

SHELTERING EMERGENCIES: DESIGN DEVELOPMENT PROCESS OF TEMPORARY STRUCTURE

Ar. Shweta Ghonge¹, Prof. Sandeep G. Dige², Prof. Anjali S. Jadhav³, Prof. Rakhi Begampure⁴

¹Post Graduate Student, S.P.S.M.B.H S College of Architecture, Kolhapur, Maharashtra

²Principal, S.P.S.M.B.H S College of Architecture, Kolhapur, Maharashtra

³Professor, Dept. of Architecture and Construction Project Management, S.P.S.M.B.H S College of Architecture, Kolhapur, Maharashtra, INDIA.

Abstract - The increasing number of natural disasters has focused emphasis on the necessity to shelter to the population. The field research of flood-stricken villages in India's tembhipada reveals a need for emergency shelters that are comfortable, durable, and inexpensive to the affected community. This paper outlines the design process of creating an emergency shelter for displaced individuals in the tembhipada nagar post-flood settlements. The Mithi River's morphological records make it a unique geographical location that floods annually. We conducted an exploratory inquiry to examine several factors of shelter creation. A limited study of flood-affected towns was conducted to better understand their lifestyle and constructed culture. A community engagement meeting and activity were planned and implemented in order to arrive at a spatial design brief that adhered to humanitarian principles. We investigated an iterative method to developing a shelter, with continual community consultation. The full-scale prototype is then given to a family to see how easy it is to assemble and install. The experience of using the shelter kit provides guidance for future modifications. The shelter was found to be suitable for usage in the aftermath of a flood. Because of the community's involvement at every stage of the design process, it is culturally suitable and socially relevant. Furthermore, the study's conclusions include efforts to make it transportable and material durable.

Key Words: Disaster, Temporary shelter, Emergency, Flood, and Shelter.

1. INTRODUCTION

Humanitarian needs are rapidly increasing; millions of people are displaced each year as a result of natural disasters. The World Disasters Report 2016 predicts that the number of refugees will continue to climb over the next decade (1).

Humanitarian shelter assistance is critical in assisting displaced communities. This article aims to contribute to the implementation and development of a more effective relief and reconstruction procedure. This study focuses on a temporary shelter, which serves as an intermediate shelter in the humanitarian shelter relief process. Multiple actors, including affected people, community-based organizations,

local and central government, non-governmental organizations (NGOs), and international organizations, as well as designers (who may be architects or engineers) and builders, contribute to the successful implementation of emergency shelters. Two parts of shelter coordination, in particular, are critical to getting the intended results:

- Implementing a structured organizational design and
- Selecting an acceptable procurement strategy at the rebuilding level.

This paper describes a community-based strategy, including programme participants and the system of resources and goods required for effective recovery operations.

2. ORGANIZING FOR RECONSTRUCTION- A DESIGN PROBLEM

Organizing a reconstruction design project necessitates a systems approach to establishing the project's mandate. Questions such as who should be considered for participation and on what basis, as well as who decides on participation, must be addressed. The challenge is to identify the participants while simultaneously guiding the relationships between them. The sort of reconstruction, whether it should be built and, if so, where it should be built, and how to begin the project are the next issues to be addressed (2).

2.1 Temporary Shelter after Disaster

A construction project involves a wide range of players, from professionals to businesses and artisans from a specific context of the building industry inside a specified national area. As a result, the selected project participants are referred to as a project team, which works together to plan and execute the project (3).

2.2 Temporary Shelter for the Flood-affected people of the tembhipada

The annual flooding of the tembhipada displaces approximately a million people, damaging or partially demolishing their homes. Displaced people seek refuge in

government institutions such as schools and other educational institutions. Because the annual flooding occurs during the hottest and most humid months of the year, it was necessary to investigate a design solution for comfortable living over the lodging supplied surrounding government facilities in the form of tarpaulin/plastic sheet tents. According to the findings of a study of a completely eroded hamlet, displaced individuals were forced to live in a decaying community hall, where ladies were forced to sleep inside the hall at night and men were forced to sleep outdoors in the open. The sense of family and privacy were entirely ignored in such accommodations, where displaced persons stayed for more than five months or longer until they could rebuild their homes.

To comprehend the afflicted community's constructed environment. With community input, an early shelter prototype was created. The prototype goes through an iterative phase in which the user assembly and community participation are assessed for additional recommendations.

3. DESIGN BRIEF DEVELOPMENT

The design parameters for humanitarian temporary housing help are classified into three major categories:

- Basic human needs such as the necessary elements of a home and its spaces, the social environment, and its functions.
- The aid organization's settlement standards are exact drainage, layout, security, water, and sanitation.
- Technical standards for standard physical and mechanical shelter and settlement properties.

3.1 Sense of Place

In traditional societies, the process of housing is the most fundamental component of living. Individuals and households were endowed with the knowledge and supplies needed to coexist with the ecology of the area by primitive cultures. The household resulted in the creation of the individual's and household's "place" in society (4). Maslow's hierarchy of human needs analysis presents a brief reflection on human wants as a source of motivation in life. A thoughtful shelter design aimed at creating a friendly and familiar environment could aid in the users' recovery process through its use. We discovered that when people have control over their living area and their privacy demands are addressed, they might experience sensations of comfort and independence. This flexibility allows for relaxation and personal development (5). In this regard, Nobel Laureate Amartya Sen's capacity approach proposes a theoretical way for assessing quality of life and social well-being in humanitarian design. The capability approach is centered on people and their capacities. Because individuals live in groups, families, neighborhoods, and communities, understanding the

collective capabilities of vulnerable communities is critical (6). It is vital to be familiar with the culture of the settlement when dealing with communities. The Co-Design Approach was examined for investigating the design of emergency housing in flood-prone parts.

Table -1: List of Design Criteria based on the essential qualities of human necessities

Sr. No	Design Criteria	Objectives	Source
1	Security	<ul style="list-style-type: none"> • Feeling of safety and security • Ensuring protection for the inhabitants and their belongings. • Protection from nature and other external anti-social factors. 	(IFRC, 2011)
2	Permanence	<ul style="list-style-type: none"> • Experience of continuity that characterises the home environment. • sense of belonging and connection with the place 	(Hayward, 1977)
3	Personalization	<ul style="list-style-type: none"> • exclusive control and use of the environment • self-expression and scope for customisation 	(Sebba & Churchman, 1986; Pennartz, 1986)
4	Privacy	<ul style="list-style-type: none"> • control of space in dense and crowded environments • sound insulation • internal partitions 	(IFRC, 2011)
5	Social Relationships	<ul style="list-style-type: none"> • relationships with family • community meeting places • shared spaces for cooking, washing, cleaning etc. 	(Smith, 1994)
6	Complexity	<ul style="list-style-type: none"> • visual perception • scope for customised assembly to avoid confusion due to repetition 	(Stamps, 2005)
7	Identity (Form, Color, Light)	<ul style="list-style-type: none"> • perception of physiological, environmental and cultural factors 	(UNHCR, 2011)

3.2 Spatial requirements and functions

Space is a fundamental constraint in the post-disaster reconstruction of shelter and settlements. A single unit is typically utilized to execute numerous tasks. Table 2 highlights the design criteria that we considered when arranging the space.

Table 2. List of Design Criteria based on the spatial requirements and functions

Sr. No	Design Criteria	Objectives
1	Sleeping Areas	• indoor area with the optimum size for sleeping
2	Health and Hygiene	• one latrine per 20 individuals to be considered
3	Culinary activities	• covered space preferably shared clean and dry
4	Storage	• storage of belongings and other relief materials
5	Washing and cleaning	• externally provided facilities of WASH to be considered
6	Studying	• Community space among shelters one in 100 shelters
7	Outdoor playing / playing / working /meeting	• Semi covered spaces

- Load Bearing
- Thermal Comfort
- Water Resistance
- Vector control
- Fire Resistance
- Environmental impact

4. CONTEXT OF DOMESTIC ARCHITECTURE OF THE DISPLACED SETTLEMENT

The setting for this paper is Maharashtra, a state in India. It is vulnerable to natural calamities such as floods, landslides, and earthquakes due to its location in a seismic zone. Flooding happens in the region owing to a variety of causes, including

- Heavy Rainfall in short space of time
- Storm
- Aggravation of Riverbed
- Encroachment in the flood plains
- Degradation of the catchment area in the form of deforestation
- Lack of Proper Control of Land use

5. CO-DESIGN PROCESS

To satisfy the post-disaster reconstruction need, the co-design approach, a type of community participation, was used. We conducted a community involvement design exercise with displaced population representatives. The community expressed a desire for collaborative design assistance. To engage the participants in the design process, an intensive technique of sketching talks, prototype, and modelling was used to facilitate architectural facilitation. We documented the process in order to create a co-design approach. The act of allowing all members of the relief team: young people and adults, men and women, authorities and contractors, to participate in the design conversation is the key to reducing relief situation alienation.

Taking into account the SPHERE Humanitarian criteria, Shelters were created in collaboration with selected members of the affected community to satisfy the needs of the community and to be delivered with the availability of land and other resources.

6. CURRENT GUIDELINES FOR SHELTER

To understand how such shelters have been developed in the past, what types of shelters were involved in specific catastrophes, as well as the disaster's environmental,

3.3 Humanitarian standards Space

Over the previous 10 years, aid agencies have established some general guidelines that have been summarized in many instruction booklets. Among the most well-known is The Sphere Handbook (7), which was first produced in 2000 collaboratively by the IFRC and many humanitarian NGOs. It has a section on the minimum criteria for shelters, settlements, and non-food products. Table 3 contains the criteria provided by help organizations.

Table 3. List of Design Criteria based on the Humanitarian Standards

Dimensions	Transport	Cost	Appropriateness	Assembly	Durability and Afterlife
Shelter for 5	Local availability of material	Per family 150 dollars	Culturally and Socially relevant	Preferably made by the user community	Contribute to reconstruction

3.4 Structural and Technical requirements

The structural and technical requirements of shelter design are typically given by aid groups, and we examined the following parameters. The engineering calculations are not covered in this paper. We did, however, approach to verify with pertinent sources.

economic, technological, and sociocultural perspectives, were examined.

Design elements determine how well shelters perform and should be developed in collaboration with disaster survivors, government agencies, private industry, and any other parties involved in disaster recovery, such as volunteers and insurance companies, in order to prevent the environmental, economic, technical, and sociocultural issues listed below, which is what this research aims to do in order to meet this need.

6.1 Assessment of relocation and resettlement issue

In community consultation, a preliminary assessment of the displacement pattern and rehabilitation of a displaced community was made. A user interview was done to better understand the impact of the displacement on daily living. In conjunction with the community, a variety of possible relocation options were investigated. As an emergency refuge, the entire community of 75 families lived in a 180m² community hall. Because of the inefficient spatial arrangement, the improvised camp in the community hall lacked essential human shelter. Reading and stitching required inadequate ventilation, cleanliness, and lighting. The presence of women and children in the hall had an impact on the family's comfort and mutual support. The community lacks knowledge on shelter rights and humanitarian aid. In conjunction with community shelter, the assessment process resulted in the establishment of unit shelter in a cluster.

6.2 Developing layout plans

In this context, the contemporary DIY, "do it yourself" culture, ethic, process, and suggestions, as well as their creative application in academic experiences of architectural self-construction, appeared fitting. CASA Adaptable Architecture and AIDA Collaborative Strategies Analysis of the interconnected design area and design approach were investigated in order to produce numerous options. Figure 5 depicts the layout creation process and viable design possibilities. One of the layout concepts was further developed for user assembly prototype development of the temporary shelter kit.

6.3 Design of the shelter kit

The spatial, functional, humanitarian and technical aspect of the shelter kit

- 9m² per unit shelter.
- Maintaining the privacy of the family unit by perforated walling over openings.
- Opening of the shelter into the access pathway.
- Community cooking corner with cleaning facility is considered in the commonplace.

- A shared toilet & washing facilities per every eight units.
- The lowest position of the roof inside the shelter unit considered to be a minimum of 1.8m.
- A compressed roofing layer develops a sandwiched roof with HDPE Sheet.
- A 15cm perforated lattice bamboo between the roof & the top of the wall cladding act as ventilation to enable the release of hot air.
- All residents were involved in setting up the shelter kit.
- User assembly thus giving scope for customization and sense of ownership.
- The affected community were involved in the process of designing. They had the skills and experience of utilizing the local resources and which makes the process fast.



Fig -1: Perspective of Temporary framing



Fig -2: Framing system

3. CONCLUSIONS

According to the conclusions of the community-led design exercise, the design discussions should be available to all persons who may be affected by post-disaster displacement. Aspirations from the community are architecturally transformed into visions of agreement that are useful in post-disaster settings. Furthermore, we iterated the shelter-building procedure to create a Shelter Kit that can be made available for the region's reoccurring flood crisis every year.

We can conclude from the shelter's user experience that the:

- Shelter provides the structural stability that the user desires.
- Users were pleased with the shelter's comfort.
- We were successful in meeting the financial cost criteria.
- The bare minimum of humanitarian criteria has been reached.
- Assembly time of the Kit is 1 HR. 15 MNTS by four people
- Weight of each shelter Kit is an average of 75 to 80 kg.
- There is an abundance of local resources precisely to deliver the required quantities

The topic of post-disaster housing is very multidisciplinary, combining social, environmental, and technological sustainability principles with economics, logistics, and politics. According to the findings of the study, engaging with the community is a beneficial technique in afflicted areas where victims frequently seek external support. As a developing country with limited resources, we must endeavor to work with what we have and correct its inadequacies. Urged to be used in the designed shelter kit because it has a minimal carbon footprint, is socially meaningful, and is cost effective in the setting. However, the concern of termite infestation due to non-treatment, ecological harvesting followed by wall waterproofing provides scope for further research of exploring the material and learning traditional treatment practices that can not only contribute to the longevity of the shelter kit but also give an aesthetic visual character due to the stains of the use of plant-based insecticides.

REFERENCES

- [1] (2016). World Disasters Report
- [2] Davidson, C. (2010). Multi-actor arrangements and project management. In C. J. Davidson, *Rebuilding After*

Disasters (pp. 88-109). Auckland, New Zealand: Routledge.

- [3] Ehn, P. (2008). *Participation in Design Things*. Proceedings of the Tenth Anniversary Conference on Participatory Design 2008 (pp. 92-101). Indiana: Indiana University.
- [4] Hayward, D. G. (1977). Psychological concepts of 'home', HUD Challenge. 10-13.
- [5] IFRC (2011). *Transitional shelters, eight designs*. Geneva: International Federation of Red Cross and Red Crescent Societies.
- [6] IFRC, UN-Habitat & UNHCR (2008). *Shelter Projects 2008*.
- [7] Sphere Project, the (2011). *Minimum Standards in Shelter, Settlement and Non-Food Items*. The Sphere Handbook. 3rd ed. Practical Action Publishing.