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EVACUATION CENTRE FOR FLOOD-PRONE AREAS IN ASSAM

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1. Abstract

Flood is the most devastating and costly natural hazard in the world that leads to significant economic and social damages. Causative factors of floods are interrelated between various weather factors such as heavy rain, storm surges, inadequate drainage systems and structural failures of dams. Nevertheless, people living within the flood plain areas or in close proximity to geographic regions such as coastal areas and river basins are vulnerable to flooding. Relief shelters play a vital role as part of disaster response and recovery in providing optimum security, personal safety, protection from climate and improving resistance to ill health and diseases for victims who lost their accommodations as a result of the disaster itself.

When a flood occurs, the victims are needed to evacuate immediately to the safest relief/evacuation centre. At this stage, victims are only keen to save their lives and leave their belongings and property. Relief centres are the first temporary living spaces for disaster-affected people. These spaces should be safe and follow the minimum standards of living and care for the people's duration of their stay. During these floods, thousands of victims are evacuated to government facilities such as community halls, schools, mosques, churches, etc.

Keywords: Flood-Prone, Evacuation Centre

2. Introduction

Agriculture is the most important source of economic aid and a prime factor in the growth and development of India. It is the main source of food supply and occupation for the major portion of the country's population which resides in rural areas. It provides livelihood to about 50 per cent of the labour force and contributes nearly 17-18 per cent to the GDP according to the Economic Survey of India (2018).

In Assam, Agriculture is the primary sector of its economy. More than 70 per cent of the total population in Assam gets their means of livelihood from the agricultural sector. Agriculture is influenced by a range of social, economic and environmental factors. Every year during the successive waves of floods, thousands of people are rendered homeless, causing widespread damages to agricultural crops, properties (public and

private) including communication systems between regions and leads negative impacts on economic activities Flood occurs with an increased frequency every year in Assam. This leads to damage to standingcrops and most part of the population in Assam is rural and agriculture is the main occupation for almost 70% of the population. Due to floods millions of people are affected and are homeless because of their property being inundated and they end up staying in schools, churches, mosques, etc which are turned into an evacuation centre by the government. The facilities provided in those buildings are not satisfactory because those buildings are not servedas an evacuation centre.

But the evacuees end up living in those buildings until their property goes back to normal. There has been a complaint that there is no adequate space given for sleeping, food tastes bad,no proper medical attention given to the person in need and many more issues. Considering all the issues, there is a serious need for a proper relief centre where the victims can be provided with necessary medical attention, maintain hygiene, provide facilities considering different age groups, disabled people, children, babies, pregnant women, etc

3. Background studyFactors causing floods

Year after year, the biggest state in the northeastern region, Assam, is ravaged by floods. It displaces thousands and damages property worth billions—but lessons are rarely learnt. While natural topography and excessive rainfall are obvious causes, floods are also caused by humanintervention—like encroachment of river banks and wetlands, lack of drainage, unplanned urban growth, hill cutting and deforestation.

The Brahmaputra, a transboundary river and among the mightiest rivers in Asia, is braided and unstable in its entire reach in Assam except for a few places. As per the Brahmaputra board's latest annual report, the main reasons behind the instability of the river are high sedimentation and steep slopes. Additionally, the entire area falls in an earthquake-prone zone and experiences high rainfall.

Some of the main factors that act singly or in combination cause flood in the valley are:

i. High incidence of rainfall
ii. Deforestation in the upper catchments
iii. Inadequate natural drainage system
iv. Reduction in natural reservoirs
v. Heavy encroachment in the riverine area
vi. Large scale construction activities without proper planning

Effects of floods

The immediate effect of a disastrous flood tends to create a situation where vast areas of land are inundated. As a result, standing crops is damaged, roads, highways and railways, shops, service centres, offices and market places are forced to shut down, almost all activities come to a standstill.

People find themselves stranded in their homes especially in the rural areas where about eighty per cent of the people live. When evacuation becomes imperative many seek refuge in the houses of relatives, nearby highlands, public buildings, schools, embankments, roads etc. While others are found to be stranded on their rooftops waiting to be rescued.

Transportation poses a problem as most roads and transportation routes are submerged, moving pregnant women, sick persons and aged persons often becomes difficult and after the move, they often require medical attention and care.

When a disaster happened, most of the evacuees particularly the elderly and low-income communities rely on the relief shelters for their temporary houses or shelters. However, some of the evacuees were either stayed in hotels, relatives' houses, or even reluctant to leave their own houses in times of flooding. Living in sheltered places with unfamiliar people may lead to invasion of personal space and privacy of the evacuees. Relief centre is not only function as immediate and short-term shelter for the victims but also help them to recover from the trauma of the disaster as well as provide a base to start the rehabilitation process.

Situations during bafloodsod demand systematic management of evacuation centres. The most important flood management focused on the immediate evacuation for the victims. Due to the large number and urgency of managing the flood victims, the authority of the relief centre is facing some problems to manage all victims effectively. The volunteers and officers cannot resolve all of the problems faced by victims who have been living in evacuation centres for longer period of time due to the lack of supply, funding, or access. Even though these people usually have clear instructions about how to act, they often have difficulties in making appropriate decisions, due to a combination of factors, including time pressure and heavy emotions.

Expectations from an evacuation centre

Affected people arriving at an evacuation centre have often left their homes in haste with minimal possessions or without aids and medical equipment. They may be emotionally distressed, hungry or thirsty and concerned for loved ones, pets and personal possessions. They are likely to arrive at a centre with a range of immediate basic needs.

Apart from foods and warm resting shelter, medication is a priority in order to accommodate the needy; physically and emotionally. As a result, it leads towards the design management which needed to be considered such as; safe zone area, shelter management, hygienic system and accessibility for land or/and air transportation. Most of the victims hope that the relief centre will provide them good facilities and basic comfort. Being emotionally affected, they also need a proper medication and attention.

To ensure evacuation centres are fit for purpose, they should:

- be located outside the expected hazard impact area
- be available for the duration of the shelter stage, confirmed in formal agreements withowners
- have sufficient space and appropriate bedding (which may be brought in) to enable evacueesto sleep comfortably
- have electric power and water connected, or the ability to connect to emergency supplies
- have adequate heating, cooling and airflow
- have adequate toilet and washing facilities (consider family and non-gender specificfacilities)
- have laundry facilities (or arrangements if occupied for an extended period)
- have adequate provisions for dining and recreation
- be accessible to people with disabilities
- have safe spaces for children and people with special needs
- be safe for survivors of family violence and for people of diverse gender and sexual identities
- accommodate a range of assistance services
- have arrangements in place to safeguard children and vulnerable adults from harm(e.g power point covers, fenced water areas, stair rails)
- be secure
- have sufficient parking
- have access to transport to local population centres
- have insurance appropriate for the intended use

Needs of a flood affected victims

Primary needs	Secondary needs
Safety of people and property	Maintenance of dignity
Shelter	A sense of control over one's destiny and a sense of order and belonging
Food and clothing	Privacy
Adequate rest and sleep	Access to accurate and timely information
General physical and emotional wellbeing	Attending to urgent personal practical matters

Evacuation centres are open to all affected persons within the community, however special arrangements will need to be put in place for affected persons who are not self - caring. The needs and dynamics of affected people accessing the evacuation centre will therefore be as diverse as any community and should be planned for in the resourcing and layout of the centre.

Health, safety and security

The evacuation plan should identify measures to ensure the health, safety and security of shelter staffand evacuees, addressing:

- appropriate induction of staff and evacuees into the premises
- environmental health issues including food safety and the prevention and control ofcommunicable diseases
- fire safety
- safe work practices
- site security, perhaps involving police, private security services or other authorized persons.

Current conditions of relief centre

Currently, the type of evacuation centre that has been practiced is often referred to government or public facilities, such as mosques, schools, churches or even community halls. The after effect of every event is devastating which leaves the building in a state of destructions of property, garbage andsewerage system is clogged. On the other hand, location wise is far most important in order to cater for accessibility of victims and rescuing team.

In every relief centre, services are provided to make evacuees in order to feel them comfortable during their stay. There are many cases where victims are not satisfied with the service provided. There are cases such as over-crowded environment, poor infrastructure and equipment. This relief centre focuses on victim's need and satisfaction by improving the quality of the relief centre. Data till now collected shows that it is assured that the natural disaster situation of temporary evacuation system requires improvements in order to facilitate the victims, rescuers or to salvage public property. Nevertheless, Non-Governmental Organizations always provide temporary tents or shelters, of which that only focuses on some part of the needs; the resting place. This is however is not enough considering the situations of the victims from various family sizes and ages such as toddlers and senior citizens.

Gender sensitivity: One of the problems cited at many of the centres was a lack of gender sensitivity.There simply was not enough privacy for anyone, particularly not for female evacuees, many did not have private spaces where they could change their clothes or breast-feed their babies. Many centres eventually installed partitions, but it was often too late.

Welfare shelters for those with special needs: Many experts have pointed out that evacuees tend to suffer from tremendous stress, especially children, and therefore need special mental health care and counselling services as evacuation periods extend. But the availability of such services varied from centre to centre.

Use of centre for rest of the year

Evacuation centre will be occupied by flood victims in the span of 4 months when the victim's property are inundated and can remain vacant for the rest of the year. During those months the centrecan be used for certain events such as training centre, civic infra meetings.

Setting up the evacuation centre

A temporary shelter building, where the locals The setting up of relief centre for the people whose houses have been damaged by floods/landslides and the provision of basic amenities in such centre involves complex logistics of mobilizing relief supplies, tents, water supply and sanitation systems, transport and communication systems, and medical supplies. Most importantly, site selection for evacuation centre based on best available scientific information (hazard mapping etc.) should be part of the disaster preparedness phase. Centre, and access corridors to these centres, should be outside of zones of residual risk, and safe from any potential secondary hazards.

can find shelter during the times of disaster should beerected/ built in a raised location to ensure resilience to landslides and floods. The building will include a raised plinth which will safeguard it from flood waters and needs to be built with landslideresistance standards of the highest orders.

4. Case study conclusions

1. *Temporary Evacuation and Relief Centre Design Management in Malaysia*

Conclusion

In conclusion, the needs of temporary evacuation centre during crisis and disaster time are importantas shelters for evacuees can be gathered in a controlled environment. As a preventive measure taken,the contingency plan is for precautions that will be useful during a disaster. In relation with that, victims may easily face emotional and physical stress while looking forward for a place to feel safe and comfortable temporarily. With the newly designed planning system, it can be used under any circumstances with different environments to meet the needs during any disastrous event. Moreover, every relief centre has to have medical personnel on standby all the time in case of an emergency. In addition, a temporary ward for critical patients is also needed to control any diseasesfrom spreading out infecting other victims.

2. *Material Characterization of Traditional Assam-Type Wooden Houses in NortheasternIndia*

Conclusion

In the present study, all the members, including the walls (Ikra panels), of the houses were tested under relevant loading conditions to get an insight into their contribution to the lateral load behaviour of these houses. Various material and physical properties, e.g., moisture content, specific gravity, axial compression strength (parallel and perpendicular to the grain), axial tensile strength (parallel and perpendicular to the grain), and bending strength of two species of timber used in the construction of such houses, were determined. Finally, the Ikra panels

or walls of the houses were subjected to diagonal compression loading to determine their influence on the lateral stiffness, strength, and deformability of the house

6. Literature review

1. *Collaboration to improve evacuation centre operations in Queensland*

Evacuation centres provide temporary shelter to disaster-affected people who are forced to evacuate or who voluntarily do so. They are intended to meet people's basic needs including shelter, food, water and information. As an evacuation centre remains open for longer periods, people's basic needs evolve. During the course of an evacuation centre's lifespan, this form of emergency sheltering can grow from initially providing limited services such as food and accommodation towards providing a more comprehensive range of support including entertainment, children's activities, counselling and pet management facilities.

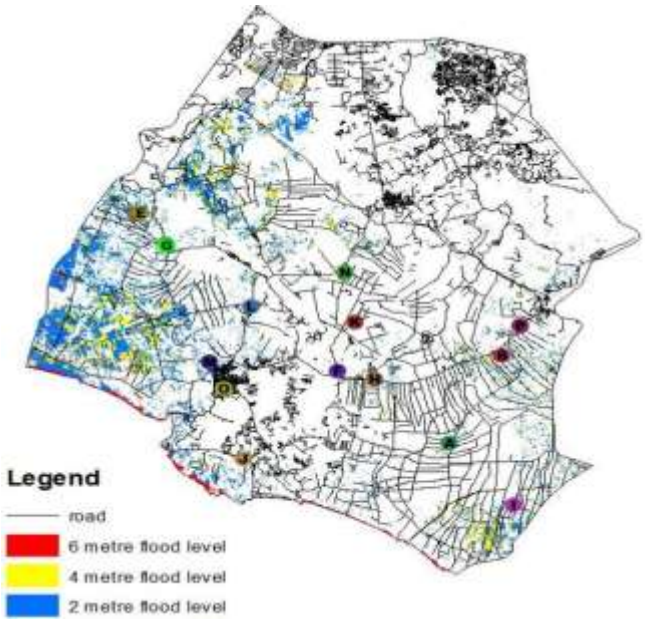
Some experts suggest that Australia will experience more and worse disasters in future and observed that American society is evolving in ways that will make the provision of emergency sheltering morecomplex, and these observations are reflected in the Australian context. For example, there is increasing variation in household composition including more single-parent families and childless households. Ageing populations will require more targeted support, and as society becomes increasingly diverse, emergency sheltering will need to cater for cultural, linguistic, religious, ethnic and lifestyle differences and needs. The transition to people living much longer in the community as they get older and people with physical and cognitive disabilities living in the community also means that the needs of people requiring shelter will become more complex. In light of these factors, the need for well-planned and adaptable emergency sheltering will become more critical. Registration is an important service provided in evacuation centres to assist people separated from their families. The "Register. Find. Reunite." service is the primary registration system connecting people to their family and friends.

Evacuation centres can increase the likelihood and consequences of environmental health risks (e.g. large numbers of people in close proximity increase the risk of disease spread to more people which could overwhelm local health services). In addition, during periods of high stress, people are more susceptible to many environmental health risks and may not be as focused on managing these risks as they normally would (e.g. emotional trauma may result in a person being less focused on washing theirhands before eating). Environmental health risks must be adequately managed to ensure the safety of the residents and staff at evacuation centres and to prevent a secondary disaster (e.g. food poisoning outbreak and communicable disease outbreak). Ensuring evacuation centres contain adequate permanent or temporary facilities is advantageous when trying to manage environmental health risks.

2. A Study of Flood Evacuation Centre Using GIS and Remote Sensing Technique

Remote Sensing incorporate with GIS techniques was used to determine the suitability location of the evacuation centre from contour map of flood affected areas in Batu Pahat. GIS will calculate the elevation of the area and information about the country of the area, the road access and percentage of the affected area. The flood affected area map may provide the suitability of the flood evacuation centre during the several levels of flood. The suitability of evacuation centre can be determined based on several criteria and the existing data of the evacuation centre will be analysed. From the analysis among 16 evacuation centre listed, there are only 8 evacuation centre suitable for the usage during emergency situation. The issue of flood especially involving the emergency response solution can be approached from the aspect of the evacuation centre itself by the determinations of the effectiveness of every evacuation centres and this requires multiple solutions especially in using GIS and Remote Sensing technique. Remote Sensing are defined as the process of sensing the Earth's surface from space by usingthe characteristics of electromagnetic waves emitted, reflected or disclosed by the detected objects, for the purpose of improving natural resource management, land use and environmental protection. The criteria of the evacuation center are the building itself should be in a location that is reachable and safe from the flood-affected area. Some of the evacuation centers pass the criteria but there are certain of them did not because the position of the building itself was placed in the affected area of the flood. All the evacuations selected have a road connected to them but the access of the road depends on the flood level from mean sea level. Based on the figure when a flood is 2 meters from the mean sea level, all the roads

are able to access to the evacuation centre and placed in a safe from flood affected area.



When the floodlevel rises for 4 meter there are certain roads that have been affected and submerge by flood.

Fig. Road accesses for flood evacuation center on the flood map.

In order to find the best solution for the evacuation selection location issues, a method by using GIS and Remote Sensing software have been created which is important contribution to the process of rescue and selection of the location for evacuation centre. The evacuation site selection begins with the analysis of the flood map process which could determine the level of flood from the contour and elevation valueof the study area. From the flood map the process continue with the analysis of the flood affected area analysis. The flood map used to help in determination of the suitable and non-suitable evacuation centre from the map. The evacuation centre that is expose to the flood will be classified a non-suitableevacuation centre and the spared from flood will be classified as suitable evacuation centre.

7. ARCHITECTURAL INTERVENTION

- Focusing on building local resilience, through proactive technical assistance during planningand operation;
- Adapting and targeting assistance accordingly for affected people with special needs whorequire additional assistance during the emergency sheltering process.
- Ensuring that all materials will support and maintain human dignity and respect the privacy ofaffected people, including being responsive to gender, culture, religion and accessibility considerations.
- Designing a facility where victims are living ensuring safety and security and delivering basicneeds.
- The material used has to be durable, weatherproof and cheap.
- Proper toilet facilities and a drainage system to control from spreading of diseases.
- Part of a building conserved for doctors to assist the victims.
- Designing a division/headquarters for local authorities, police department, rescuers,government and non-government bodies for their administrative work.
- Electricity supply is required for lighting systems or any kind of basic needs. A generator orsolar system for generating electricity should be used.
- Drinking water: Water Pump and filtration, using a basic water filtration system.
- The food preparation area for victims or volunteers to cooks.
- Storage for storing food or dry clothes

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