Flood Disaster Management in Rethare Harnaksh Village

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***Abstract*— Floods are among the most frequent and devastating natural disasters globally, causing significant loss of life, property damage, and disruption of livelihoods. Effective flood disaster management is essential to mitigate these impacts and enhance community resilience. This paper presents a comprehensive analysis of flood disaster management strategies, encompassing risk assessment, early warning systems, emergency response, and post-disaster recovery. It explores both traditional approaches and modern technologies, in predicting and managing flood events. Case studies of Rethare Harnaksh Tal- Walwa Dist.- Sangli flood-prone regions are examined to identify best practices and challenges in implementation. The paper emphasizes the importance of community participation, inter-agency coordination, and climate adaptation in developing robust flood management frameworks. The findings aim to inform policy makers, disaster management professionals, and urban planners on integrated approaches to reduce flood risks and build safer, more resilient communities.**

INTRODUCTION

Floods have also occurred in areas, which were earlier not considered flood prone. An effort has been made in these Guidelines to cover the entire gamut of Flood Management. Eighty percent of the precipitation takes place in the monsoon months from June to September. The rivers a bring heavy sediment load from catchments. These coupled with inadequate carrying capacity of rivers are responsible for causing floods, drainage congestion and erosion of river-banks. Cyclones, cyclonic circulations and cloud bursts cause flash floods and lead to huge losses. It is a fact that some of the rivers causing damage in India originate in neighbouring countries; adding another complex dimension to the problem. Continuing and largescale loss of lives and damage to public and private property due to floods indicate that we are still to develop an effective response to floods. NDMA's Executive Summary Guidelines have been prepared to enable the various implementing and stakeholder agencies to effectively address the critical areas for minimizing flood damage. Floods are the most frequent natural hazard in the world affecting most of the countries on a regular basis. They occur at any time of the year and are most often caused by heavy rainfall, rapid melting of a thick snow pack and ice jams, or more rarely, by the failure of manmade dams.

Over the past few decades, the economic damage of floods has rapidly increased, principally driven by the increased exposure of assets at risk. Flooding in the cities and the towns is a recent phenomenon caused by increasing incidence of heavy rainfall in a short period of time, indiscriminate encroachment of waterways, inadequate capacity of drains and lack of maintenance of the drainage infrastructure. Keeping in view the fact that the problem is becoming more severe and losses are mounting every year, the subject of urban flooding has been recognized by the NDMA as one meriting exclusive attention and separate guidelines for its management are being prepared and will be issued soon. Historically floods are known to cause damage to property and life leaving a long-term traumatic impact on those who get affected by them. The intensity and magnitude of floods is supposed to be increasing world over in the recent decades because of climate change and global warming phenomenon. The Western Ghats are globally important, not only being rich in biodiversity, but primarily because of the role, they play in influencing climatic regime and annual precipitation in Indian subcontinent. The climate change has caused uncertainty and wide fluctuations in precipitation pattern from extreme droughts to heavy rains and periodic cloud bursts. Thus, floods, which were locally

almost unknown, are becoming a potential disaster in the earlier relatively safe and climatically stable areas.

I. BIBLIOMETRIC ANALYSIS

Islam Rabiul, et.al, (2016), studied on "A Review on Mechanism of Flood Disaster Management in Asia", Disaster risk reduction and introduced mechanism of flood disaster in Asia continent including Malaysia, Indonesia, Bangladesh, India, Pakistan, Japan, China and analyze flood risk in Asia continent, introduce Policy and strategic planning, Flood mitigation policy and strategy, Flood disaster relief gives a solution to structural and non-structural measures & concluded structural as well as nonstructural measures to avoid flooding in India and country in Asia.

Tingsanchali (2011), studied on "Urban flood disaster management" introduce facilities and human resources, preparedness before flood impact such as flood forecasting and warning readiness upon flood arrival; emergency responses during flood impact and; recovery and rehabilitation and preparedness machinery and concluded implementation of multiple purpose measures enables municipalities to achieve multiple goals such as flood mitigation, water supply, space for recreational activities, groundwater recharge and improvement of urban environment.

Patil Pramod (2012), studied on "Disaster management in India" introduced Disaster Profile of India Focus on Mitigation Recommendations for improvement, Awareness, Communication, & concluded and gives a solution like Natural hazards are result of climatic imbalance and cannot be prevented but we can develop effective warning system and minimize loss by reducing vulnerability and increasing capacity. We need to be more proactive than reactive.

Ramachandran, et.al, (2009), studied on "Disaster and development" and introduced causes of manmade factors to flooding, gives a preventive method according to condition & concluded that causes and its manmade factors of flooding and gives efficient preventive methods to avoid flooding like good drainage and water relief system.

Shimi Lawrence, et.al, (2012), Studied on "The Need for Integration of Disaster Management into Engineering Curriculum" and introduced disaster management education, emergency preparedness, problem based learning and concluded that as India is a country of various anthropogenic disasters and natural disasters, it becomes necessary for the future generation of Engineers to be familiar with preventive measures and the Disaster Management practices.

II. METHODOLOGY

Flood is one of the disasters which leads to so many losses such as socially, economically as well as of environmental loss. To avoid its effect on environment some preventive methods have adopted as, and some authority has taken charge to handle this like National hazard disaster management of India at national level. To minimize flood effects, some methods are followed as;

1. To study of flood history of Sangli and Rethare Harnaksh as well as its causes.
2. To collect information of Krushna river and monsoon data of Walwa tehsil and Sangli district during monsoon season.
3. Before flooding, give necessary instruction to all the peoples so that they will know how to take necessary action to prevent from loses that overcame after flooding.
4. To analyse preventive methods of flooding to reduce losses.

III. FLOOD HISTORY OF SANGLI

River Krushna is formed by five tributaries in the mid-section of the district and is the major flood prone river along with others in the south of the district namely Dhudhganga, Hiranyakeshi, Vedganga, and Tamraparni. These flood plains are restricted only to lower reach in the east of the district till they meet river Krishna flood plain. There are several irrigation and multipurpose projects in the district which include 3 major dam projects, 12 medium project and 10 minor projects. It is seen that majority of these dams are situated in the maximum rainfall area i.e. western parts of the district. This will be helpful to reduce the impact of flood during maximum rainfall period and also it maintains river flows in the summer season and reduces the severity of water. However, in the event of unforeseen situation, as a result of climate change, the excess water from these tanks also needs to be considered as potential threat for flooding. It can be seen that the large percentage of flood affected villages in Sangli district are from Chandgad tahsil followed by Karveer and Shirol tahsils. Whereas excessive rainfall in the river basins is the main cause to flood prone villages in Sangli district except in Shirol and Hatkanangale tahsil, where main cause of floods is due to the back water pressure of Krushna river caused by excesses swelling of Krishna River flood during the same time (table no. 1 and Plate-III (a to f)).

Table 1- Details Of Sangli And Rethare Harnaksh

River	Tehsil	Total villages	flood prone villages	% total number of flood prone to total flood prone villages
Krishna	Walwa	128	23	17.96875
Krishna	Shirala	129	14	10.85271318
Krishna	kadegaon	82	33	40.24390244
Krishna	palus	65	25	38.46153846
Krishna	Miraj	81	6	7.407407407
Krishna	Jath	112	16	14.28571429
Total	6	340	117	34.41176471

IV.MONSOON DATA OF SANGLI DISTRICT

The rainfall of the twelve tehsils of Sangli district, in the years 2001 to 2013, was collected from relevant agencies and analyzed for the mean, S.D., coefficient of rainfall variability, rainy month's rainfall percentage, and month wise total rainfall variation and finally the choropleth map were evaluated. The study revealed significant variation trends in the frequency the magnitude of extreme rain events all over Sangli district. This type of detailed localized study is useful for the practical implementation for disaster planners and managers. (Data generated is applicable to the tehsil level but not geographical area). Table no 3.1 presents the mean annual rainfall value with standard deviation and coefficient of variability, during the years 2001 to 2013 for the twelve tehsils of Sangli district.

- Measures to prevent flooding

1. Introduce better flood warning systems

The UK must "improve our flood warning systems", giving people more time to take action during flooding, potentially saving lives, the deputy chief executive of the Environment Agency, David Rooke, said. Advance warning and pre-planning can significantly reduce the impact from flooding.

2. Modify homes and businesses to help them withstand floods

The focus should be on "flood resilience" rather than defence schemes, according to Laurence Waterhouse, director of civil engineering flood consultancy Pell Frischmann. He advised concreting floors and replacing materials such as MDF and plasterboard with more robust alternatives. "We are going to have to live with flooding. It's here to stay," Mr. Waterhouse said. "We need to be prepared." His recommendations were echoed by Mr. Rooke, who suggested waterproofing homes and businesses and moving electric sockets higher up the walls to increase resilience.

3. Construct buildings above flood levels

Britain should construct all new buildings one metre from the ground to prevent flood damage, the former president of the Institution of Civil Engineers has suggested. Professor David Balmforth, who specialises in flood risk management, said conventional defences had to be supplemented with more innovative methods to lower the risk of future disasters.

4. Tackle climate change

Climate change has contributed to a rise in extreme weather events, scientists believe. Earlier this month the leader of the Green Party, Natalie Bennett, welcomed the landmark Paris Agreement, whereby governments from 195 countries pledged to "pursue efforts" to limit the increase in global average temperatures to 1.5°C above pre-industrial levels. "It is now crucial that world leaders deliver on the promise of Paris," Ms. Bennett said. "The pressure is now on the British government to reverse its disastrous environmental policy-making."

5. Increase spending on flood defences

Figures produced by the House of Commons library suggest that real terms spending on flood defences has fallen by 20 per cent since David Cameron came to power. Yesterday [MON] the Prime Minister rejected this allegation, insisting the amount being spent had risen. Mr. Cameron promised to review spending on flood defences after chairing a conference call of the government's emergency Cobra committee at the weekend.

6. Protect wetlands and introduce plant trees strategically

The creation of more wetlands – which can act as sponges, soaking up moisture – and wooded areas can slow down waters when rivers overflow. These areas are often destroyed to make room for agriculture and development, the WWF said. Halting deforestation and wetland drainage, reforesting upstream areas and restoring damaged wetlands could significantly reduce

the impact of climate change on flooding, according to the conservation charity.

7. Restore rivers to their natural courses

Many river channels have been historically straightened to improve navigability. Remaindering straightened rivers by introducing their bends once more increases their length and can delay the flood flow and reduce the impact of the flooding downstream.

8. Introduce water storage areas

Following the severe flooding of 2009 a £5.6 million flood alleviation scheme was established in Thacka Beck, on the outskirts of Penrith, Cumbria. More than 675 metres of culverts underneath the streets of Penrith were replaced and a 76,000m³ flood storage reservoir – the equivalent of 30 Olympic sized swimming pools – was constructed upstream to hold back flood water. The risk of flooding from the beck was reduced from a 20 per cent chance in any given year to a one per cent chance, according to Cumbria Wildlife Trust.

9. Improve soil conditions

Inappropriate soil management, machinery and animal hooves can cause soil to become compacted so that instead of absorbing moisture, holding it and slowly letting it go, water runs off it immediately. Well drained soil can absorb huge quantities of rainwater, preventing it from running into rivers.

10. Put up more flood barriers

The Environment Agency uses a range of temporary or "demountable" defences in at-risk areas. These can be removed completely when waters recede. Temporary barriers can also be added to permanent flood defences, such as raised embankments, increasing the level of protection. "As the threat and frequency of flood risk increases, the use of passive flood defence has to be the only realistic long term solution," Frank Kelly, CEO of UK Flood Barriers claimed earlier this month in Infrastructure Intelligence, a magazine for the infrastructure sector. Mr. Kelly's company was responsible for designing a self-activating flood barrier he said had proved to be "invaluable" in protecting properties close to the River.

V. FLOOD IN RETHARE HARNAKSH

According to Census 2021 information the location code or village code of Rethare Harnaksh village is 568331. Rethare Harnaksh village is located in Walwa tehsil of Sangli district in Maharashtra, India. It is situated 26km away from sub-district headquarter Uran Islampur (tehsildar office) and 66km away from district headquarter Sangli. As per 2009 stats, Rethare Harnaksh is the gram panchayat of Rethare Harnaksh village. The total geographical area of village is 1677 hectares. Rethare Harnaksh has a total population of 6,976 peoples, out of which male population is 3,609 while female population is 3,367. Literacy rate of rethare Harnaksh village is 76.20% out of which 81.27% males and 70.78% females are literate. There are about 1,466 houses in rethare Harnaksh village. Pincode of rethare Harnaksh village locality is 415302.When it comes to administration, Rethare Harnaksh village is administrated by a sarpanch who is elected representative of the village by the local elections. As per 2019 stats, Rethare Harnaksh village comes under Islampur assembly constituency & Hatkanangle parliamentary constituency. Uran Islampur is nearest town to rethare Harnaksh for all major economic activities, which is approximately 26km away. Rethare Harnaksh river image shown in figure 1.

Figure 1-Map of rethare harnaksh

VII.WHAT TO DO BEFORE A FLOOD

- To prepare for a flood, you should:

1. Avoid building in flood prone areas unless you elevate and reinforce your home.
2. Elevate the furnace, water heater, and electric panel if susceptible to flooding.
3. Install "Check Valves" in sewer traps to prevent floodwater from backing up into the drains of your home.
4. Contact community officials to find out if they are planning to construct barriers (levees, beams and floodwalls) to stop floodwater from entering the homes in your area.

5. Seal the walls in your basement with waterproofing compounds to avoid seepage.

- If a flood is likely to hit your area, you should:

1. Listen to the radio or television for information.
2. Be aware that flash flooding can occur. If there is any possibility of a flash flood, move immediately to higher ground. Do not wait for instructions to move.
3. Be aware of streams, drainage channels, canyons, and other areas known to flood suddenly. Flash floods can occur in these areas with or without such typical warnings as rain clouds or heavy rain.

- If you must prepare to evacuate, you should:

1. Secure your home. If you have time, bring in outdoor furniture. Move essential items to an upper floor.
2. Turn off utilities at the main switches or valves if instructed to do so. Disconnect electrical appliances. Do not touch electrical equipment if you are wet or standing in water.

- If you have to leave your home, remember these evacuation tips:

1. Do not walk through moving water. Six inches of moving water can make you fall. If you have to walk in water, walk where the water is not moving. Use a stick to check the firmness of the ground in front of you. Do not drive into flooded areas. If floodwaters rise around your car, abandon the car and move to higher ground if you can do so safely. You and the vehicle can be quickly swept away.

VIII REQUIRED KIT TO TAKE NECESSARY ACTION DURING FLOODING

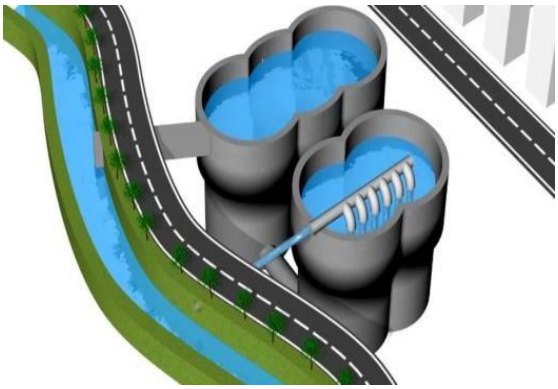
- Rope
- Stretcher
- Torch
- Helmet
- Rescue boat
- Safety jacket
- Net
- Hand gloves
- Safety shoes
- Spine board stretcher

IX.PREVENTIVE METHODS FOR FLOOD MANAGEMENT

- Flood protection wall

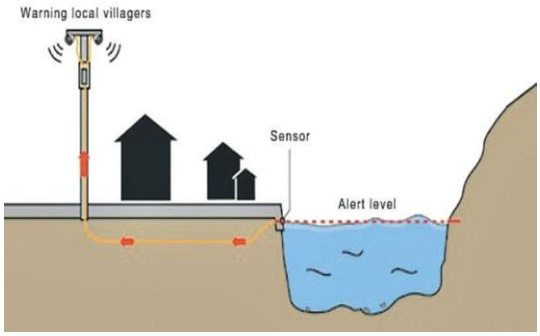
- A flood wall is a tall, man-made barrier built to temporarily hold back rising river or waterway levels during heavy rains or seasonal flooding. These walls are especially useful in crowded urban areas where there's no room to build wider structures like levees or dikes. They help protect important places—like buildings, historic sites, or waterfront businesses—where space is limited and permanent earth barriers would be disruptive.

- Anti-flood reservoir



It is a one of the type of reservoir in which surplus water present above normal water level of river, it gets transfer to this reservoir by pumping or by gravity means. It is necessary to take surplus water from river during monsoon season to avoid damages due to flooding. This surplus water can be transferred far from the flood basin to reduce the load of flood water. The water from anti flood reservoir can be used for various purposes such as ground water recharge and for future use purpose.

- Flood warning system



- Flood warnings are a crucial way to adapt in situations where building large, permanent flood defenses isn't practical or suitable. This could be because such structures might harm the environment or local communities, or because the cost of building them is too high.

Working of flood management model

In flood management model, we introduced flood warning system, flood protection wall & anti-flood reservoir. It consist of following components are as follows –

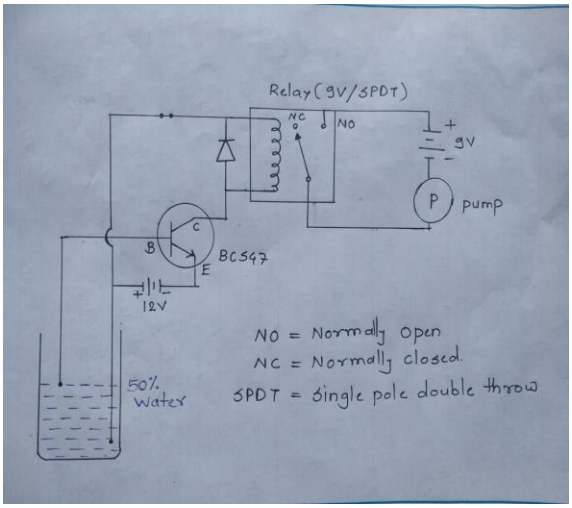
1. Precipitation block.
2. Dykes in the form of sponge.
3. River basin.
4. Villages at different levels.
5. Intake structure.
6. Flood protection wall.
7. Anti-flood reservoir.
8. flood-warning system.
9. relay circuit.

1. Upper block indicates that precipitation which falls rain on hilly areas Due to the slope on hilly areas, water flows with high velocity and water percolation to the ground is of low rate. So dykes is constructed on hilly areas which decrease the water velocity also increase rate of water percolation to the ground. Sponge indicates dykes on hilly areas.

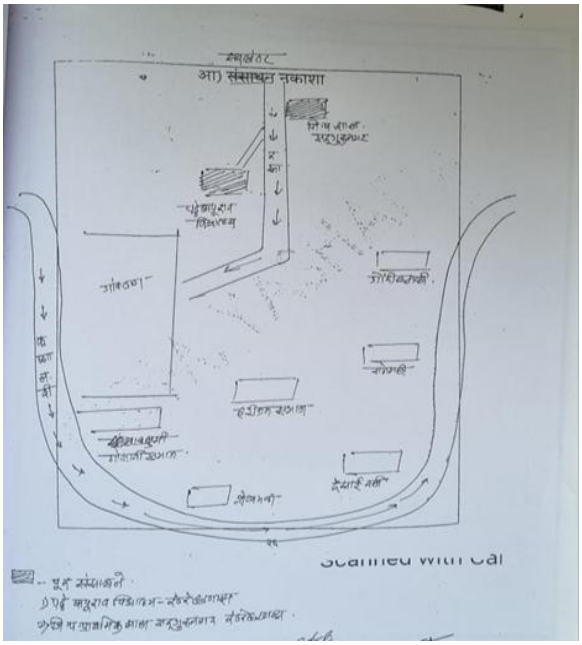
2. In this model flood warning system is provided, in normal water level of river flood warning system indicate green light, if river flood water is increases and goes to near the houses of the villages which is the lower elevated than other villages then blue light indicates on the flood warning system, if river flood water goes to the near the houses of the higher elevated villages then red lights in flood warning system. 3. If river flood water increases above the flood protection wall then gives alerts to the people near the river bank.

4. "An anti-flood reservoir is built near a river or in a suitable location to store excess river water. To divert this surplus water into the reservoir, an intake structure is installed along the riverbank. A conduit, tunnel, or pipe is then laid at an appropriate location to transfer the water from the river to the reservoir." Fix up relay circuit and pump in the anti-flood reservoir, after it gets filled upto 50% of the reservoir capacity it gets automatically pumped for raising ground water recharge and the surplus water that stored in reservoir can be used for various purposes.

- Relay circuit diagram



- Relocation of Rethare Harnaksh



X.CONCLUSION

1. It is observed that flood intensity in Rethare Harnaksh village was not only dependent on the regional rainfall but it also depended on the water already stored before monsoon in the dams. When there is more water storage in these wetlands before monsoon, then the dams in the water shade overflow in the downstream rivers, even with modest rainfall in their catchments & worst flood came in Rethare Harnaksh in the year of 2019.

2. According to monsoon data of 2001-2013, most of the rainfall falls in month of july. Average rainfall in Sangli district from 2001-2013, most rainfall falls in Walwa then followed by Karad, Shirala etc.

3. Use of science and technology, telecommunication and media for alarming and pre-disaster measures can be effective to reduce the devastations. To set up alarming system at the bank of rivers which can alert neighbouring dwellers about rising water level can also be an affective measure to minimize the damage.

4. we relocate village by using village map, water flow of river & height of homes from sea level.

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