

Socio-Economic Survey of Heavy Rain in Shaheed Benazirabad, Pakistan

Fahad Raza Bhambhro¹, Farhan Hussain Wagan², Abdul Hafeez Buller¹, Ghulam Hussain Wagan³

¹Civil Department, Quaid-e-Awam University of Engineering, Science & Technology, Nawabshah, Sindh, Pakistan

²Irrigation Department, Government of Sindh, Sindh, Pakistan

³Department of Civil Engineering, Swedish Engineering College Raheem Yar Khan, Punjab, Pakistan

Email address:

farhan_hussain_4u@yahoo.com (F. H. Wagan)

To cite this article:

Fahad Raza Bhambhro, Farhan Hussain Wagan, Abdul Hafeez Buller, Ghulam Hussain Wagan. Socio-Economic Survey of Heavy Rain in Shaheed Benazirabad, Pakistan. *International Journal of Oil, Gas and Coal Engineering*. Vol. 5, No. 6, 2017, pp. 130-138.
doi: 10.11648/j.ogce.20170506.12

Received: December 3, 2016; **Accepted:** January 17, 2017; **Published:** November 12, 2017

Abstract: Average rainfall in Pakistan is very low and irregular in sindh plain. Mostly high order rainfall occurs from July to September in a monsoon period. Due to heavy rain in September 2011, floods are come in left bank of drain and it has many impacts on the various towns and rural areas of sindh were observed, at least 360 people were killed, some 5.330 Million people were affected and 1.21 Million homes affected as well 1.74 Million Acres of arable land inundated. The storm originated in bay of Bengal move northwest worldly across the gigantic plains and with passage of time reaches Indus plains. The (2011) heavy downpour caused a high damaged became of improper disposals of run-off insufficient and choked drainage system caused stagnancies of surface as well as ground water and impacted badly on infrastructure of buildings, roads, agriculture human and animal life. Floods if not mitigated in time are most serious environmental threat to the country. It needs a careful and wise policy planning and formulation of strategies to combat floods and control destruction which they cause. It was therefore deemed fit to take up this project and investigate the actual pros and cons of the heavy downpour destruction and formulate some intensive strategies to mitigate such calamity in future without much damage of epitome of this research project. Data was collected from social survey in premises of town, different departments including Non Governmental Organizations and Governmental Departments and also solutions on immediate basis are discussed [1].

Keywords: Hydrological Cycle, Climate, Impact of Rainfall, Flood, Flood Impact Assessment, Survey, Discussion

1. Introduction

The field of hydrology cannot be defined by just single definition, but a researcher needs vast amount of insight in this field. In simple words hydrology is circulation of water in nature but it is intensively of water transpiration are natural circulation is an outer system controlled by solar energy and an inner system, where human return water after the usage, which is sadly much polluted. Acidification is one of the example which comes from transport pollution, green house effect and energy balance of earth. It is very complicated to analyze the entire system, natural system and human influenced system. Supply sources such as lake, river and oceans are contaminated by human which affects evaporation process.

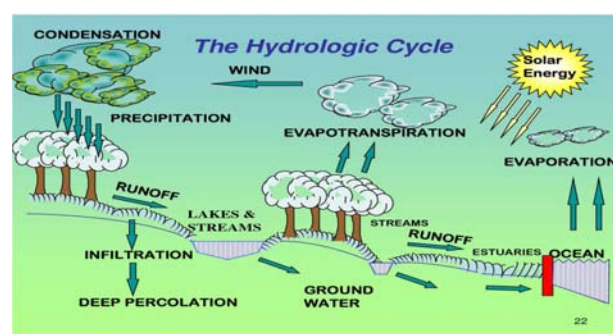


Figure 1. Hydrological Cycle.

1.1. Importance of Climate

Before starting with the importance of climate, it is

necessary to know what climate is, it is the average of weather during a long time period. The time period can depend upon the purpose, it is usually 30 years. One of the importance of climate is that it greatly affects global economy and social sectors such as agriculture, energy and health. Moreover, bad climate has an adverse effect on agriculture sector and it also badly affects human health. The climate prediction can help investors to make effective decision on investment in different sectors, for example if the prediction is of good climate then investor will be motivated to invest in agriculture sector. Moreover, the accurate climate prediction can help business to manage the risk and setup effective strategies to overcome the climate.

1.2. Effect of Climate on Rainfall

Rainfall has great effect on climate, the annual rainfall in any locality varies from year to year due to some certain limits and weather conditions. These variations are principally determined by the overall individual of the local typical weather in region, consequently, it becomes required to state something generally, the types of the typical weather in region effect on something probable act of varying. The high quality is originally a geographically one. Particular place near to the interior of moderate. The characteristics of the two types are well known continental typical weather in region have a very warm summer, understand something by a relatively cool winter. In such event, the major fraction of the rainfall, and all that has any virtual effect on something the run-off exist throughout well defined length of time the year ordinary way not exceeding four months in distance from end to end, and throughout the part of something left of the twelve months the rain that does fall, substantial in amount and chance in fact of occurring. Usually, it may be previously announced that insular typical weather in region is comparatively involving speech a damp weather throughout the year.

1.3. Technical Impacts Due to Rain Fall

Also education became badly disturbed due to non-availability of conveyance because damage of roads and blockage of water, i.e. all over the urban and rural Government schools in different union councils and Talukas in which most of schools has been fully and partially damaged. Due to technical fault in left bank of drains system water returned back also people suffered due to this water, in Sindh many districts were badly disturbed due to heavy rainfall, flood and monsoon season in 2011. Specially in Shaheed Benazeerabad Talukas was disturbed very badly in which standing crops i.e. Rice, cotton, sugarcane, fodder crop and vegetables. Anyhow their live stock became ill and due to appearance of diseases many of which were died, also huge no. of animals were missed and float and drown through flood and rain water as well as died, for example buffaloes, cow, goats, sheep's etc. Also mud houses were destroyed due to rainfall and flood roads were destroyed and drainage system was already partially weak, due to heavy

rainfall which became destroyed and pumping station were insufficient as well as due to improper level, water was choked due to which building and schools were destroyed as well as roads were damaged, people suffered too much from every point of view.

1.4. Background Flood Caused by Monsoon Rains in Sindh

By the research of Safwco (2011) tells us about the damage caused by monsoon rains has affected about 22 districts of Sindh province that include Sh. Benazeer abad, Badin, Tando Mohammad Khan and Tharparkar. NDMA have reported that around 88 tehsils, 707 union councils and around 40,000 villages in 22 districts are affected by the flood damage. And the total deaths were 466 whereas 766 people were injured. Other reports showed that around 1.6 million houses were completely and partially damaged. The flood water also entered the urban areas of Sanghar, Badin, Sh. Benazeer abad, Sanghar etc where as no effective step has been taken.

2. Literature Review

According to WHO (2012) floods began in 2011 in Sindh province during the monsoon season of Pakistan in mid-August (2011), causing from serious rains in Sindh, and experienced the unpredictable 600mm downpour which was recorded the worst rainfall in the history of Pakistan. These floods were resulted into some serious problems; almost 434 civilians were dead, with 5.3 million people were affected and 1,524,773 homes were distressed. A fruitful region like Sindh and which is also sometimes called "breadbasket" of the country; the harm and levy of the floods on the local agrarian economy was wide. These floods inundated almost 1.7 million acres of cultivable land [2].

The report given by Rapid needs assessment (RNA) conducted in the month of September 2011 shown that around 5.44 million people and 33000 villages were affected with 347 deaths and 1.4 million homes destroyed and damaged. Most of the people in 23 districts of Sindh lost their assets and their livelihoods. Many different kind of organizations estimated that standing crops of rice, cotton, sugarcane, sorghum, vegetables and pulses have been destroyed that were on about 0.84 million hectares of agricultural lands [3]. UNICEF is very active in order to recover the child health and to support living and build pliability among 5.2 million people that were hit by the floods occurred in 2011. Lack of the funds has put many people in trouble and to bring them in a good condition and to build resilience of those vulnerable children and women. UNICEF is engaged to support mothers health care and also new born babies and counseling in 23 health facilities, in 6 districts providing medical service for whole day. In the early phase of recovery, around 35,305 female have received antenatal care, 4,326 mothers were assisted in the delivery of their babies and 57,297 female patients received tetanus vaccinations [4].

Water is not only vital for sustenance of life, but equally essential for socio-economic development [5]. Rainfall

proves to be the main operator of soil aloofness in the procedure of erosion. Whereas precipitation erosivity may be defined as the latent of rain water to detach soil. The similarity (between rainwater intensity and rain drop size distribution (DSD) controls different rainfall parameters that include rainfall Erosivity. But considering geographical locations, the relationship between rainfall intensity and rainfall erosivity differs. Several researchers working in the past have been appreciated by the role of rainfall microstructure on the determination of rainfall Erosivity [6]. According to Pakistan to witness cooler winter in early (2012) tells us that Pakistan has faced a very summer in its southern part, which caused many deaths due to sun stroke. But it has been predicted that the winter is likely to reach at its peak across the country in early (2012) i.e. January and February. So the conditions over north-western India including northern part of Pakistan are expected to be cooler than the normal temperatures during the coming months [7]. Surface water has put tremendous pressure on ground water. Over drawing of ground water by users to compensate the shortage. In turn reduced recharging owing to less percolation. This has result rising of saline water lens nearer to the ground surface. [8]

Pakistan, largest populated and one of the fastest growing economy in the world, having several socio-economic issues, which cannot cope with the pace of economic growth. The most important challenges Pakistan is facing today is poverty, reduction in agriculture production (mainly destruction of agricultural land due to urbanization, industrialization and other climatic effect) and frequent disasters because of climate change and vulnerability issues. [9]

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC 2007) dispelled many uncertainties about climate change. Warming of the climate system is now unequivocal. It is now clear that global warming is mostly due to man-made emissions of greenhouse gases (mostly CO₂). Over the last century, atmospheric concentrations of carbon dioxide increased from a pre-industrial value of 278 parts per million to 379 parts per million in 2005, and the average global temperature rose by 0.74° C. According to scientists, this is the largest and fastest warming trend that they have been able to discern in the history of the Earth. An increasing rate of warming has particularly taken place over the last 25 years, and 11 of the 12 warmest years on record have occurred in the past 12 years. [10]

3. Collection of Data

Considering the socio-economic process of destroying occurred due to heavy rainfall of (2011) in Taluka Shaheed Benazeerabaddistrict Shaheed Benazirabad were studied in detail and loss of property, live stock, and human life were added in this research work and its ill effects were collected from various points of locality all surrounding of Taluka Sh. Benazeer abad. In order to finish proposed work the different data was collected from various departments of Shaheed

Benazeerabadnamed as follows:

1. Pakistan Air force Shaheed Benazeerabad.
2. Irrigation Department Shaheed Benazeerabad.
3. Rain survey Report of Shaheed Benazeerabadcity area (Member water wapda Lahore).
4. Education works and Division Shaheed Benazeerabad.
5. Public Health Engineering Shaheed Benazeerabad.
6. Works and services Department Government of sindh Highway Division Shaheed Benazeerabad.
7. Shah Sachal Sami foundation Shaheed Benazeerabad.

On the basis of above collected data loss of property, human life and live stock were discussed in detailed and its effects of socio-economic due to heavy rainfall were studied in every point of view to clear the subject study of research work properly.

3.1. Pakistan Air Force Shaheed Benazeerabad

The following data were collected by the Pakistan Air Force Shaheed Benazeerabad.

Table 1. Weather department PAF Base Shaheed Benazeerabadrainfall (2011).

Weather department PAF Base Shaheed Benazeerabad RAIN FALL IN 2011					
S. No	DATE	RAIN (mm)	S. No	DATE	RAIN (mm)
1	26-07-2011	22mm	7	30-08-2011	54.5mm
2	11-08-2011	5.3mm	8	31-08-2011	70mm
3	12-08-2011	108mm	9	01-09-2011	18.6mm
4	13-08-2011	1mm	10	02-09-2011	67mm
5	14-08-2011	0.8mm	11	03-09-2011	2mm
6	26-08-2011	0.5mm	12	04-09-2011	70mm

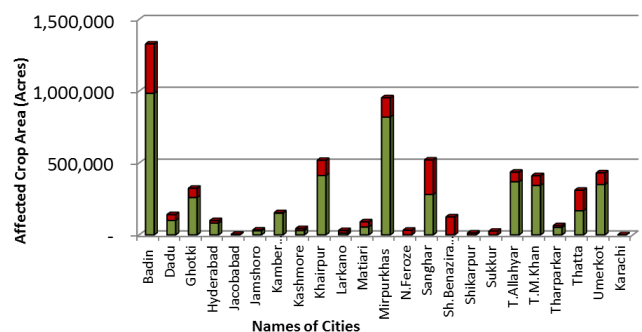


Figure 2. Area vs Crop Affected due to the Rainfall.

3.2. WAPDA Lahore (Rain Survey Report of Shaheed Benazeerabad)

On university to housing society by pass road which was badly affected during the rainy days, the people has started pumping out their standing water of houses on the above mentioned road because of chowking of drainage system.

3.3. Education Works & Division Shaheed Benazeerabad

- The heavy rainfall and flood 2011 has badly affected all over the technical and social life of human beings and also effects the educational aspects i-e all over urban and rural government schools in different u. c and Talukas in which most of schools has been fully and

partially damaged.

- Now number of schools which are being affected the

list in which name schools and name of u. c and Talukas shown in chart.

Table 2. Statement Showing Demand of Funds for Restoration of Rain Damages 2011 Education works Division Shaheed Benazirabad.

S. No	Name of Building	Union Council	Taluka	Nature of Damages	Restoration Cost in Million
1	GBPS Qazi Ameer Ali	Sh.Benazeer abad-1	Sh. Benazeer abad	Partially Damaged	0.700
2	Blind School Building Sh. Benazeer abad	Sh.Benazeer abad-1	Sh. Benazeer abad	Partially Damaged	0.590
3	GBMS Airport Coloy Sh. Benazeer abad	Sh. Benazeer abad-2	Sh. Benazeer abad	Fully damaged	2.754
4	GBPS Abdul Haq Lakhmir	Sh. Benazeer abad-2	Sh. Benazeer abad	Partially Damaged	0.774
5	GGGPS Muhammad Saleh Billo	Sh. Benazeer abad-2	Sh. Benazeer abad	Partially Damaged	0.825
6	GGPS Faiz Muhammad Bhangwar	Sh. Benazeer abad-2	Sh. Benazeer abad	Fully damaged	1.630
7	Govt. Sachal Sarmast College Sh. Benazeer abad	Sh. Benazeer abad-2	Sh. Benazeer abad	Partially Damaged	0.6321
8	GGPS Peero Lakhmir	Sh. Benazeer abad-3	Sh. Benazeer abad	Partially Damaged	0.866
9	Govt. Girls Vocational Instt: Sh. Benazeer abad	Sh. Benazeer abad-3	Sh. Benazeer abad	Fully damaged	4.265
10	GGPS Ghulam Hussain Chandio	Sh. Benazeer abad-4	Sh. Benazeer abad	Partially Damaged	1.454
11	GGPS Nawab Bhutto	Sh. Benazeer abad-4	Sh. Benazeer abad	Partially Damaged	0.718
12	GGPS Islamia Higher Secondary Sh. Benazeer abad	Sh. Benazeer abad-4	Sh. Benazeer abad	Partially Damaged	0.693
13	Govt: Municipal H. S Sh. Benazeer abad	Sh. Benazeer abad-4	Sh. Benazeer abad	Partially Damaged	0.645
14	Old Hostel Block Of Sachal Colleg liaquat Market	Sh. Benazeer abad-4	Sh. Benazeer abad	Partially Damaged	0.731
15	GBPS Camp No:2 Sh. Benazeer abad	Sh. Benazeer abad-4	Sh. Benazeer abad	Partially Damaged	0.659
16	GBPS Jamil Arain	Sh. Benazeer abad-6	Sh. Benazeer abad	Partially Damaged	0.774
17	GBPS Muhammad Ali Housing Society (Taj Colony)N. Shah	Sh. Benazeer abad-6	Sh. Benazeer abad	Fully damaged	2.000
18	GBPS Kashmir Colony	Sh. Benazeer abad-7	Sh. Benazeer abad	Fully damaged	2.528
19	GBPS Haji Bashir	Sh. Benazeer abad-7	Sh. Benazeer abad	Fully damaged	1.925
20	GBPS Naimatullah Kerio	Sh. Benazeer abad-7	Sh. Benazeer abad	Partially Damaged	0.660
21	GBPS Muhammad Saleh Kakepoto	Sh. Benazeer abad-7	Sh. Benazeer abad	Partially Damaged	0.599
22	GBPS Mir Jan Muhammad Khaskheli	Sh. Benazeer abad-8	Sh. Benazeer abad	Fully damaged	2.077
23	GBPS Huzoor Bux Rind	Sh. Benazeer abad-9	Sh. Benazeer abad	Fully damaged	1.065
24	GBPS Khamiso Kahn Rustaman	Ghandtar	Sh. Benazeer abad	Partially Damaged	1.142
25	GBPS Saleh Abad	Ghandtar	Sh. Benazeer abad	Partially Damaged	1.149
26	GBPS Suleman Jamali	Ghandtar	Sh. Benazeer abad	Partially Damaged	2.279

3.4. Works and Services Department Government of Sindh Highway Division Sh. Benazeerabad

- As concerned this department roads were fully/partially damage due to the rainfall.
- Also communication (telephone and internet) were affected.
- The roads which were damaged in Shaheed Benazeerabad are shown below:
 1. Passport office to D. C Chowk.
 2. Court road.
 3. Kazi ahmed road to Gulshan school.
 4. Taj colony to T. M. A fountain.
 5. Road from Shaheed Benazeerabad to kazi ahmed.
 6. Vip road to greve yard via Motia Masjid.
 7. Sakrand road.

starts from April and up to September. The winter season of the city sometimes temperature about -1°C , and the winter season start from October to February. During the summer season rainfall occurs May to September and maximum rainfall occurred in (2011) is about 645mm.



Figure 3. Show Complete damage of Main Roads at Naka.

4. Impact Assessment

Shaheed Benazeerabad is considered one of the most important cities of Pakistan, is located about centre of the province Sindh. In this city most of the facilities like airport, railway station, many road network connected to the other cities, educational facilities, hospitals and it is also irrigated peace of land. The climate of Sindh very hot in summer season and temperature rises above 50°C and summer season

Problems Occurred During Flood

- Due to Low capacity of discharging water designed it becomes up-stream and resulted breaches, due to which received too much loss.
- Partially choked drainage system.
- Force able cuts in drains and irrigation channels by the farmers and locals for the early evacuation of lands and settlements.

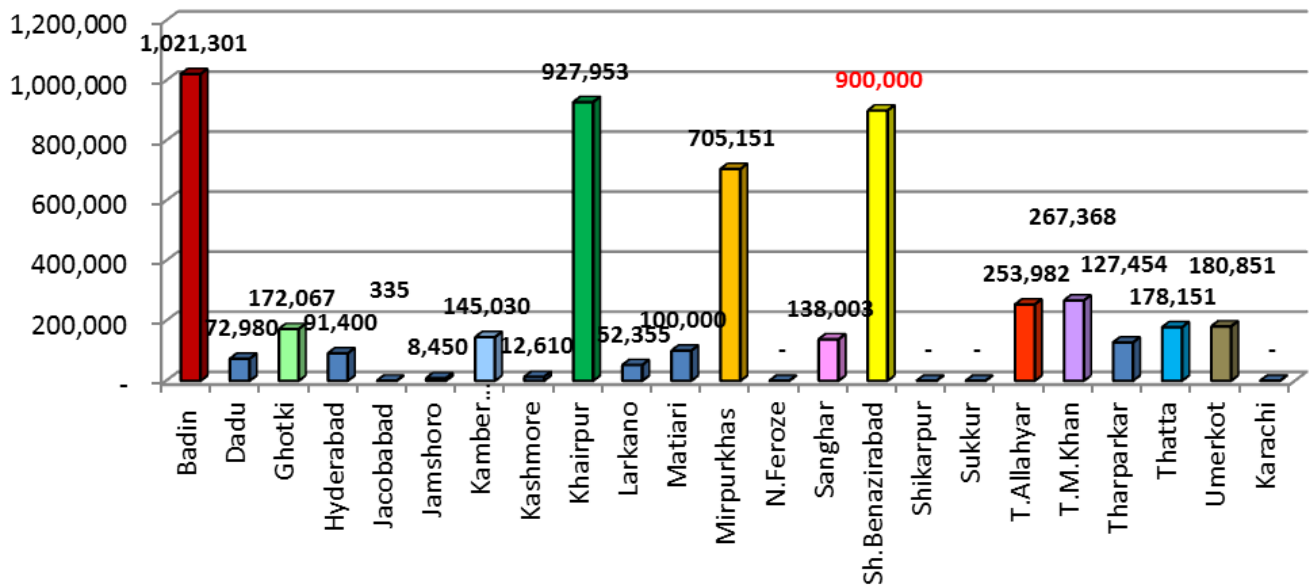


Figure 4. Persons Affected: 5,355,441.

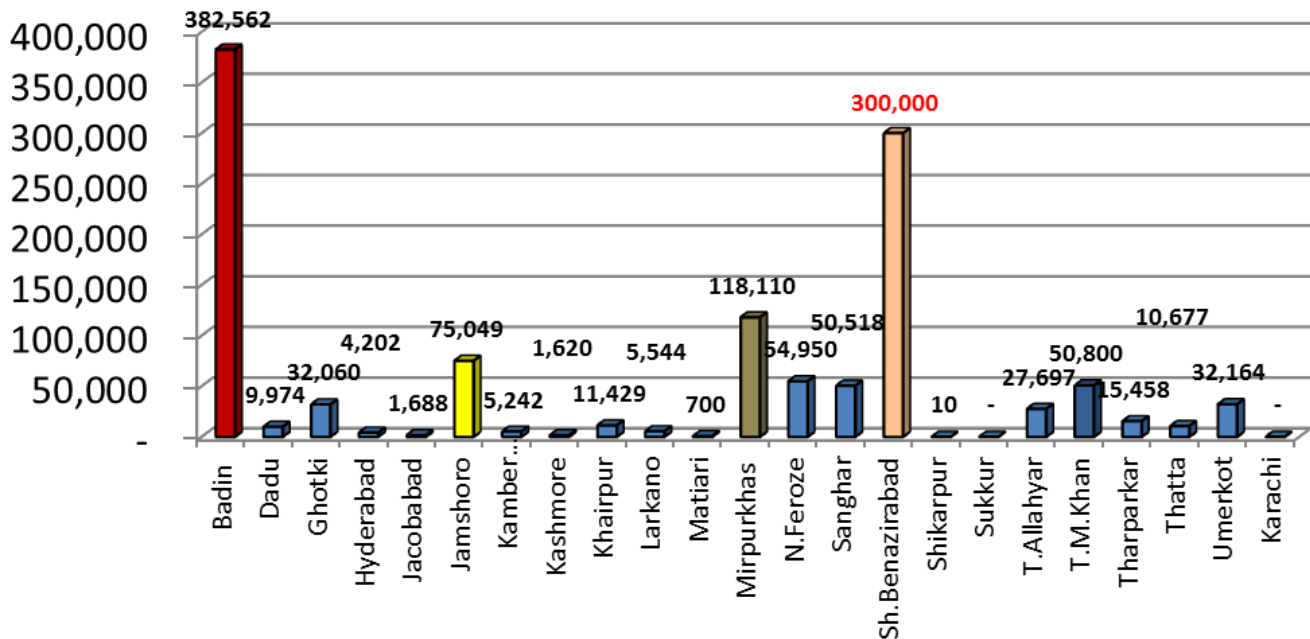


Figure 5. Total Houses Damaged 11,90,454.

5. Measures Taken by the Related Departments

- On emergency basis all main canals completely closed on 28th August (2011) (on receipting weather warning)
- Special machines and skilled labors should deploy along entire drainage system and F. P bund being affected areas
- Local Government should look after canals and not allow any cut in main canals and drains.

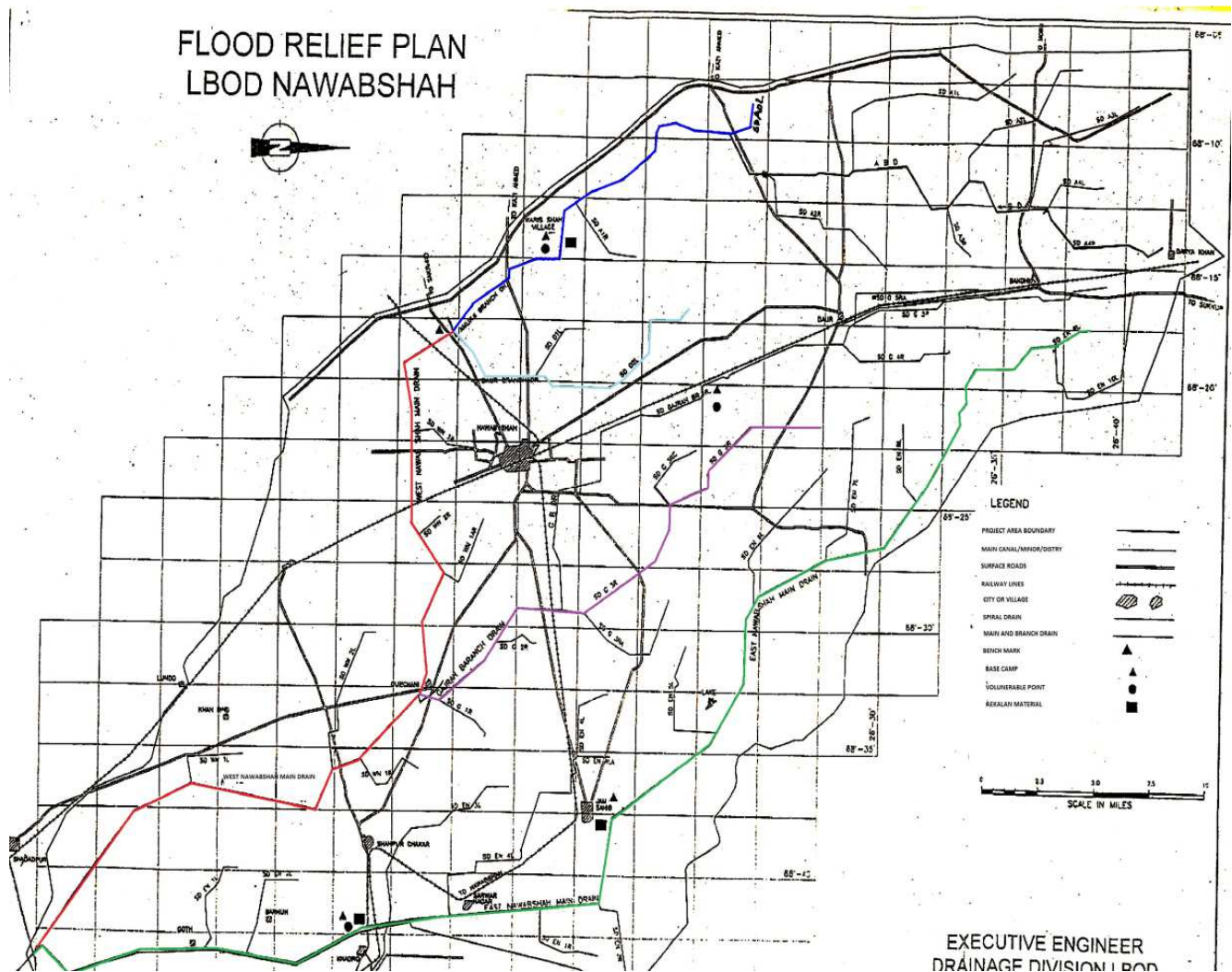


Figure 6. Of the Drain LBOD Shaheed Benazeerabad.

Table 3. Rain Water Survey Report of Shaheed Benazeerabad Project Area.

Date	Spinal Drain RD 815+000	West Sh. Benazeer abad Main Drain (WNMD) Junction Point	East Sh. Benazeer abad Main Drain (ENMD) Junction Point	Junction Point of Amurji Branch Drain (ABD).
22.09.2011	71.16	71.58	71.42	-
23.09.2011	71.06	71.50	71.35	96.92
24.09.2011	70.93	71.02	71.03	96.55
25.09.2011	70.75	70.84	70.91	96.35
26.09.2011	70.59	70.70	70.82	96.11
27.09.2011	70.53	70.66	70.59	69.05
28.09.2011	70.46	70.59	70.48	96.00
29.09.2011	70.40	70.52	70.44	95.96
30.09.2011	70.34	70.46	70.39	95.75
01.10.2011	70.105	70.20	70.25	95.60
02.10.2011	69.94	70.02	70.06	95.28
03.10.2011	69.79	69.88	69.91	95.23
04.10.2011	69.67	69.73	69.76	95.09
05.10.2011	69.60	69.69	69.71	94.93
06.10.2011	69.52	69.64	69.67	94.43
07.10.2011	69.48	69.60	69.55	94.06
08.10.2011	69.41	69.56	69.50	94.00
09.10.2011	69.36	69.51	69.44	93.88
10.10.2011	69.29	69.45	69.38	93.70
11.10.2011	69.20	69.22	69.30	94.00

Date	Spinal Drain RD 815+000	West Sh. Benazeer abad Main Drain (WNMD) Junction Point	East Sh. Benazeer abad Main Drain (ENMD) Junction Point	Junction Point of Amurji Branch Drain (ABD).
12.10.2011	69.21	69.24	69.22	94.40
13.10.2011	69.19	69.22	69.22	94.26
14.10.2011	68.83	68.96	68.97	94.18
15.10.2011	68.75	68.80	68.83	94.01
16.10.2011	68.58	68.68	68.69	93.85
17.10.2011	68.54	68.60	68.62	93.80
18.10.2011	68.48	68.53	68.54	93.76
19.10.2011	68.43	68.50	68.52	93.76
20.10.2011	68.35	68.48	68.50	93.75
21.10.2011	68.32	68.47	68.48	93.70
22.10.2011	68.22	68.40	68.48	93.65
23.10.2011	68.18	68.38	68.46	93.62
24.10.2011	67.90	68.10	68.52	93.30
25.10.2011	67.41	67.70	68.60	93.21
26.10.2011	67.08	67.44	68.60	93.12
27.10.2011	67.06	67.26	68.76	93.00
28.10.2011	66.90	67.22	69.02	92.72
29.10.2011	66.78	67.19	69.23	92.48
30.10.2011	66.64	67.18	69.35	92.40
31.10.2011	66.48	67.00	69.20	92.20
01.11.2011	66.43	66.63	69.05	92.00
02.11.2011	66.34	66.56	69.01	91.86
03.11.2011	66.27	66.54	68.95	91.80
04.11.2011	66.21	66.50	68.91	91.76
10.11.2011	65.74	66.19	69.59	91.63
11.11.2011	65.65	66.12	69.63	91.60
14.11.2011	65.47	65.97	69.60	91.51
15.11.2011	65.42	65.93	69.55	91.47
16.11.2011	65.38	65.88	69.53	91.42
17.11.2011	65.32	65.84	69.50	91.40
18.11.2011	65.32	65.82	69.40	91.30
21.11.2011	65.30	65.80	69.13	91.38
22.11.2011	65.28	65.74	69.06	91.30
23.11.2011	65.24	65.72	69.00	91.28

5.1. Public Health Engineering Shaheed Benazeerabad

- It has been observed that during rainfall in (2011) water level become high and due to unsatisfactory drainage system water becomes stopped in streets on roads, as well as in houses.
- Following disposal of the city Shaheed Benazeerabad were damaged due to heavy rainfall 2011
- 1) Jam shed colony 2) Taaj colony 3) Greebabad colony 4) sahabi colony 5) Awami colony 6) Azeem colony 7) Ghulam rasool shah colony 8) Mehran colony 9) Bloch colony 10) Baloch colony 10) sanghar road disposal
- Anyhow disposable water was pumped through machines even by fully/partially damaged as well as houses.
 - Estimate of Apathy Peoples:
- More than 30% of the houses were under water people are living without halt and living along with their relative's, 20% hostile have taken shelter by their own at open sky locations beside roads, 30% of such affected have been stayed in the various buildings of the government and other private owners such primary

schools, otaques, mosques, and other empty buildings. Near to 50% of the affected countrymen were discommunicated and flood water was stored around most of the villages in district Shaheed Benazeerabad which resulted discommunication and hard movements for their basic purposes, people prefer to live besides road with their assets and live stock by passing the irreparable rain water

• Role of Government:

- Emergency situation was declared by District Government and also the Benazirabad District was declared as a hostile District. However, the lack of responsibility and lack of management towards coordination with the various organizations of humanitarian and community has provided a big gap to provide quick rescue and on time relief to the maximum affected peoples. The mechanism of distribution of very limited relief supplies have been followed through the participation of political representatives thus it is feared that stipulation of relief items would not be availed by the most susceptible peoples at priority.

5.2. Irrigation Department Shaheed Benazirabad

- Due to Low capacity of discharging water designed it becomes up-stream and resulted breaches, due to which received too much loss.
- Partially choked drainage system.
- Force able cuts in drains and irrigation channels by the farmers and locals for the early evacuation of lands and settlements.

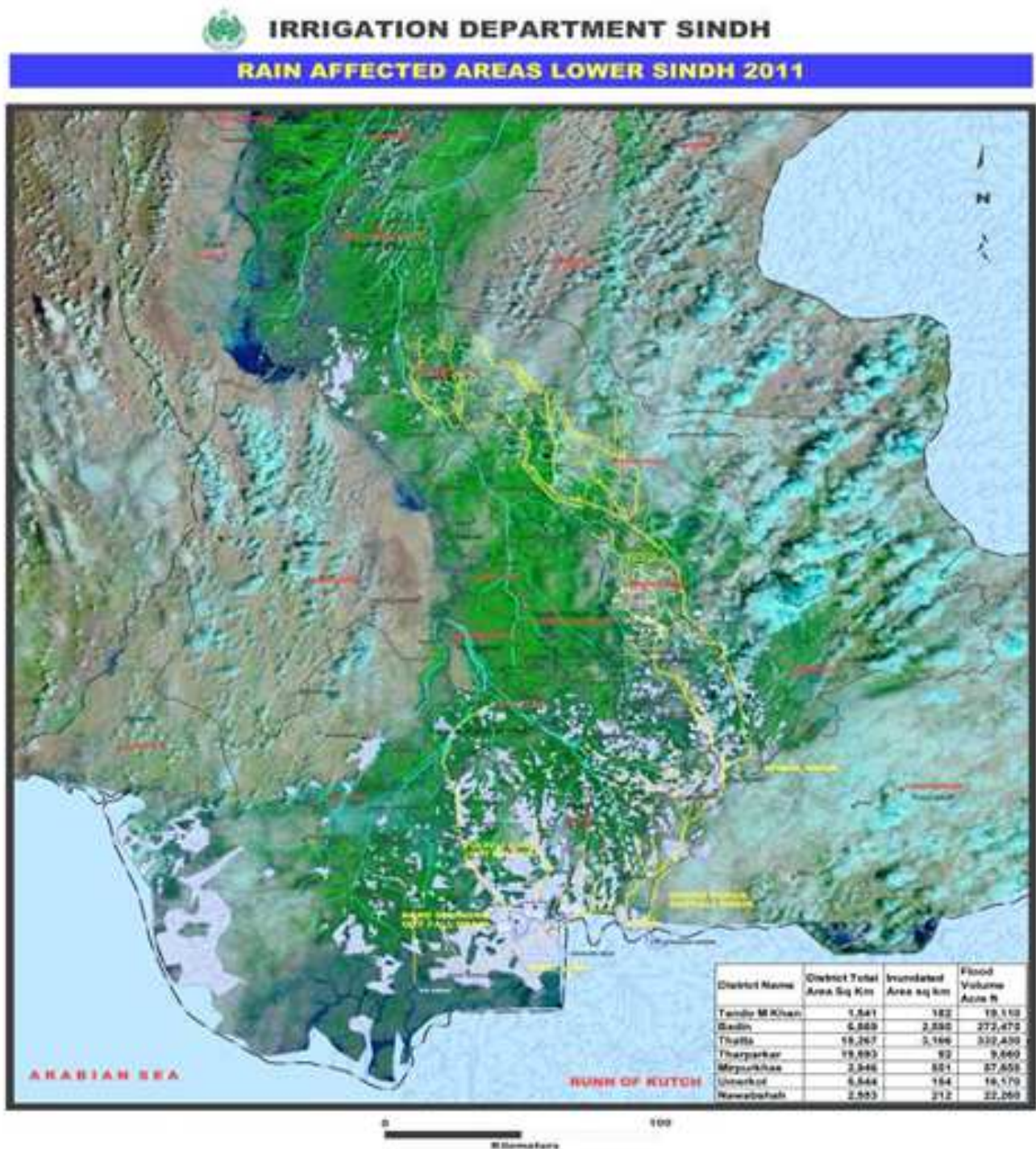


Figure 7. Rain Affected Areas in Sindh.

6. Conclusions

50% of flood and rain water 600mm was drained out through sewerage system and remaining 50% was not drained out but blocked.



Figure 8. Rehabilitation of Government Boys Degree College at Society Road.

- Four new disposals were constructed.
 - i. Ghulam hyder shah colony.
 - ii. Awami colony.
 - iii. Mehran university colony.
 - iv. Lakha disposal.
- Concerned district Administrations enforces sanction to not allow any unauthorized cut in main canals and drains by locals.
- The damage occurred due to excess surface run-off therefore required drainage system must be improved to meet requirements of such heavy rainfall such that (2011).
- From collected data we are in conclusion that disasters of such quantum incidents of rainfall must be handled by municipal Government and have capacity of management to encounter heavy rainfall must be improved.
- On the basis of data collection, human life and live stock were disturbed badly and economic life was disconnected.
- The flood (2011) not only caused heavy damaged, but also exposed the shortcomings of existing drainage system in District Sh. Benazeer abad.
- Disposed water pumped through machines was not enough to cater rain water properly.
- Communicated system either roads or telephone/internet were affected and whole system was damaged aggressively.
- After the rainfall these roads was too much damaged due to the heavy rainfall, due to the bad condition of road Government construct and rehabilitated road of the city Shaheed Benazeerabadas shown in figures.
- Government support financially by WATAN CARD scheme to affected people.

7. Suggestions

- Topography of city and neighboring vicinity of area must be thoroughly studied and suggest most suitable inclined sloped passage to give way of drainage water in drainage inlets in such a way that maximum quantity

of water should be disposed off without any interference.

- Rain water should enter the drain through proper inlet system.
- Drain capacity should be enough to cater surface as well as seepage water.
- Disposal outfall system should be located at proper location.
- A mechanism must be devised to sink rain water in ground aquifer.
- LBOD constructed new drains such as; university side drain, khair shah drain, and also government did pitching of rohri canal in process.

8. Solution

For future planning emergency Centers should be constructed near affected areas.

References

- [1] Fahad Raza Bhambhro, Ghulam Hussain Wagan, Farhan Hussain Wagan (2014), "Socio-Technical Impact of Heavy Down Pour of rainfall 2011 in Sh. Benazeer abad, Sh Benazeerabad, Pakistan" International Journal of Latest Trends in Engineering and Technology (IJLTET) India. Vol. 4 Issue 4, ISSN: 2278-621X, pp 47-57.
- [2] WHO, January (2012), Environmental Health Response to Sindh January(2011) Floods, introduction, pp 1-38.
- [3] UNICEF Pakistan Update 17 july-25 august, humanitarian need pp-1.
- [4] Mohamed A. M. Abd Elbasit, Hiroshi Yasuda1, Atte Salmi and Zahoor Ahmad, (2010), Impact of Rainfall Microstructure on Erosivity and Splash Soil Erosion Under Simulated Rainfall, pp 1-178.
- [5] Ghulam Hussain Wagan, Farhan Hussain Wagan, Fahad Raza Bhambhro (April 2014), "Water Harvesting Strategies for sustainable Water Resources Management" 1st National Conference on Civil Engineering (NCCE 2013-2014) QUEST Shaheed Benazeerabad Pakistan.
- [6] Prof: Ghulam Hussain Wagan (2012) published "Irrigation and Water Resources Engineering." pp 99-131.
- [7] UN, (September 2011), Pakistan Floods Rapid (september 2011) Response Plan Executive Summary pp 1-44.
- [8] Farhan Hussain Wagan, Salim Khoso (2013), "WATER SHORTAGE ITS CAUSES, IMPACTS AND REMEDIAL MEASURES". 6th International Civil Engineering Congress 28th December Karachi Pakistan.
- [9] SZENT ISTVÁN UNIVERSITY GÖDÖLLŐ SOCIO-ECONOMICS OF CLIMATE CHANGE pp 3.
- [10] IMPACTS, VULNERABILITIES AND ADAPTATION IN DEVELOPING COUNTRIES United Nations Framework Convention on Climate Change.