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# Process inclusive Infrastructure: Notions towards Cyclone Resilience in Bangladesh

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## Abstract

While developing a housing project the concept of resilience needs to be reflected in the whole process rather than the resulting product; because both the extent of loss or damage and recovery from a disaster depend on victim's building practices, preparedness, effective response and most importantly acknowledgement of the risks. The design process, therefore, should be derived from beneficiaries' economy, social behaviour, settlement and dwelling morphology, and inclusive of their participation. Any rehabilitation initiative devoid of empowerment of victims may result in unsuccessful endeavour. As Bangladesh is highly disaster prone and projected as one of the worst victims of climate change, resilience inevitably becomes a part of the housing process. The Purpose of this write up is to demonstrate some concepts of resilient habitat for cyclone prone areas of Bangladesh. These concepts are derived from literature review, observation study and interviews with the inhabitants and stakeholders. It emphasizes the inclusion of indigenous measures as well gender dimensions. Technologies that may promote local skill and facilitate women's involvement in maintaining and preparing the house are encouraged. As a whole, the paper attempts to manifest local response experiences and outline some points to look into the way of reducing disaster impacts and build back better.

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*Keywords:* housing; resilience; process; inclusion; alternative technology

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## 1. Introduction

Bangladesh is one of the most disaster prone countries in the world; and highly vulnerable to different disasters because of climate variability, high population density, high incidence of poverty and social inequity, poor institutional capacity, and poor infrastructure [1]. The global concept of "Reducing Risk" has become very popular in Bangladesh

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and Disaster Risk Reduction (DRR) has become a major development agenda since 2002 [2]. Cyclone is one of the most devastating recurring phenomena in Bangladesh and with time Bangladesh has been successful in significantly reducing human casualties through effective management. However, destruction of houses and infrastructures continue and people saved by the cyclone shelters have to return to the destruction shortly after the storm stops [3]. The persisting temporary or make shift nature of houses can seldom survive these storms even with moderate intensity. Considering the long term effect these houses turn out to be uneconomic as a result of rebuilding it almost every year.

Studies have been carried out to seek resilient techniques of construction. U.K. Roy et al [4] have experimented effects of wind on traditional rural huts through wind tunnel modelling and have affirmed the use of bracings and wind breaker for safe construction. B. Haque et al [5] reported that proper orientation of hut against wind and proper plantation can determine the degree of damage. A. Agarwal [6] documented different safe cyclone resilient rural building techniques based on reasons of structure failure from storm. R. Taher [7] has shown that proper roofing design can resist the blowing off of roofs during storm.

However, a technically sound option may not always be viable due to resource constraints [8]. Therefore the paper aims to draw attention more on a process that affects users' lives beyond built forms. Housing is often considered as an all-inclusive system of finance, livelihood, affordability and infrastructure; therefore economy, social norms, lifestyle, settlement pattern and morphology of dwelling spaces need to be assessed and addressed accordingly while designing. Today shelter in a humanitarian context is increasingly being seen not as discrete product, but as an integral part of settlement which includes the physical and social infrastructure needed to support communities including water, education, health and employment [9]. Hence when it comes to resilient habitat it must take into account an all-inclusive approach in order to make it acceptable and functional in the inhabitants' life. Though there remains little scope for implementation of local knowledge or personal needs after an emergency, the inhabitants and local craftsmen can judge the compatibility of these from their context [10].

Realizing the importance of inclusive design process the paper thus aims to demonstrate some notions of resilient housing by demarcating examples of local survival measures, community participations, and importance of gender dimensions in the process. Following that, ideas of building techniques and alternative building materials are presented based on its affirmative laboratory results, easy manufacture, and economic prospects.

### *1.1. Objective*

Objective of the study is to understand local adaptation and housing practices in order to generate resilient guidelines. Objective of the particular write up is to delineate the importance of considering local experiences as well as gender inclusion in resilient housing design process; also to draw attention on some design techniques and technologies which would enhance vernacular skills and victims' capacity concomitantly.

### *1.2. Methodology*

Methodology of the study comprises literature review and site survey through observations and interviews. Observations focused mainly on the differences of built form patterns, materials, techniques and living style of users in different regions. Sites were selected on basis of one district from each among the demarcated three zones (listed in table 1) of coastal areas of Bangladesh. Around 90 households were interviewed including both beneficiaries and non-beneficiaries of different rehabilitation projects. Interviews emphasized to collect data on user's capacity, vulnerabilities and opinions regarding resilient house. Different stakeholders from govt. and NGOs were also consulted. The particular paper illustrates the conceptions and recommendations elicited from the overall findings.

## **2. Brief description of the survey findings**

To assess and explore the housing conditions along with people's experiences different coastal areas were visited. As living norms, building practices and physical features of different regions vary from each other sites from each

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