

FLOOD DISASTER MANAGEMENT AND RECONSTRUCTION OF DAMAGED RESIDENTIAL BUILDINGS

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ABSTRACT:- Flood disaster impacts on residential buildings are the most dangerous disasters in the world. It results in losses of life and damages to the properties. Flood loss prevention and mitigation includes structural control measures and non structural control measures.

This paper is the study of damages caused by recent flood in a village at Kerala state and also developing a new strategy for the reconstruction of damaged houses by volunteer contribution of resources and participation by the people lived in that area and as well as nearby area by applying the construction engineering and management techniques in flood disaster management and reconstruction. The strategy developed includes, Damage data collection of affected residential houses, Analysis of observed data for recovery and reconstruction, Development of strategy for reconstruction,

Detailed Cost estimation, Scheduling the total reconstruction project, Approval from authorities, Execution and controlling the project, Monitoring and recording the work done, Reassessment of strategy.

2. INTRODUCTION

Flood disaster is one of the most severe disasters affecting the people across the world. Although floods do occur naturally, some of them are man-made failures such as bursting of dams, deforestation, filling of water logged land areas, improper planning and use of land etc. Impacts due to floods are significant in terms of economic losses both direct loss and indirect loss. This is due to high density of population, large impervious areas, clogging of drainage systems, high economic values of properties and infrastructures, etc. The impacts of floods can be Physical, economic, social and environmental. It may be both direct and indirect impacts. Primary potential losses can be prevented through better land use planning, which also impact the potential of secondary losses. Better flood emergency responses mechanisms help reduce potential of secondary losses. While in rural areas the damages due to floods are mostly direct in terms of loss of agricultural production.

3. EXPERIMENTAL CASE STUDY (KERALA FLOOD AUGUST 2018)

The state has seen the worst flooding in the living memory, due to heavy rains continuing since July. People had not seen such deluge ever before due to excess rainfall. After 7 August more than 317% of the normal rainfall was recorded. Kerala has a coastline of 450 km with water on one side and mountains on the other. The state sees heavy rains and has natural slopes and water flows down right into the seas through the 44 rivers. For the first time in the history of Kerala, all the gates of 37 reservoirs had to be opened to release excess water, which caused widespread inundation of rural as well as urban areas. Kerala's undulated topography paved ways for several landslides and flash flooding in many places washing away and destroying many habitations. Due to the floods, over 350 people have died, thousands are marooned and over 1.2 million are displaced who are sheltering in approximately 2,000 relief camps setup by the state government. Search and rescue operation was called off only on 22 August after evacuating over 20,000 marooned people.

Rains finally stopped on 20 August and the water started receding afterwards allowing the displaced population to return to their homes wherever possible. Most of the families are witnessing the scene of absolute devastation with over 50 cm of mud within their houses. In this scenario we select a small area in a village at Thrissur district, Kerala state for study and developing a reconstruction strategy. The study was conducted at an area consist of 93 residential houses in ward no: 16 of Adat Grama Panchayath, Thrissur district, Kerala state.

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DEVELOPMENT OF NEW STRATEGY

We have developed a new strategy for the reconstruction of damaged houses by the volunteer contribution and participation of people's lived in affected area and also nearby areas. In this method following are the various stages of work.

3.1 Constitute a committee for organising the reconstruction process by the help of Government and district administration including MLA, District Panchayath president, Block Panchayath president, Grama Panchayath president, government departments like LSGD, KSEB, Water authority etc. The members of committee are

Chairman	:	Member of legislative assembly
Vice chairman	:	Grama Panchayath president
Convenor	:	secretary, Panchayath
Member 1	:	ward member and joint convenor
Member 2	:	ward member and joint convenor
Member 3	:	ward member and joint convenor
Member 4	:	ward member and joint convenor
Member 5	:	ward member and joint convenor
Member 6	:	ward member and joint convenor
Member 7	:	ward member and joint convenor
Member 8	:	ward member and joint convenor
Member 9	:	ward member and joint convenor

3.2 Resource collection strategy for the reconstruction of houses. They are

- Reusable materials like, bricks, wood, steel, gravel, sand, earth etc from affected area.
- contribution of volunteer skilled and unskilled manpower from the affected area and also from nearby area and public
- volunteer technical manpower contribution of professionals from the society
- volunteer students manpower from engineering colleges, polytechnics, ITI's , colleges and other institutions
- contribution from non-government organisations
- donations from the public's and other local organisation like, residential association, political parties, workers associations, merchant associations, cultural clubs, lions clubs, rotary clubs, banks, cooperative institutions, etc
- utilisation of various funds from government projects, Panchayath funds, corporation funds, district administration funds, disaster management fund, chief ministers disaster relief fund, asset development funds of MLA, etc
- manpower contribution from NCC,NSS,SCOUTS, student police,etc
- Use of technical man power from urban planning department authority and also district engineer's association.

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3.3 Under the reconstruction committee various sub committees are formed for the easy, economical and efficient execution of the project. Committee and their responsibilities are

Chairman: Member of legislative assembly, Overall responsibility of project

Vice chairman : Grama Panchayath president, assisting the chairman

Convenor: secretary, Panchayath, Coordination of all activities of project

Member 1: ward member, joint convenor for project execution team1, 2 and 3

Member 2: ward member, joint convenor for project execution team4, 5 and 6

Member 3: ward member, Joint convenor for project execution team7, 8, 9 and 10

Member 4: ward member, Joint convenor for food supplies committee

Member 5: ward member, Joint convenor for purchase committee

Member 6: ward member, Joint convenor for transportation committee

Member 7: ward member, Joint convenor for documentation committee

Member 8: ward member, Joint convenor for resources collection committee

Member 9: ward member, Joint convenor for planning and controlling committee

3.4 With the help of professionals, we prepare a detailed project report containing the details of damages, quantity of items of works, quantity of material required, manpower required, money required for reconstruction, work scheduling, task scheduling, resource allocation, etc

3.5 Obtain necessary sanction and authorisation from government and other departments for the proposed project

3.6 Under the execution committee, execute the project in a systematic and proposed way. The project controlling, recording, documenting, evaluating the nature of work implementation, etc

3.7 Under the planning committee, monitor the work progress and document the activities for evaluation

3.8 Reassessment may be done after the execution of each activity in the project for the quality of construction, effective usage of resources, project strategy, duration of each activity, cooperation of stakeholders, corporation of flood affected people's, etc

3.9 Completion of the project.

4. RESULT AND DISCUSSION

4.1 DETAILS OF FEILD SURVEY

Sl.no	description	No of Effected Houses
1	DAMAGES TO OPEN WELLS	
	Well protection wall repairing work	28
	Cleaning of water inside the well	93
	Water quality testing	93

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2	SEPTIC TANK	
	Septic tank repairing	18
	Soak pit repairing	50
	Cover slab repairing	3
3	MASONRY WORKS	
	Foundation	6
	Concreting P.C.C	27
	Plastering	40
	Flooring	5
	Brick masonry	32
4	CARPENTRY WORKS	
	Door shutter repair	93
	Cub boards repair	18
	Window shutter repair	24
	Window frame repair	10
	Door frame repair	18
5	SANITARY WORKS	
	Water Closet replacing	20
	Manhole repairing	60
	Sanitary line P.V.C repairing	30
6	PLUMBING WORKS	
	Electric motor repairing	40
	Water tank repairing	22
	Plumbing line P.V.C repairing	39
	Tap and other fittings replacing	56
7	ELECTRICAL WORKS	
	Electrical wiring repairing	39
	Switch board repairing	18
	Switch and plug replacing	34
	Tube and bulb replacing	70
	Main switch and fuse replacing	23
	Energy meter replacing	27
	Connection line from KSEB post	16
8	R.C.C WORK	
	Roof slab repairing	18
	Floor slab repairing	28

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	Sunshades repairing	48
9	DOCUMENTS LOST	
	Bank documents	52
	Title deeds and other documents	12
	Identity proof documents	45
	Educational certificates	12
10	CLEANING AND DISINFECTION TREATMENT	
	Surroundings	93
	Outside house	93
	Inside house	93

4.2 ABSTRACT OF COST

Sl no	Description	Quantity	Rate	Amount
1	Masonry repairing work using HD concrete brick masonry in CM 1:6 for all repairing works including all cost of materials and labour etc complete.	200M3	5000/m3	10,00,000.00
2	Plastering with CM 1:5 for all repairing works including all cost of material and labour etc complete	2310M2	200/m2	4,62,000.00
3	PCC 1:4:8 using 20mm metal for flooring including all cost of material and labour etc complete	12M3	7000/m3	84,000.00
4	Random rubble masonry in CM 1:6 for basement including all cost of material and labour etc complete	8M3	4000/m3	32,000.00
5	Floor finishing with CM 1:3 for damaged floors including all cost of material and labour etc complete	65M2	250/m2	16,250.00
6	RCC 1:2:4 using 20mm metal including all cost of reinforcement, other materials and labour etc complete	60M3	10000/m3	6,00,000.00
7	Cleaning of water inside the well	93 no	2000/no	1,86,000.00
8	Water quality testing	93 no	250/no	23,250.00
9	Soak pit cleaning and refilling labour charges	50 no	800/no	40,000.00
10	Carpentry repairing work including all cost of materials and labour etc complete			
	Door shutter repair	93nos	1000/no	93,000.00
	Cub boards repair	18nos	300/no	5,400.00
	Window shutter repair	24nos	1000/no	24,000.00
	Window frame repair	10nos	500/no	5,000.00
	Door frame repair	18nos	300/no	5,400.00
11	Supplying and fixing Indian water closet with all fittings including all cost of material and labour etc complete	20nos	3000/no	60,000.00

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12	Cleaning and repairing the existing manholes including all cost of materials and labour etc complete	60nos	500/no	30,000.00
13	Supplying and fixing 10 cm size dia PVC pipes for sanitary line including all cost of materials and labour etc complete	90m	150/m	13,500.00
14	Repairing work of damaged electric motor including all cost of materials and labour etc complete	40nos	1000/no	40,000.00
15	Supplying and fixing 300 litres capacity PVC water tanks including all cost of materials and labour etc complete	22nos	1500/no	33,000.00
16	Supplying and fixing 2.54 cm size dia PVC pipes for water line including all cost of materials and labour etc complete	120m	70/m	8,400.00
17	Supplying and fixing PVC taps for water line including all cost of materials and labour etc complete	56nos	30/no	1,680.00
18	Electrical wiring repairing	39nos	3000/no	1,17,000.00
19	Switch board repairing	18nos	1000/no	18,000.00
20	Switch and plug replacing	34nos	1000/no	34,000.00
21	Tube and bulb replacing	70nos	250/no	17,500.00
22	Main switch and fuse replacing	23nos	500/no	11,500.00
23	Energy meter replacing	27nos	1000/no	27,000.00
24	Connection line from KSEB post	16nos	500/no	8,000.00
25	Cleaning and disinfection			
	Surroundings	93nos	2000/no	1,86,000.00
	Outside the house	93nos	1000/no	93,000.00
	Inside the house	93nos	2000/no	1,86,000.00
26	Unforeseen Items			39,120.00
	TOTAL			35,00,000.00

4.3 LIST OF MATERIALS REQUIRED

Sl no	Name of Items	Quantity	Rate	Amount
1	Rubble	8m ³	1500	12,000.00
2	Manufactured sand (coarse)	70 m ³	2000	140,000.00
3	Manufactured sand(fine)	40 m ³	2100	84,000.00
4	HD concrete bricks	19200 no	35	672,000.00
5	Steel	30000 kg	55	165,000.00
6	Cement	870 bag	400	348,000.00
7	20mm metal	70 m ³	1650	115,500.00
8	Electrical wires (1/18)	23 coil	730	16,790.00
9	One way switches	68 no	30	2,040.00

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10	5A plug	68 no	50	3,400.00
11	40W tube light	40 no	250	10,000.00
12	10 W LED bulb	30 no	90	2,700.00
13	PVC boxes 20 x 15 cm size	18 no	50	900.00
14	25 mm dia PVC Pipes	120 m	70	8,400.00
15	110 mm dia PVC Pipes	90 m	150	13,500.00
16	water tank 300L	22 no	2000	44,000.00
17	Indian Water closet	20 no	2000	40,000.00
18	wood planks of different sizes	3m3	30000	90,000.00
19	unforeseen items	LS		9,370.00
			TOTAL	1,777,600.00

4.4 LIST OF LABOUR IN DAYS REQUIRED

Sl no	Type of labor	Quantity	Rate	Amount
1	Mason	551 no	900/E	495,900.00
2	Skilled male helper	106 no	700/E	74,200.00
2	Male helper	590 no	650/E	383,500.00
3	Female helper	661 no	500/E	330,500.00
4	Carpenter	186 no	900/E	167,400.00
5	Bar bender	60 no	900/E	54,000.00
6	Technician	25 no	900/E	22,500.00
10	Electrician	80 no	900/E	72,000.00
11	Plumber	43 no	900/E	38,700.00
12	Sanitary worker	93 no	900/E	83,700.00
			TOTAL	1,722,400.00

4.5 SCHEDULING THE RECONSTRUCTION PROJECT

The scheduling of all items of work can be done manually because all the required resources are collected by volunteer contribution of man power and donation of money and materials from the public. There are 3 types of scheduling of activities are involved in this method.

4.5.1 SCHEDULING AT PLANNING STAGE

It includes Damage data collection, analysis of data collected, cost estimation, preparation of man power schedule, material schedule, etc. Planning team should allocate required resources to these activities in proper time. Member 9 and Joint convenor for planning and controlling committee should obtain required approvals for the project from necessary authorities

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4.5.2 SCHEDULING AT EXECUTION STAGE

It includes, division of the available workers in to small groups having a team leader with 4 workers, allot a supervisor for each team, 3 such teams are controlled and monitored by a subcommittee, All the activities of these sub committees are controlled and monitored by organising committee.

It also includes working strategy like, grouping the similar items of activities in different houses together to get effective and economical way of completing the activity. It may help to form a continuous and speedy nature of work. Different repairing works like masonry work, carpentry works, plumbing works, sanitary line work, and also cleaning and disinfection work may be carried out simultaneously.

4.5.3 SCHEDULING AT COMPLETION STAGE

It includes, monitoring each and every activities, controlling the execution, allocation of all resources to the project like material, manpower, design, food supplies, transportation facility, storing facility, hiring of skilled workers, collection of special resources etc, reassessment of strategy, documentation work. The reconstruction committee evaluate the strategy, project execution method, speed of reconstruction, quality of work done, usage of resources and eventually the completion of project

5. CONCLUSIONS

Although the reconstruction activity through this method is a tedious process, committed volunteer contribution of manpower, materials, and money from all parts of the society gave the execution team lot of courage and strength to achieve the target and also overcome the risk factors. the humanitarian consideration and also the broad mindness of society has always shown keen interest in contributing their valuable resources to the reconstruction of damaged houses of poor people's lived in that area. This is the most efficient, economical, cost effective, time targeted method of reconstruction of flood disaster damaged houses with the help of government and public participation.

In any reconstruction process, the people with whom we work should become the subject experts and masters on their own destiny. The well-intended NGOs and various stakeholders should demonstrate convincingly that they are committed to work through transparency, bottom-up planning, democratization, accountability, cost effective measures, ensuring proper utilization of resources, strengthening of peoples organizations for self governance etc, eventually for achieving sustainable and fruitful development to the damaged house reconstruction of existing 93 no residential houses at 17th ward in Adat Grama Panchayath, Thrissur district, Kerala state.

REFERENCES

1. **Morris D, Hargreaves B, Pazzaglia F, Weisman R and Williamson C.** Assessing the interactive effects of landscape, climate, and UV radiation on river ecosystems (Grant# R829642), Lehigh University Bethlehem, PA, USA; 2004.
2. **Keokhumcheng Y.** Flood damage functions for surrounding area of Second Bangkok International Airport, International Symposium on Urban Safety of Mega Cities in Asia, November, 2006; p. 291-300.
3. **Tingsanchali T.** Flood disaster and risk management, Invited Paper, Proceedings, 1st EIT International conference on water resources engineering, Petchaburi, Thailand, August, 2011; p. 15-24.
4. **Study report** Kerala floods of august 2018 Government of India Central Water Commission, Hydrological Studies Organisation, Hydrology (S) Directorate, New Delhi.
5. **International Journal of Science, Engineering and Technology Research (IJSETR)**, Volume 5, Issue 1, January 2016
6. **International Journal of Scientific & Engineering Research** Volume 8, Issue 12, December-2017



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Department of Civil Engineering, T John Institute of Technology, Bangalore-83

7. **International Journal of Scientific & Engineering Research**, Volume 7, Issue 8, August-2016
8. **www.econjournals.com**
9. **www.sciencedirect.com**
10. **<https://www.researchgate.net/publication/309767741>**