindh suffered most with 94 percent of total damage and Balochistan with 6 percent. The losses were largest in the crops subsector, which accounted for 91.5 percent, including estimates of damages to Kharif crops; food and seed stocks; on-farm irrigation water facilities; and support services for crops, as well as indirect damages to the forthcoming Rabi 2011-12 and Kharif 2012 crops. The most affected crops are cotton with 74 percent damages to the overall planted area in the affected districts. In terms of the damage to different crops it is estimated that land area under rice 33 percent, sugarcane 34 percent, vegetables 79 percent and fruits 32 percent was affected adversely.

**Table-2: 2011 Kharif Area Affected by Flood**

Province	Crop Area Damaged (000' ha)	Area Damaged (000'Ha)						
		Cotton	Rice	Sugarcane	Maize	Vegetables	Fruit	Other
Balochistan	21.42	1.29	14.30	-	-	1.78	0.17	3.88
Sindh	859.62	494.94	163.85	88.40	-	99.24	13.19	-
Total	881.04	496.23	178.15	88.40	-	101.02	13.36	3.88

Source: World Bank and Asian Development Bank (ADB) Damages and Needs Assessment Report 2011.

The flood also substantially affected the livestock population causing death and loss in productivity mainly in Sindh. The deaths were mainly in small ruminants and productivity losses were mainly in large ruminants. Animals standing in mud and stagnant water for extended periods contracted various diseases. The losses in productivity occurred due to acute fodder shortage, debilitation and emaciation. Sources of livestock feed were fully inundated and the availability of fodder in local markets was very low. Facing an acute

shortage of feed, these livestock were left stranded. The productivity of milking animals dropped from an average of 7 or above litres to 2-3 litres (50-70 percent), and many young calves died due to the reduction of the milk in their mothers. The loss in productivity accounts for more than 50 percent of the total loss. Fisheries losses are estimated at around \$3.4 million (0.2 percent) that accounts for private fish farms/ponds and hatcheries. A total of about 881 thousand ha or 53 percent of the fisheries areas was affected.

**Table-3: Livestock, Poultry and Fisheries Damages in Flooded Areas**

Province	Large Animals (000head)	Small Animals (000heads)	Poultry Perished (Million Nos.)	Fishery/Pond Damaged
Balochistan	0.10	0.20	0.0	n/a
Sindh	33.8	81.2	1.14	393
Total	33.87	81.4	1.14	393

Source: World Bank and Asian Development Bank (ADB) Damage and Needs Assessment Report 2011

The summaries of preliminary loss estimates are shown in Table 4. Livestock damages, which include loss of animals, distress sales, and destruction of animal health support services, as

well as indirect damages due to reduced milk production, accounts for 8.3 percent of total losses. Fisheries losses are estimated at around \$ 3.36 million (0.2 percent of the total losses).

**Table-4: Estimated Direct and Indirect Losses (US\$ million)**

Province	Livestock			Crop			Fisheries/ Pond	Total
	Direct	Indirect	Sub-Total	Direct	Indirect	Sub-Total		
Balochistan	0.41	7.94	8.35	87.84	7.58	95.42	n/a	103.77
Sindh	45.51	99.28	144.79	1499.19	89.20	1,588.39	3.36	1,736.54
Total	45.92	107.22	153.14	1,587.03	96.78	1,683.31	3.36	1,840.31

Source: World Bank and Asian Development Bank (ADB) Damages and Needs Assessment Report 2011

The total reconstruction cost to this sector is estimated at Rs.26,590 million (US\$ 306 million) which focused on the restoration of normalcy in the agriculture sector; to support small and medium farmers through provision of seeds,

fertilizers, tools and implements along with support for land preparation, livestock based assistance package, partial subsidies for fishing communities as well as the partial rehabilitation of on-farm water management infrastructure.

## Energy

Power generation is provided by thermal plants, hydroelectric facilities and a small nuclear facility (300 MW). The 13 hydroelectric facilities (installed capacity 6,481 MW) are owned and operated by the Water and Power Development Authority (WAPDA), a public sector entity. Thermal power plants are owned by public and private companies. The public sector operates 13 thermal power plants (installed capacity 4,900 MW). About a third of Pakistan's generation (5,987 MW) is provided by private sector companies (independent power producers or IPPs). Also, KESC operates plants with a total capacity of 1,955 MW. Out of the total 19,252 MW of the national installed generation capacity, dependable generation is about 17,523 MW in the summer and about 14,640 MW in the winter, depending on the annual hydrology.

Damage to the energy sector was modest, estimated at Rs. 1.2 billion (US\$ 14.2 million). This comprised of direct damage of Rs. 456.5 million (US\$ 5.2 million) and Rs. 783 million (US\$ 9 million) of indirect damage. In the power sector the total damage was Rs. 281.5 (US\$ 3.2 million) whereas in the petroleum sector total damage was Rs. 958 million (US\$ 11 million):- out of which Rs. 783 million (US\$ 9 million) relates to indirect losses as shown in table below. In the power sector the majority of the direct damage is in distribution network with about 90 percent of the damages being to distribution transformers. Damages to the petroleum sector are also very heavy, effecting only two upstream public owned (70 percent shares) gas fields.

**Table-5: Damage and Losses in Energy Sector**

Entity	Direct Damage (Rs. million)	Indirect Damage (Rs.million)	Total Damage (Rs.million)	Total Damage (US\$ million)
Transmission	19.7	-	19.7	0.226
Distribution	261.8	-	261.8	3.0
Total Power	281.5	-	281.5	3.226
Upstream Oil and Gas	175	783	958	11.0
Total Damage	456.5	783	1,239.5	14.226

Source: World Bank and Asian Development Bank (ADB) Damages and Needs Assessment Report 2011

The immediate need for the power sector is Rs. 281.5 million (US\$ 3.226 million) covering the direct damages suffered by the Public Sector Powers (PSPs). The needs for the petroleum sector

are only Rs. 10 million (US\$ 0.115 million) as shown in Table 6 for damages not covered by insurance. Insurance cover for public sector companies has not been factored into the needs assessments.

**Table-6: Recovery and Reconstruction Needs Assessment Summary**

Sector	Reconstruction and rehabilitation/repair cost (Rs. million)	Total (Rs. million)	Total (US\$ million)
Power	281.5	281.5	3.226
Petroleum	10.0	10.0	0.115
Total	291.5	291.5	3.341

Source: World Bank and Asian Development Bank (ADB) Damages and Needs Assessment Report 2011

## Transport & Communication

The 796,095-square kilometer area of Pakistan and its almost 180 million inhabitants are connected through a transport and communications (T&C) network of 259,618 km of roads; 7,791 km of railways; 42 airports; and 34,950 km of

telecommunication lines and other infrastructure. The 11,800 km long national highways and motorways network is the spine of the primary transport corridor. This is supported by the provincial highways network of 37,400 km that fans out to the districts through 161,000 km of

district roads (including farm-to-market and access roads) in rural areas and 54,000 km of municipal roads in urban areas.

In the two flood-affected provinces, the national highway system traverses 1,975 km in Sindh and 4,630 km in Balochistan. About 13,700 km of provincial highways and 31,900 km of district roads are located in Sindh and 11,800 km of provincial highways and 20,200 km of district roads are in Balochistan. The railway network of 7,791 km railway lines and 1,100 stations serve the long-distance main north south corridor and connections to other regions including Balochistan. Approximately 1,899 km of railway lines are in Sindh while 1,202 km are in Balochistan. Six international airports in major cities serve as hubs connecting to 19 regular and 17 feeder and other airports. The telecommunication infrastructure consists of 3,155 exchanges; 34,950 km of optical fiber transmission lines for the landline networks; and 25,554 transmission towers for the cellular telephone networks.

The rains and floods during August and September 2011 damaged the Transport and Communications (T&C) infrastructure in the province of Sindh and Balochistan. Based on the data received on the damages to the T&C Sector, a total of 5 districts in Balochistan and 18 in Sindh have been affected by the floods and the longer than usual spell and higher intensity of rains. It affected the network of national and provincial highways, district and

municipal roads. Damages to the road infrastructure were caused by submergence, high surface runoffs and ingress of water in roadway formation; floods have caused damages to railway tracks, bridges, stations and residential buildings under the administrative control of Pakistan Railways. There were no reports of damages by Civil Aviation Authority in the aviation sub-sector. In the communication sector, damages were reported to the buildings, equipments and transmission network of cellular and landline operators.

The reported damage is classified into two broad categories: Completely Destroyed (CD) and Partially Damaged (PD). For roads and railways, the data is segregated into lengths of roads, railway lines and number of affected structures. For telecommunication infrastructure, the reported damage is more specific. Four national highways were affected at various places; three in Sindh and one in Balochistan. On these highways, seven bridges were also reported to be partially damaged; all located in Sindh. About 1,955 km of provincial highways in Sindh, representing 15 percent of the provincial highway assets and 5,773 km of district roads were affected (including municipal and urban roads). On the contrary, damages in Balochistan are lower and comprised about 426 km provincial highways and district roads (about 1 percent of this road stock). A summary of loss and damage in Transport and Communication is given below:-

**Table-7: Transport and Communication Damage and Loss Figures.**

Province	Direct Damages (Rs. million)	Indirect Losses (Rs. million)	Total (Rs.million)
<b>Roads</b>			
Sindh	14,850	9,974	24,824
Balochistan	1,095	108	1,203
Subtotal	15,945	10,082	26,027
<b>Railways</b>			
Sindh	277	-	277
Balochistan	-	-	-
Subtotal	277	-	277
<b>Telecommunication</b>			
	165	-	165
Total	16,386	10,082	26,468

Source: World Bank and Asian Development Bank (ADB) Damages and Needs Assessment Report 2011

The total reconstruction cost to this sector is estimated at Rs.33,902 million (US\$ 388 million) including US\$5 million for railways and US\$ 2 million for telecommunication sub-sector and remaining US\$ 383 million for the roads subsector.

### Environment

Pakistan suffers a loss of 8.84 percent of its GDP each year from environment-related disease. Almost half of this cost is caused by mortality (4.13 percent of GDP) while the rest stems from the malnutrition caused by environment-related disease (4.71 percent of GDP). Approximately 90 percent of typhoid and diarrheal illness in Pakistan is attributable to inadequate drinking water, sanitation and hygiene. Up to 83,500 deaths a year are linked to these causes. Morbidity linked with waterborne diseases amounts to 74.5 million cases per year.

The environmental damages caused by the 2011 floods included: i) contamination of resources for

drinking water; ii) contamination of water resources that are used for other domestic usage; iii) stagnant water ponds resulting in proliferation of disease vectors such as mosquitoes; iv) solid waste and debris accumulation; v) agricultural lands affected by pollution and salt; vi) damage to soil through erosion; vii) damages to wetlands and mangroves; and viii) damages to protected areas and cultural assets.

The floods that recently affected Sindh and Balochistan have already impacted millions of people and are likely to have economic, social and environmental consequences for years to come. The 2011 floods have caused damages to the forests, plantation, nurseries, department infrastructure, and cultural heritage sites. These damages have been estimated to be Rs. 2,762.66 million (US\$ 31.75 million). The reconstruction and restoration costs of the damages estimated at Rs. 2,873.59 million (US\$ 32.79 million) are shown in table below.

**Table-8: Total Cost to Address Environmental Needs Associated with the Floods**

S.No	Description	Rs. in million	US \$ million
1	Field investigations to determine damage to agriculture land caused by pollution and salts	20.0	0.23
2	Study to estimate debris quantity and disposal arrangements	5.00	0.06
3	Rehabilitation of forests and plantation	589.18	6.77
4	Study to estimate damage to wetlands and mangroves	5.00	0.06
5	Rehabilitation of cultural sites	16.41	0.19
6	Study to estimate damage to cultural heritage sites	2.00	0.02
7	Storm water drainage master plan	714.00	8.20
8	Land use plans and building regulations in urban areas	604.00	6.94
9	Monitoring and evaluation, and information databases	442.00	4.85
10	Strengthening the Legal and Institutional Framework	476.00	5.47
Total		2873.59	32.79

Source: World Bank and Asian Development Bank (ADB) Damages and Needs Assessment Report 2011

### Social and Gender Impact

Barely one year has passed since the floods of 2010 devastated the lives of an estimated 20 million people nationwide. The flooding in 2011 was relatively localized; the impact on people and livelihoods was severe, but infrastructure damages were less so. In Sindh, 19 social welfare infrastructure units serving a population of 37,006 people were partially or fully damaged. In

Balochistan, 18,403 people were reported affected with no damage to social welfare infrastructure.

According to the report, 9.6 million people were affected including 744,000 displaced in the aftermath of the 2011 flood. Total deaths are reported as 520. The direct damage estimated costs are Rs. 39 million. Indirect costs are assessed as Rs. 4.6 million. According to the United Nation office for the Coordination of Humanitarian

Affairs (UN OCHA), the situation remains alarming with poor coverage of all essential sectors. Failure to meet Rabi cultivation will have severe consequences on farm dependent households.

The UN reported that 2.5 million children and 1.2 million women were affected by the floods in 2011, while 744,000 people were displaced. With 46 percent of health facilities damaged, the vulnerability of women and children have increased in the affected areas. The children who are pushed out of schools are estimated at over 733,000. 60 percent schools were damaged in Sindh alone. Acute Respiratory Infections (ARI) and skin infections represent major health risks in flood affected areas. Women are at high risk due to disruption in the provision of pre and post natal care. Migration has taken place largely due to non-availability of fodder in flood affected areas. Approximately, 10-15 percent of the affected population is engaged in non-farm livelihoods, including fisheries, which are severely affected by the rains.

### **Water Supply and Sanitation**

The government of Sindh had identified seventeen (17) districts as flood affected where damages needed to be assessed. However, flood damage data was forthcoming only from thirteen (13) districts. From the Balochistan province flood damages were reported from Kalat, Lasbela, Nasirabad and Jaffarabad districts, and that too for the water supply sector only. The most obvious result from the data compilation is the finding regarding the relative damage distribution amongst the districts and talukas. In the Sindh province that has been largely affected in the 2011 floods the Shaheed Benazirabad (Nawabshah) district by far shows the most extensive damages both in the public water supply and sanitation sectors. Badin, Sanghar and Mirpurkhas districts also show significant damages to the water supply related infrastructure and facilities. More damages are reported in the sanitation sector as compared to the water supply sector. Shaheed Benazirabad (Nawabshah) district is the worst hit accounting for 42 percent of the overall damage cost in the public sanitation sector.

Total damages (both direct and indirect) for water supply and sanitation are estimated at Rs.1,160 million and Rs. 43.6 million in Sindh and Balochistan, respectively. Direct damages in Sindh are Rs. 456.6 million in 378 reported schemes in the flood affected districts. These damages include Rs. 147.6 million for public water supply and Rs. 253 million for public sanitation. An amount of Rs 56 million for community infrastructure damage is also included. In Balochistan, water supply and sanitation damages have been assessed at Rs. 43.6 million, in a total of 80 schemes. Indirect losses for Sindh have been calculated to at Rs 703.6 million. No such loss is calculated for Balochistan due to lack of data. Indirect losses which is derived from higher expenditures related to (i) supplying potable water (tankers, cost of hand pumps, water tanks, purification and disinfection processes), and (ii) cleaning, wells, sewers and pipes; and for the loss of revenue from interrupted water supply services.

The total reconstruction cost for water supply and sanitation is estimated at Rs.1,831.7 million and Rs.68.5 million for Sindh and Balochistan respectively.

### **Governance Infrastructure**

Governance related institutions in the flood-hit districts of Sindh have suffered damage to their assets, which in turn eroded their already limited capacities. In Balochistan, reported damage to the governance sector was limited. Flooding caused by rains led to disruption of social and economic life and created a crisis. Demand of governance and related services in a crisis is much higher and ever more challenging to respond to effectively and promptly. Governance sector institutions in Pakistan, even before the disaster, faced many challenges.

Governance institutions in the 17 affected districts of Sindh have reported damage to 648 facilities including offices and residences. Aggregate covered area damaged or destroyed has been estimated to be slightly below 3 million square feet. In Balochistan, the 5 affected districts have reported damage to 18 buildings. The worst hit district in Sindh is Mirpurkhas where estimate of aggregate affected covered area is 845,000 sq feet, followed by Sanghar (299,000), Tharparkar

(246,000), Shaheed Benazirabad (201,000), Dadu (186,000), Umerkot (171, 000), Khairpur (161,000), and Hyderabad (140,000).

The civil administration in Sindh suffered heaviest damage to its facilities. A total of 257 buildings were reported to have been partially damaged and 86 as completely destroyed. Partial damage to 11 Prison and 71 Police facilities and complete

damage to 3 Prison and 66 Police buildings have been reported. Additionally, 14 court buildings have been partially damaged and 10 have been reported as completely destroyed along with 21 Auqaf buildings which are reported as completely damaged and 10 as partially damaged. NADRA, Post Offices and other governance institutions shared the remaining disaster damage.

Provinces	Direct damage	Indirect Damage	Total
Sindh	1,555.83	369.23	1,925.06
Balochistan	15.61	12.65	28.26
Total	1,571.44	381.88	1,953.32

Source: World Bank and Asian Development Bank (ADB) Damages and Needs Assessment Report 2011

In case of governance institutions service and productivity losses create complex issues. Disruption of services or functions and inability to respond to much bigger demand can and do impede relief and reconstruction. States of rule of law, justice, security, property and citizenship records and management capacities of public accounting and local level public management become exposed to risk of deterioration because of damage and serious inadequacy in the face of much higher volume of work demanded by recovery and reconstruction needs. Disruption of governance services and functions affect the condition of the population already suffering from the direct effects of the disaster. The economic loss to the population is complex to estimate as it would involve estimating economic value of security, justice and protection. Indirect loss to

governance institutions is estimated on notional costs of continued services and functions despite loss to their facilities, records and reduced staff productivity/availability in the damage quantification.

The value of reconstruction needs is based on the current government notified rates for contractors. It was challenging to gather information in precise categories on the types of construction required, pre-flood condition and the nature of damages. Consequently, suitable assumptions and broad classifications had to be used. In order to improve accuracy of the estimates- statistically and factually- sound assumptions have been used. Computations have been made in spreadsheet with stated assumptions, criteria and parameters clearly identified.

Province	Reconstruction and Rehabilitation/Repair costs	Capacity Building	Total
Sindh	4,716.113	12.580	4,728.693
Balochistan	36.572	3.700	40.272
Total	4,752.685	16.280	4,768.965

Source: World Bank and Asian Development Bank (ADB) Damage and Needs Assessment Report 2011

### Irrigation and Flood Management

Sindh's agriculture accounts for 17.4 percent of the provincial GDP and 50 percent of the employment. The Sindh irrigation system consists of Guddu, Sukkur and Kotri Barrages on the Indus River. These barrages divert water into fifteen canals -

four at Guddu, seven at Sukkur and four at Kotri Barrage commanding 2.5 million ha. A total of 2,240 km of drains and 5,835 tube wells complement the irrigation system. In Balochistan only about 767,120 ha land in 3 out of the 26 districts is irrigated by Indus Basin Irrigation

System. The main canals are the Pat Feeder, Kirther and Uch canals. In remaining parts of the province there are many small basins where spate irrigation, karezes, small irrigation schemes, small dams and tube wells are the main sources of irrigation.

The damages reported are in 38 irrigation divisions of Sindh province (Rs. 3,936 million or US\$ 45.2 million), and 14 irrigation divisions of Balochistan province (Rs. 827 million or US\$ 9.5 million). In Sindh, fifteen divisions suffered damages exceeding US\$ 2.5 million each. In Balochistan, three divisions have reported damages exceeding US\$ 1.0 million. The damage estimates reflect the reconstruction requirement at depreciated value as most of the infrastructure is more than 15 years old. Indirect losses such as damage to crops due to flooding and disruption of irrigation supplies, siltation and water-logging of agricultural land are not covered in irrigation and flood sector.

The reconstruction cost estimated for Sindh province is Rs. 7,872 million (US\$ 90.5 million) and for Balochistan it is Rs. 1,654 million (US\$ 19

million). The proposed irrigation, drainage and flood protection sector reconstruction strategy is to restore all damaged infrastructures, and strengthen vulnerable and damaged sections before 2012 monsoon.

### Social Protection and Livelihoods

The total affected population in flood hit districts of Sindh and Balochistan are based on the total affected area. Pakistan Social and Living Standards Measurement Survey (PSLM) data was used to calculate post-flood poverty levels; this was combined with damage to housing and agriculture to estimate the number of severely affected poor and vulnerable households who require assistance to cope with the negative impact of the floods. The total is in the range of 801,897 to 851,439, representing 52-54 percent of the total affected population. The majority of these are in Sindh (786,917 to 836,311) and the rest in Balochistan. Districts with over 50 percent, or more, severely affected households are Badin, Dadu, Khairpur, Matiari, Mirpurkhas, Sanghar, Tando Allah Yar, Tando Muhammad Khan, and Thatta in Sindh, and Kalat, Jaffarabad, and Lasbela in Balochistan.

**Table-11: Summary Estimates of Cash Grants to Severely Affected Poor Households** (Rs. in Million)

Provinces	No. of Severely Affected House Holds (HHs)	Cash Grant of Rs. 6,680 per month for 6 months
Sindh	836,311	33,519.35
Balochistan	15,127	606.31
Total	851,439	34,125.66

Source: World Bank and Asian Development Bank (ADB) Damages and Needs Assessment Report 2011

### Government Response

In the immediate aftermath of the floods, the government responded through the mobilization of national, provincial and district resources including the deployment of civil and armed forces personnel. Several infantry platoons of the army as well as medical and engineering teams were deployed in disaster affected areas to carry out search and rescue operations, which were further supported by helicopters and dozens of navy and coast guard personnel and boats. To support the national and provincial Disaster Risk Management (DRM) institutions, the Prime Minister's Flood Relief Committee was also formed to monitor rescue and relief activities. Small-scale engineering works were also undertaken to strengthen flood mitigation infrastructure to avoid

further damage and loss of lives. During peak of this humanitarian crisis, almost 700,000 people were being housed in approximately 3,500 relief camp managed by the government, international partners, NGOs and civil society organizations. In January 2012, NDMA reported to World Bank and Asian Development Bank Damage and Needs Assessment, a report regarding the distribution of over 316,000 tents in the affected areas and 3.7 million ration packs, out of which 48,000 ration packs were distributed in Balochistan. To provide immediate cash assistance to the flood affected population in Sindh, the provincial government, with the support from the federal government, has disbursed approximately Rs. 10.3 billion through the Pakistan Card-based cash transfer scheme (Rs. 10,000 per family).

The Government continued to mobilize shelter materials, non-food items (NFIs), bottled water and food rations. Provision of temporary shelter in public buildings had been arranged for those uprooted by the floods in 13 districts out of 23 in Sindh, which accommodated 194,969 people.

Initially the federal and provincial governments responded to the disaster through own resources, which however, were overwhelmed in the wake of the growing humanitarian crisis. Despite providing assistance during the unprecedented floods of 2010, the international community immediately responded to the appeal by the Government of Pakistan for international support for rescue and relief activities following 2011 floods. In December 2011, forty-six countries pledged a commitment of approximately US\$ 260 million including support in cash and in-kind.

Furthermore, an emergency flood relief cell, established at the Ministry of Foreign Affairs, closely liaised with the members of the diplomatic community and international organizations to coordinate international assistance.

The United Nations (UN) undertook an Initial Rapid Needs Assessment to focus on the immediate relief phase for the following clusters: (i) emergency shelter; (ii) food security; (iii) health and; (iv) water sanitation and hygiene. Based on these cluster assessments, the UN launched a US\$ 356 million Rapid Response Plan in September 2011. As of April 2012, approximately, US\$ 171 million or 48 percent were received in response to the UN's appeal. In January 2012, the UN launched the Early Recovery Framework seeking a further US\$ 439 million to continue flood response until September 2012.

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