A STUDY OF RESILIENCE IN VERNACULAR ARCHITECTURE OF WATER NOMADS IN BANGLADESH

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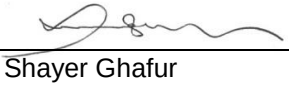

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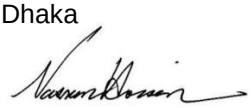

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Abstract

A large percentage of Bangladesh's population lives directly beside water or derives livelihoods from its lush tropical deltaic plain sand complex riverine systems. 'Water culture' has played a powerful role in shaping South Asian histories, societies and economies. The Bede traditionally live, travel, and earn their living on the river, which has given them the name of "Water Nomads" or "River Gypsy".

This Study of 'Resilience in Vernacular Architecture of Water Nomads in Bangladesh' is intended to find out the characteristics of resilient dwelling practices of water nomads on water and land in the context of Bangladesh. This thesis addresses a single research question: Do the lifestyle, activity, material use and construction technology stimulate resilience in vernacular architecture practice of water nomads? The broad aim of this research is to understand resilience in vernacular architecture of water nomads (Bede community) in Bangladesh by documenting and analyzing the dwellings and settlements of them. To do so it specifically aims to enhance understanding of the relationship between socio-cultural factors and resilient architecture practice of nomadic Bede community of Bangladesh. To explain their vernacular responses, the research has sought to identify and interpret their social issues, lifestyle, spatial organization, collaboration and adaptation.

Adopting a mixed methodology consisting of ethnographic case study and syntactic approach, the primary research was conducted in 2 settlements around Dhaka. The research employs a range of methods including observation on site, questionnaire survey of local water nomads, semi-structured interviews with various agents working for nomads and community members, relevant literature survey and analysis of historical photographs. Taking two examples of these respective tendencies Bede settlement in Keranigonj and Bede fleet on boat in Gazipur as comparative case studies. The potential of resilient nomadic living is latent in vernacular practices of water nomads. Both mobile life on boat and semi-static life on shores are studied which indicates mobility, adaptation and collaboration may be the means for resilience practice in their architecture. The research tries to find out how social context influences the architecture of water nomads through ethnographic study and syntactic analysis.

The vernacular compact physical features of water nomads have impacts on the socio-cultural as well as environmental aspects of this community and vise-versa. Both spatial arrangement and building technology of dwellings derive from their social activity and living pattern. The most integrated spaces of their settlement welcome more interaction and interaction allows them to be more united as well as collaborative. Living in an adverse mobile situation enables them to be more creative and adaptive. The research examined, whether the mobility and lifestyle of Bede community enhance the scope of an adaptive and collaborative life in their physical settlements as well as enables them to be more resilient both socially and ecologically.

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1. Introduction

1.1 Introduction

Cultural factors shape the activity patterns in space and activity guides' resilient spatial pattern in vernacular dwelling. In order to deal with the resilience of a certain community, it is essential to examine the association of human bodies with vernacular material culture and construction techniques of building dwellings. The study of spatial organization is recommended as an approach to identifying the conception and principle of how cultural order is constructed in house form. The arrangement of space associated with a logical process because it must at least serve the functional objective (Hillier and Hanson, 1984) .House or dwellings of a community express cultural and lifestyle preferences. House or dwelling is a concept of both activities like living and residing and a place or structure to contain such activities (Gomes, 2014).

The form of the house is the consequence of a whole range of socio-cultural factors seen in their broadest terms. Social relations and events express themselves through spatial configuration (Monteiro, 1997). Spatial properties and their arrangements are culturally and behaviorally formulated. Since built spaces directly influence behavior, in order to understand the interaction between people and environments, the design of spaces and user's occupancy are main factors to be concerned. On one hand, interaction characterizes the socio-economic resilience of a community. On the other hand, socio-economic state of a community prescribes selection of materials or techniques based on availability and abundance. This selection of materials and construction techniques represents the ecological resilience of a community.

Thus, the focus of the research in this Study of Resilience in Vernacular Architecture of Water Nomads in Bangladesh revolves around two key issues:

- Spatial Organization of dwelling units generating interaction as well as socio-economic resilience through activity within the community.
- Vernacular aspects influencing ecological resilience through nomadic technology and material selection.

1.2 Research background and context

Human civilization started with nomadic way of living as they had to shift their shelter whenever the food and water supply faced scarcity. And therefore, early civilization practiced temporary and ephemeral vernacular architecture to ease their movement. In the context of the increasing globalization of architectural cultures, an imperative to challenge sedentary bias arises from the need to confirm the value of diversity in architectural cultures in the different socio-cultural context. Traditionally, nomadic cultures have been strongly affected by capitalist sedentary culture through increasingly 'Western' globalization. The present thesis proposes ways of resilience of these divergent nomadic cultures that still accommodate and promote the benefits of cultural difference.

1.2.1 Overview

The world's major civilizations developed along rivers, which have both united and divided human beings. Without water there would be no human civilization, indeed there would be no life. From the beginning of civilization, sapiens and other species choose their shelters on or around water. Water culture refers to the cultural practices associated with the natural water system. Monsoon South Asia is representative of a 'hydraulic civilization' (Wittfogel, 1956). A large percentage of the region's population lives directly beside or derives livelihoods from its lush tropical deltaic plain sand complex riverine systems. 'Water culture' has played a powerful role in shaping South Asian histories, societies and economies. The countries of India, Bangladesh and Sri-Lanka raise a host of complex and intertwined issues regarding water science, water impacts on ecosystems and societies, water law, policy and politics, water economics etc.

Bangladesh represents an extreme case, where by one-third of its area is comprised of water in the dry season; in the rainy season 70% of the territory is submerged, 10% of the people live in boats, 40% depending on the sea and rivers fora livelihood, and 100% depending on the rain and floods for food. Bangladesh is in the world's largest delta system and has the greatest flow of river water to the sea of any country on earth (Novak, 1993). And water nomads are considered one of the few

communities who live on and around water. Their space use, activity and social life profoundly revolve around water and they are considered the keepers of the river. Their vernacular living twirls on water and empowers them with socio-economic and ecological resilience.

1.2.2 River, Water culture and Bangladesh

The pride of Bangladesh is its rivers with one of the largest networks in the world with a total number of about 700 rivers including tributaries, which have a total length of about 24,140 km (MAH Khan, 1990). Water bodies in this delta consist of tiny hilly streams, winding seasonal creeks, muddy canals (khals), some truly magnificent rivers and their tributaries and distributaries. In some places, such as Patuakhali, Barisal and Sundarbans area the watercourses are so plentiful that they form a veritable maze. The watercourses of the country are obviously not evenly distributed. They increase in numbers and size from the northwest of the northern region to the southeast of the southern region. Bangladesh has predominantly four major river systems - (1) the Brahmaputra-Jamuna, (2) the Ganges-Padma, (3) the Surma-Meghna, and (4) the Chittagong Region river system. However, Brahmaputra is the 22nd longest (2,850 km) and the Ganges is the 30th longest (2,510 km) river in the world (Anon., 2014).

Preparing a complete list of the rivers of Bangladesh is more or less tough as often a single river possesses different names at different places. Even a five or six-Kilometer segment has a different name upstream or downstream. Also, a single name is used for different rivers in different locations. These rivers host a large number of communities who go and flow with the water.Their livelihood, socio-economic life profoundly connected to a river. Water nomads are such a group who are deeply attached to river and water for decades.Their life revolves around the river and settles them as nomad like flowing water of rivers.

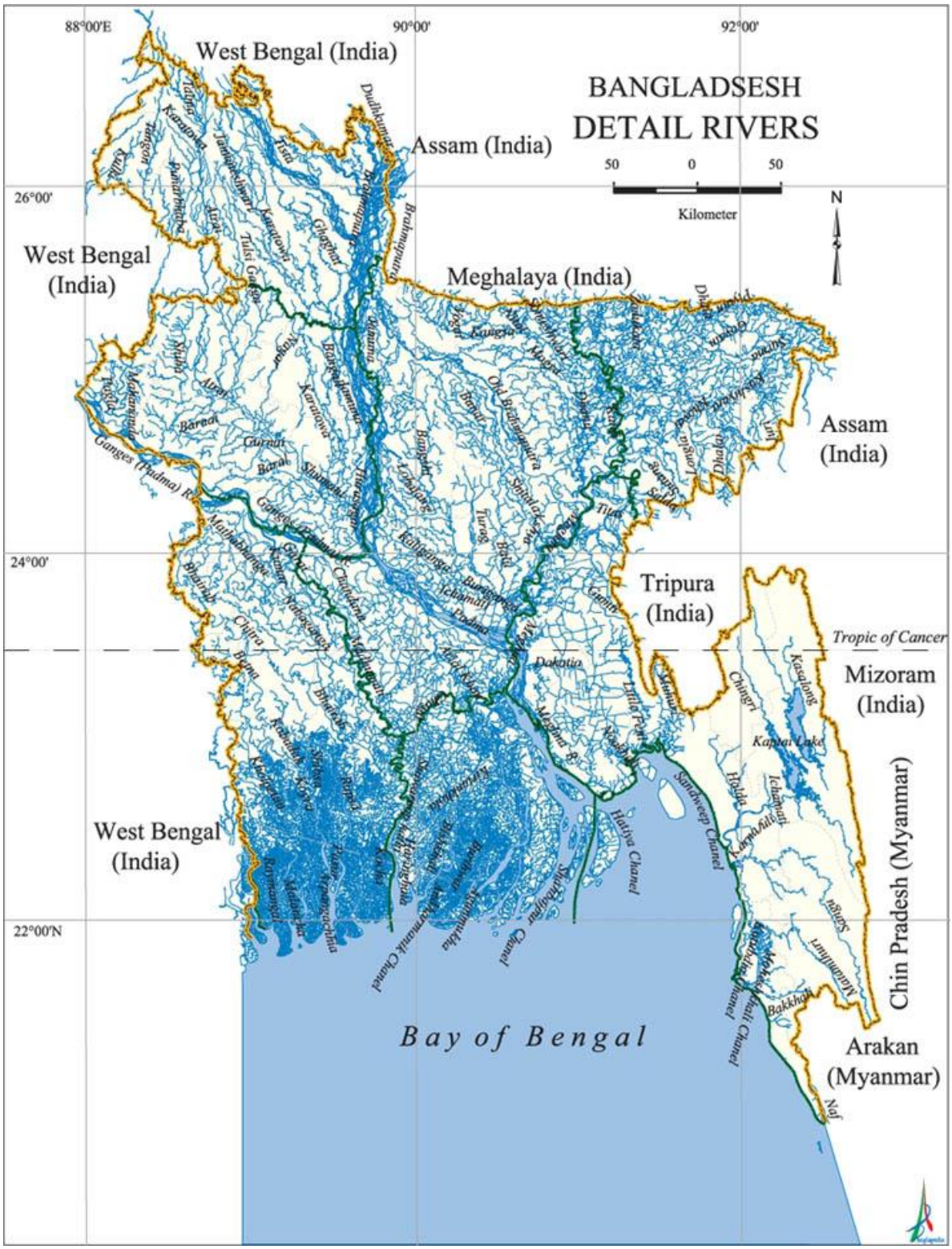


Figure 1.1 Rivers of Bangladesh (Source: Banglapedia)

1.2.3 Water nomads (Bede community) in Bangladesh

Bede is a nomadic community living in Bangladesh popularly known as water nomads. They are also known as **Mangta** (they prefer to call them Mangta). The Bede traditionally live, travel, and earn their living on the river, which has given them the name of "Water Nomads" or "River Gypsy". They are boat dwellers and mostly have no abode or property on land. All their activities are performed on boats. But some of them have temporary dwelling in lands which is not their own property. They mostly settle in spaces that are vacant or without a landowner. Like most of the nomads, Bede (The Water Nomads) community, travel in groups and never stayin one place for more than a couple of months. The majority of the Bedes live on snake related trading, such as snake charming, snake catching, snake selling, etc. They also sell lucky heathers and herbal medicines, which they claim have magical properties. *Bede*s' other occupations are in the entertainment services (e.g. monkey shows, magic shows) and petty trading. They do not have any kind of formal education and they do not use medical facilities. Majority of them are Muslim but Hinduism, Shamanism and Animism are also seen to be practiced along with Islam. They are related to other South Asian nomadic groups of India, Pakistan or Myanmar. Though they have no alphabet but practice or restore their language, tradition, custom, song, dance and culture orally like many pastoralists or hunter-gatherer nomads.

Since Bedes are nomadic and traditionally lived on the water this community does not have any control over land and local or national political power. Most of them were not included in the voter list of Bangladesh. But after 2007 many of them were enlisted in voter list with the help of some NGO and development workers. Since they are not officially recognized as an ethnic minority, they are severely deprived of all types of basic necessities of life such as food, health, education, shelter, medical care, etc. Bede community have their own culture and language. Now a days some of them are found begging on the busy streets of big cities like Dhaka, Chittagong, Khulna as they are deprived of basic needs and their business is losing market.

Figure 1.2 : Settlement of Water Nomads (Bede community) on a river in Bangladesh

Source: Internet

1.2.4 Challenging static sedentary settlement

The conflict between increasingly globalized sedentary architectural cultures, and the often invisible and marginalized vernacular architectural cultures of non-sedentary and traditionally nomadic societies, suggests that cultural difference might be much better addressed by resilient vernacular architecture in the future.

The theoretical and ideological practice of sedentary or 'state' architecture has long been governed by the sedentary professional circle of architects which denied the existence of nomadic ways of coding architecture. And a group of rebellion always challenged the idea of a sedentary lifestyle as a basis of thinking architecture. Such criticisms challenge the state gizmo, positing the concept that mechanisms of sedentary architecture are monuments of contemporary culture. On the contrary, they got inspiration from the mobile lifestyle of the nomadic community of different region who denied a static approach to pursue architecture.

Ephemeral, pneumatic and collapsible architecture of the time was a visible part of social and political activist movements. Even in the research field nomadic culture and their vernacular architecture study and extractions from those got significant focus in the last century. Nomads practice certain adaptive and collaborative approaches challenging static sedentary settlement to survive in extreme conditions

that need to be addressed with proper research. Their socio-cultural issues and constant mobility shape up their own vernacular architecture which is resilient in different parameters. Their livelihood, adaptability, spatial organization and collaborative living all helped to develop their own vernacular techniques.

1.3 Research question

This thesis addresses a single research question: Do the lifestyle, activity, material use and construction technology stimulate resilience in vernacular architecture practice of water nomads?

To answer this question, the study addresses a series of associated sub-questions.

What are the factors that helped water nomads to shape their vernacular architecture practice? What role have socio-cultural factors including their livelihood, mobility, lifestyle, myth, religious belief etc. played in constructing their resilient vernacular practice? Will a comparative case study of two types of sample vernacular dwelling of water nomads in Bangladesh, enhance our understanding of the relationship between social and cultural factors in the spatial organization of the dwelling with particular focus on ‘resilience’?

1.4 Research aim and objectives

1.4.1 Aim

The broad aim of this research is to understand resilience in vernacular architecture of water nomads (Bede community) in Bangladesh by documenting and analyzing the dwellings and settlements of them. To do so it specifically aims to enhance understanding of the relationship between socio-cultural factors and resilient architecture practice of nomadic Bede community of Bangladesh.

1.4.2 Objectives

To address this aim, the research has the objectives.

a. To understand how lifestyle can influence to develop social resilience in vernacular practice of built environment of nomadic tribe in Bangladesh.
b. To investigate material use and technology in dwelling units that addresses

resilience of water nomads in changing climatic situations.

1.5 Research rationale

The water nomads have an unexplored story of resilience and vernacular practice of architecture that flow with water. There is a large research gap with respect to the water nomads and their relationship to water. Despite the fact that water has been of crucial significance for this deltaic region, there has been little research on community and culture-dependent on water or flowing with water. To understand and explain the resilience of nomadic Bede community living on or around water, this study investigates case studies in Tongi and Keranigonj. Bangladesh is a deltaic land dominated by water and river. Here the vulnerability is mainly from water or river flooding and land erosion of the riverbanks. Bede community- living on water adjust with the water throughout their life by means of livelihood and activity. They survival on critical climatic and ecological vulnerability and turning resilient is a success story from which we can learn to become resilient in severe climatic condition. The vernacular response of the ethnic indigenous community is now been studied to understand the wisdom that they carried for centuries. As nomadic ethnic community get hereditary techniques and methods to live and flow with changing context through mobility and constant adaptation, their resilience can, therefore, be an important guide for future where climate change is drastically challenging human existence. The nomadic community adapts and live with collaboration and touch the ground softly where sedentary community try to rule the environment. Architects and researchers can more broadly provide leadership to societies in the development of livable environments- whether fixed, permanent and solitary or portable, temporary, and communal. This thesis argues that the possibilities of the later have often been neglected and that this imbalance may be acknowledged and rectified. It is argued here that the resilience techniques and actions that water nomads of Bangladesh practice in this part of the world may guide to cope with adverse climate and help to maintain a sustainable living pattern. So, the purpose of this research is to document and analyze the resilient lifestyle of water nomads of Bangladesh to find out their vernacular techniques of adaptive living. Along with ecological resilience, social resilience also plays a great role. In the Bede community this social resilience and

its role will be examined to find out how social interaction and community bonding as well as collaboration can create greater resilience in time of need.

1.6 Organization of Research / Thesis

Chapter 1 of the thesis deals with a summary of the research, aims, and objectives and a summary of the methodology and background of the thesis.

An important part of this study is the literature review. Chapter 2 deals with the supporting theories and facts about resilience and vernacular architecture from different literatures. In this part vernacular architecture is defined and different form of vernacular architecture are discussed here from different regions. Resilience is also defined and discussed from different literature study in this chapter. In addition, the different issues of resilience and vernacular architecture in Bangladesh, the study of nomads of different regions as well as their architecture, some special features of the nomads are also identified.

The next chapter is on the methodology used for this research. This study, focusing on the spatial organisation, will be analysed with 'Space Syntax' methodology. The aim of space syntax research helps to develop the approaches to define formed spaces in such a way that their underlying social logic can be understood (Bandyopadhyay, 2006). To conduct an analysis of spatial organisation of local vernacular architecture of water nomads (Bede community), plans of the selected dwelling of water nomads will be analysed with a software (JASS software) for creating 'Justified Access Graphs'. From Justified graph integration value,depth and choice of movement is studied and identified . Observation and questionnaire survey with field visit is conducted to gather analytical information and study their social ,cultural as well as ecological resilience.

Chapter 4 discusses the case studies with detail descriptions of the selected 28 dwellings of water nomads, in which 10 dwellings are on water and the rest 18 are on land. The main attention of this chapter is to find out the activity and spaces present as well as their quality in creating social resilience in their dwellings and settlements.

Chapter 5 consists of spatial analysis of the vernacular dwellings of water nomads

in Bangladesh with the help of J-Graphs of JASS software. The vernacular building techniques also analyzed from observation .This chapter leads to finding the patterns of spatial organisations of dwellings of water nomads, the hierarchy of spaces, depth and integration of spaces as well as construction techniques of nomadic architecture on water and land.

Chapter 6 is summary of the whole study with a clear understanding of the spatial organisations of dwellings of water nomads in Bangladesh and comparative study of two types of dwellings from two case studies.

1.7 Conclusion

Spatial organization as well as socio-cultural factors influenced resilience and shaped the vernacular architecture of water nomads like other ethnic indigenous communities. The research aims to find out the resilience in the socio-cultural context of water nomads and document the current phase of their vernacular practice. It tries to connect the dots and comprehend what makes them what they are. Resilience refers to adaptation, transformation and persistence in extreme climatic or social challenges and vernacular architecture refer to the traditional response to socio-cultural element. The process and theories of these two concepts are demonstrated in this research. In each case, the research relates these concepts to socio-cultural and physical features of vernacular architecture by water nomads.

2. Research Methodology

2.1 Introduction

This Study of '**Resilience in Vernacular Architecture of Water Nomads in Bangladesh'** is intended to find out the characteristics of resilient dwelling practices of water nomads in the context of Bangladesh. It focuses on vernacular practice with the specific objectives of understanding socio-economic and ecological resilience. The research question is based on a hypothesis that vernacular architecture of water nomads in different adverse climatic situations through adaptation, transformation and persistence are more resilient in terms of socio-economic and ecological perspective. This chapter describes the framework and methodology used to understand the resilience through spatial organization study and the impact of socio-economic status of the water nomads in their vernacular architecture.

2.2 Outline of Methodology

This study undertakes both qualitative and quantitative approaches. Information and data were gathered through a review of relevant literature, physical observation, archival research, semi-structured interview of stakeholders and questionnaire survey for the sociocultural, physical, environmental and economic issues of water nomads or Bede community. To fulfil the research, aim of unfolding water nomad's resilient issues in relation to their vernacular approaches of the physical environment, the study interrogates relevant data from three different perspectives.

- Firstly, the research searches the literature that best explains the terms and issues that are going to be interrogated and analyzed.
- Secondly, information on socio-economic factors and built environment is acquired through semi-structured interview and observation with local inhabitants by physical field survey in settlements of water nomads.
- Thirdly to understand the spatial organization, syntactic analysis of dwellings floor plan has been done by space syntax methodology

The physical features have been acquired from the measurement and drawing of floor plans, while socio-demographic data basically has been acquired from the interviews with community members. In addition to interviewing, observation during the visit provided information on the use of space, daily activities, ethnographic study, family, occupation, religion, spatial pattern and building techniques as well as

materials of their physical structures. To accomplish the research, the following steps are followed.

2.2.1 Literature review

To understand the socio-economic status of the Bede community in Bangladesh extensive literature study is conducted from published books, articles, magazines, published and unpublished thesis related to this research. This review consists of contents on water nomads, resilience, vernacular architecture as well as socio-cultural factors shaping spatial organization regarding dwellings and settlements of water nomads in Bangladesh. To understand the methodology undertaken, different concepts related to Space Syntax, gender and domestic spaces were investigated.

2.2.2 Field survey

To understand the socio-cultural context and physical environment, two sites were chosen based on a pilot survey where the Bede community lives in tents or boats. Families and *Sardar* (leader of the fleet) were interviewed with a structured questionnaire. For understanding their physical environment, plans and drawings were generated and documented by taking measurements and photographs. Activity Data of the family members of the selected dwellings and their responses towards their spatial organization were collected through observation, interview and questionnaire. The structured interview was carried out to focus on symbolic aspects based on experience in the pilot survey. Household information on the use of domestic spaces and daily activities was provided by the household members. Most of the floor plans of the houses were sketched during site observation and visit. Where it was possible, photographs were taken to record the position of furniture and the possible use of spaces. Photographs provide an intensive observation of the inhabitant's activity in the house settings and use of materials in physical structures.

Naturalistic observation is a way of data collection in which people's behavior is observed in their natural environment, in which they typically exist. Researchers who are usually involved in this type of data collection make observations as unobtrusively as possible so that the participants who are involved in the study are not aware that they are being observed else they might deviate from being their natural self. The naturalistic observation was used in some cases in this research.

2.2.3 Analysis

In this chapter findings (proper drawings, sketches and photographs) from field survey are analyzed to extract the resilient features that they adapt and practice to sustain in different socio-economic situations. Socio-economic resilience was observed and analyzed through the lifestyle, profession, religious practice and domestic activity analysis. In this research 'Space Syntax' methodology has been used to understand the spatial organization of dwellings of water nomads on water and land. Space syntax is a set of techniques which generates important data on how social meanings and lifestyle are expressed in spatial organization. The morphological characteristics of a plan layout are analyzed with the help of graphs called "justified access graphs." The justified graph represents the permeability of the system. In a justified graph, each space is represented as a circle and doorways and other openings between adjacent spaces and circulation routes are shown by lines linking points. A particular space, which normally is an exterior space, will be selected as a root space and all other spaces will be applied for the depth level from root space. Therefore, the level of the root is defined as zero, while the depth level of each space in the diagram corresponds to the steps taken to move from the root to that particular space. Every space in the building is assigned a depth value according to the minimum number of movements that must be taken to get from one space into another space. Observation, sketch and photography analysis was carried out to establish the ecological resilience of water nomads through material use and building technology.

2.3 Study Area

The study area was selected by some pilot survey on some spots around Dhaka. The settlement of water nomads is spread on 70 locations all over the country. In this research, only two locations near capital Dhaka is covered in detail. One is located in Pubail, Gazipur on the bank of Turag river. In this location, nomads dwell on boat and still lead a mobile life on the water. Another location is a nomadic settlement in Kodomtoli, Keranigonj which is found to be settled on the land. In both cases, the impact of urbanization is seen and have diversity in terms of physical features and spatial arrangements. To conduct the study a total of 28 dwelling units were investigated from these 2 settlements including 10 on water and 18 on land.

2.4 Data collection

2.4.1 Field survey and observation

In this study, most of the data were acquired through different types of dwelling units of water nomads from the field survey. Different methods for gathering data were used like direct photograph and information, socio-cultural information and observation of daily activities and interviewing of community members. The graphical data of physical features were collected from the measurement and drawing of unit floor plans and socio-cultural information was gathered from interviews with inhabitants. Photographs were taken to inspect the physical structure and details of built form. Observation from field survey provided information on domestic activities and construction techniques as well as the selection of materials. The naturalistic observation was used were in some cases the inhabitants were not aware that they are observed.

2.4.2 Interviewing process

Two types of approaches were used for interviewing in the data collection process: semi-structured and structured interview. At the initial stage of the research, a semi-structured interview was used to gather basic information about the activities and lifestyle of the inhabitants as well as the background of the water nomads. Simultaneously the structured interview was carried out to focus on the details of the selected dwelling samples. Household information on the use of domestic spaces and daily activities was chalked out from interview of household members. The respondents were asked to identify activities performed in different spaces in their dwelling units. Most of the floor plans and drawings are drawn on-site during site visit as there were no graphical resources on this topic. Photographs of physical traces were taken to record the position of activities and use of spaces. Photographs provide an intensive observation of the inhabitant’s activity in the house setting. Interviews were recorded with a recorder to further investigate and get thorough ideas on the living pattern and their activity. The interview was conducted in selected sample dwelling units according to the instructions structured in the questionnaires.

2.4.3 Questionnaire Design

The main target of questionnaires was to grab data and thorough information respondents and obtain a socio-demographic character of the inhabitants including the detail on the use of space, activity pattern and household information. A primary set of questionnaires was modified further from questions previously developed in similar studies. Some questions were updated on site according to specific requirement sensed during the field study process.

2.5 Method of analysis

To address the relationship between vernacular dwelling practice and resilience of water nomads, the study implicates the methodology of the following phases.

The first phase concerns the pattern of activities as perceived through the experience of inhabitants. Generic information on nomadic living pattern and resilience of vernacular architecture practice in different context were gathered from the literature survey. Activities and professions were studied to connect the socio-economic life with resilience. Activities that generate social interaction in their domestic spatial organization were identified through literature study as well.

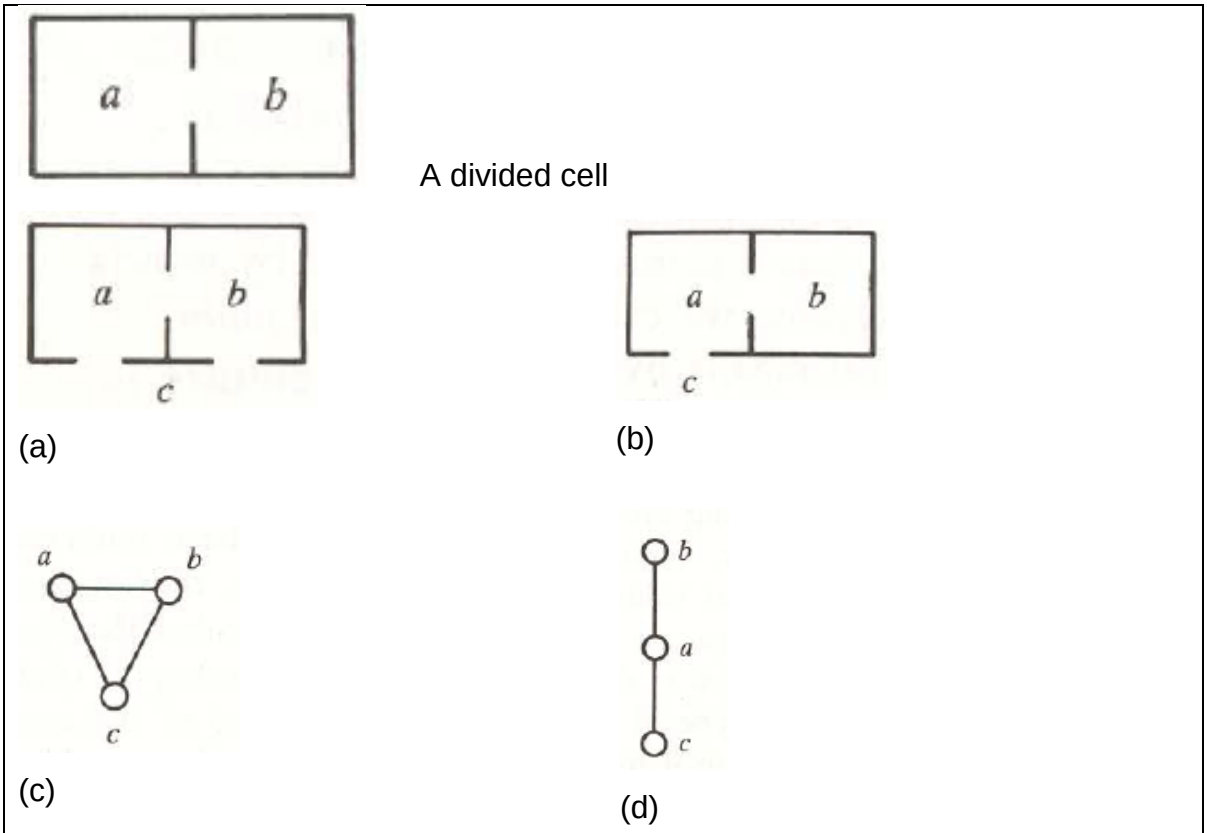
The second phase intends to examine the spatial configuration of 28 dwelling units of water nomads in 2 different settlements. Through observation and field survey, the study on the spatial organization of the selected dwellings was conducted. Through interview and questionnaire study, the activity pattern and space use of the inhabitants of the dwellings were recorded. This phase aims to uncover the built-in relationship between activities and spaces, which finally unleashes the resilience through vernacular space use practices of water nomads in the study area.

In the third phase, syntactic data from the space syntax model were applied as a tool to study patterns of the physical organization. At first, the spaces reinforcing interactive activity among family members were classified with space activity analysis. Then justified graph was developed of each dwelling to find the integration values and its relation with social interaction. JASS software, developed at the Bartlett School of Architecture, University College London, was used to construct the J-graphs and RRA value as well as the integration of different space of the sample dwellings. In the final phase, the descriptive and correlational analysis was conducted to find out the spatial characteristics of the spaces in a dwelling that influence interaction and social

resilience. Use of materials and techniques of building the dwelling were identified from thorough analysis to identify ecological resilience. Vernacular construction methods that reinforce resilience were diagnosed as well in this phase.

A graph is a way of drawing any set of relations between elements; therefore any building can be representated by a graph. By incorporating the syntactic structure of each plan into one simple diagram a set of otherwise complex spatial relationships can be more easily understood. According to Hillier, Hanson, and Graham, to any of the two spaces there is a relation created by a ‘gap’ in between them or a space from the outside controls the relations between the selected two interior spaces. It is said here that, the primary configuration of the space originates in the logic of spaces. Figure 3.1, shows an example to understand the relationship between spaces through a connection. There in Figure 2.1 (a), (b), displays a divided cell with two spaces *a* and *b*, and they are interconnected. This gap is important for the relationship between the two spaces, which might be called ‘permeability’ between the above mentioned spaces.

In the Figure 2.1 (c), (d), shows two possible relation of the spaces *a* and *b* with an outside space *c*. Now in Figure 2.1(d), it is seen that both the spaces *a* and *b* are directly connected with the space *c*. On the other hand, in Figure 2.1(c) shows a different relationship between the three spaces. It shows that, only the space *a* is connected to space *c*, and space *b* is only accessible from space *a*. If we analyze both the cases, we will find that the relationship between space *a* and *b* changed when another space *c* is present. In one of the cases, space *a* controls the accessibilty from *c* to *b*; and in another case this does not happen.



(a), (b) Two possible relations of spaces *a* and *b* to the outside, space *c*. (c), (d), the corresponding justified graphs.

Figure

Figure 2.1: Example of justified access graph (Hillier, 1987, p. 363)

2.5.1 Identification for parameters for methodology:

The first step of configurational analysis is to transcribe each space of the **dwellings** into the form of an access graph. Each effective space is represented by a point. Doorways and other openings between adjacent spaces and circulation routes are shown by lines linking points. The transcription starts from the exterior of the studied **dwellings** which, in some cases are uncovered courtyard and others are from where the **dwelling** is accessible. The exterior point is shown as the red point to differentiate it from the other interior point spaces. Exterior leads to the **entry veranda** which is a transition space and leads to **cooking, eating or sleeping areas.**.

According to space syntax theories, the fundamental properties for configurational variables are: (a) Integration, and (b) Depth, and also a way of architecture to carry culture (Gomes, 2014).

Integration:

The degree of 'integration', that is reversed value of RRA [real relative asymmetry], can be mathematically measured, which has been proved to be a powerful tool to explain the social dimension of the configuration. A space in the configuration that has the highest degree of integration can be accessed easily and quickly from the other spaces under normal conditions. In contrast, when a space has the lowest degree of integration, it is less accessible due to its topological distance further away from the others –thus most segregated in the configuration (Gomes, 2015, p. 216). Integration Value = $\frac{1}{RRA}$ (Hanson, 1998, p. 28). The integration or real relative asymmetry (RRA) value of a space expresses the relative depth of the space from the other spaces in the graph (Hillier, 1987).

Using JASS software a graph will be created and with the other values the Real Relative Asymmetry (RRA) values will be produced for each of the mentioned spaces of that plan. By inversing the RRA values we will find the Integration values.

Depth:

The justified graph represents the permeability of the system and the depth property indicates how many architectural steps one must pass through to arrive at a particular space of any building (Gomes, 2014). The depths of spaces usually indicate the level of interactions of people with the spaces. The depth of spaces in JASS software is produced according to the sequence and hierarchy of spaces. The value for depth for each space indicates the position of themselves in the interior of the studied building. If the depth value of a space is lower it means that the space is situated near the exterior.

Choice of Movement:

It is also known that 'depth' and 'rings' are the main properties of architectural space. As per ringyness or choice of movement in the spaces there are two types of

configuration expressed, which are: tree like configuration or ringy configuration (Gomes, 2014). A tree has the minimum number of connections to join the configuration up into a continuous space pattern. Rings add extra permeability, up to a theoretical maximum where every space is connected to every other. This enables us to begin to measure the degree of depth and relative ringyness of a complex, to capture in numbers the kinds of difference we find in architectural objects (Hanson, 1998, p. 27).

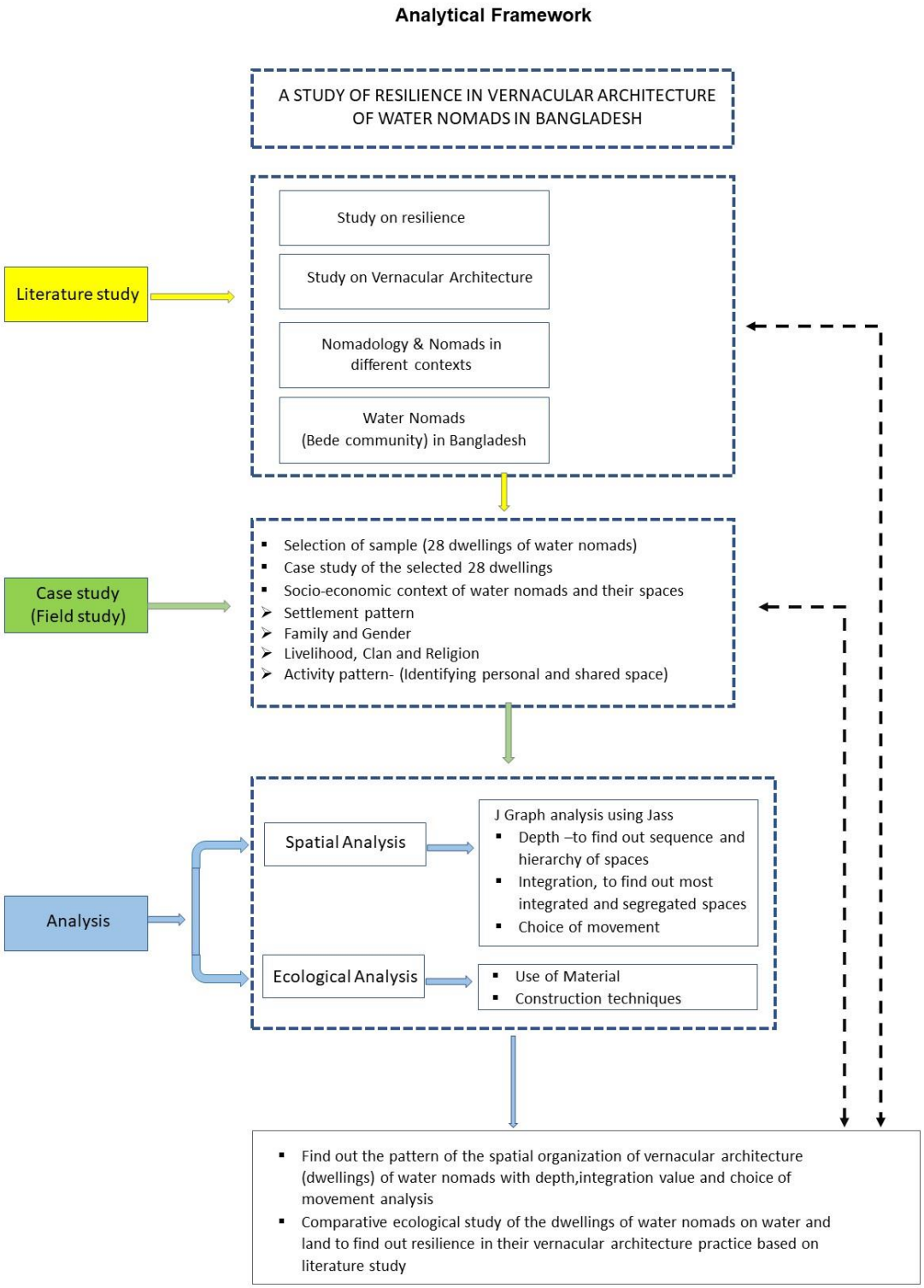


Figure 2.2 Analytical framework

3. Literature Research

3.1 Introduction

This chapter reviews previous studies that provide background for the study of resilience in vernacular architecture of water nomads in Bangladesh. This review consists of contents on water nomads, resilience, vernacular architecture as well as socio-cultural factors shaping spatial organization regarding dwellings and settlements of water nomads in Bangladesh. To understand the methodology undertaken, different concepts related to Space Syntax, gender and domestic spaces were investigated.

The review emphasizes the relationship of resilience with the socio-spatial organization and vernacular methods of making dwellings. This section tries to establish through theoretical understanding that there is a series of underlying principles guiding the arrangement of space and use of technology in vernacular architecture. Resilience is interpreted from different literatures with a focus on indigenous ethnic, social, ecological, livelihood resilience as well as resilience in Bangladesh. Indigenous ethnic resilience is analyzed to understand their mechanisms to retain traditional practice in adverse climatic and social context. Social resilience examines social groups and their abilities to endure, absorb, adapt and adjust to environmental and social hazards of different kinds. Livelihood in rural areas is highly vulnerable and threatened by different external factors. Therefore, livelihood resilience approach deals with people's capacity for taking anticipatory actions collectively or individually. Bangladesh being a delta surrounded by water bodies and rivers suffer from disasters and extreme climatic hazards. Communities in this region face vulnerability and as a result they attain resilience through adaptation, transformation and resistance. On other hand vernacular architecture evaluates built form as a response to set of social phenomena that shapes the spatial organization and formal expression. It expresses a type of practice that is traditionally practiced and imply a record of responsiveness to lifestyle and societies. Nomadic tribes of different context show strong indigenous character that dispenses the idea of a fixed home or land ownership. Their home is always mobile and adaptation as well as collaboration is common practice to sustain in constant roaming. In Bangladesh a group of nomadic tribe , known as "Bede" who dwell on boat or stilt hut, has a different culture than the other ethnic groups of Bangladesh and their socio-cultural factors shapes their resilient lifestyle in constant mobility.

3.2 Resilience

Resilience is having the capacity to persist in the face of change, to continue to develop with ever-changing environments. According to Folke, resilience thinking tells about how periods of gradual changes interact with abrupt changes, and the capability of people, communities, societies to adapt or even transform into new development pathways in the face of dynamic change (Folke, 2016). Resilience can be defined in many ways. It is the buffer capacity or the ability of a system to absorb perturbations, or the magnitude of disturbance that can be absorbed before a system changes its structure by changing the variables and processes that control behavior (Holling, 1995).By contrast, other definitions of resilience emphasize the pace of recovery from a disruption, highlighting the difference between resilience and resistance, where the later is the extent to which disturbance is actually translated into impact.The history of resilience thinking is generally traced in two key disciplinary areas; one focusing on the ability of ecosystems to absorb, adapt to or recover from the shock—whether environmental, geophysical or technological in origin, and the other in the psycho-social literature with a focus on trauma in individuals and/or communities. Recent resilience thinking places considerable emphasis on the interrelationship between social and environmental dimensions of sustainability (Kinder J., 2018). Recent perspectives on resilience can be summarized into three major views (Folke, 2006) Resilience as stability (Buffer capacity), Resilience as recovery (Bouncing back), Resilience as transformation: (Creativity). A common aspect of all perspectives is the ability to withstand and respond positively to stress or change.

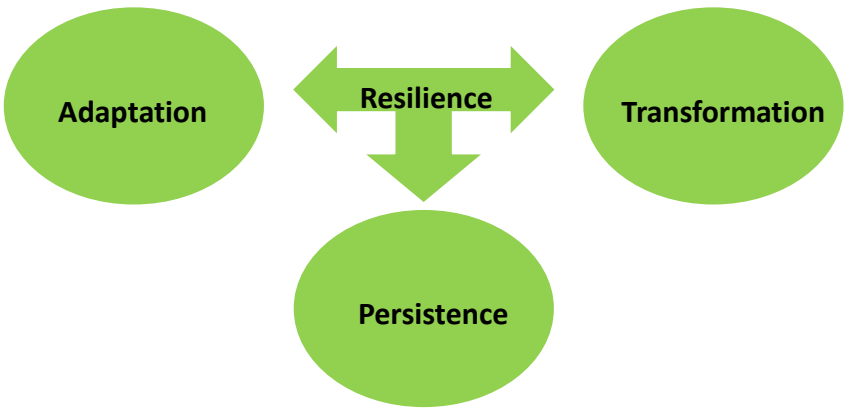
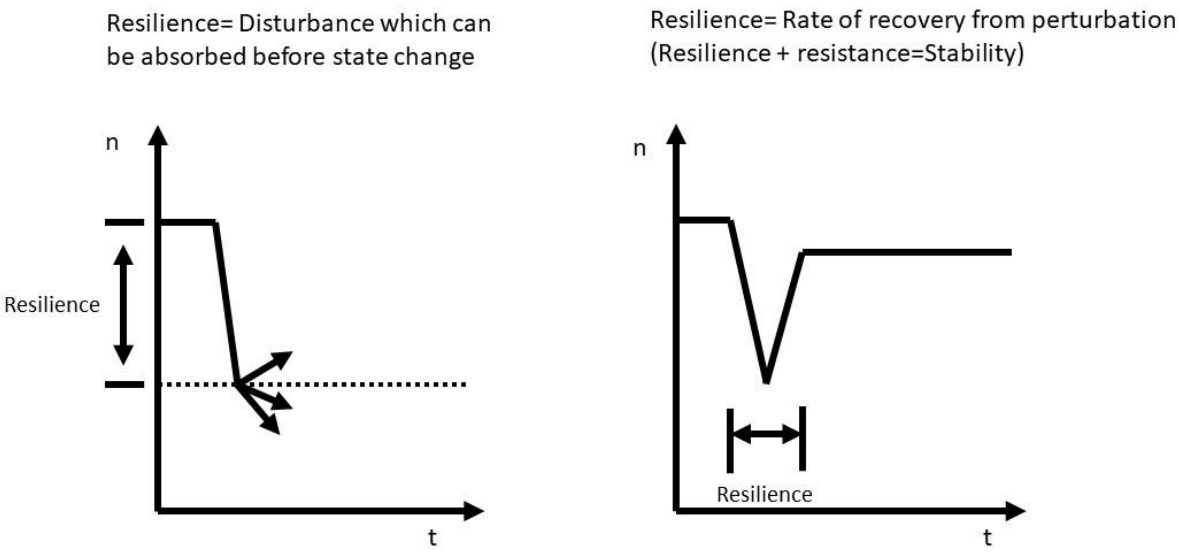


Figure 3.1 Resilience through adaptation,persistence,transformation



(left) the disturbance which can be absorbed before the dynamic equilibrium is changed completely and (right) the rate of recovery from disturbance (following Holling)

Figure 3.2 Resilience - Two alternative definitions (Source: Holling,1995)

In support of the idea of resilience as a unifying concept, Berkes and Ross (Berkes, 2003) describe community-level resilience as overlapping and complementing the two key strands of resilience literature, thus providing opportunities of mutual enrichment. Hence, they see it as important to develop an integrated concept of community resilience. As examples, they offer two definitions, one by Magis (Magis, 2010)where community resilience is the “existence, development and engagement of community resources by community members to thrive in an environment characterized by change, uncertainty, unpredictability and surprise.” Another is from the Canadian Centre for Community Renewal (Anon., 2000) which defines a resilient community as “one that takes intentional action to enhance the personal and collective capacity of its citizens and institutions to respond to and influence the course of social and economic change.”

The International Federation of Red Cross has identified the following criteria as characteristics of resilient communities:

1. Understand the disaster risks and can assess and monitor them, and take steps to protect and minimize losses.

2. Able to sustain basic community functions and structures despite disaster impacts.

3. Can build back after a disaster and work to ensure that vulnerabilities continue to be reduced for the future.

4. Understand that building safety and resilience is a long-term,

5. Appreciate that being safe and disaster-resilient means that development goals are more likely to be met. (IFRC, 2012)

According to Wilson, community resilience can be conceptualized to illustrate how economic, social and environmental capital develop and interact. (Wilson, 2012)

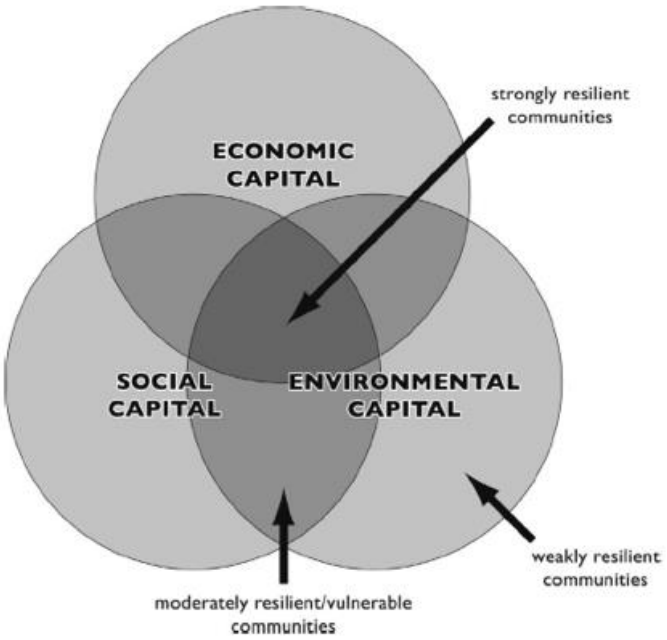


Figure 3.3 Community Resilience according to Wilson

Resilience is strongest when all three criteria are well developed and reflect “multi-functional communities” that incorporate a multitude of assets. As a result of this interaction, the strongest community resilience can be found at the intersection between strong economic, social and environmental capital. Communities, where only two capitals are well developed, are moderately resilient while communities that have one or no well- developed capital have weak resilience thus high vulnerability (Adger, 2000). In natural disaster and manmade conflict scenarios livelihood, assets, community networks and relationships get destroyed and in many areas, lives and communities are devastated. Re-settling the communities and providing essential

support to adapt to the new or changed environments has been a major challenge for community members.

According to the Internal Displacement Monitoring Centre (Internal Displacement Monitoring Centre (IDMC), May 2015), between 2008 and 2013, almost 47 million people were displaced by disasters and natural hazards in South Asia. The enormity of displacement caused by disasters is determined by communities' vulnerability to shocks or stresses and the capacity they have to withstand the disaster. In these situations, social, economic and political realities have a major influence on the capability to cope and have varying effects on individuals and communities. In disaster situations, homes and livelihoods are destroyed, social support networks disintegrated, heightened risks such as family separation, child protection challenges and gender-based violence are introduced. These risks increase the more often people are displaced and longer the displacement. Similarly, the more resilient the community, the less the risk and impact of displacement experienced.

3.2.1 Indigenous Ethnic Resilience

The human-nature relationship is another issue that often came in the discussion of resilience. This view of human-nature relationships sits at the heart of Indigenous concepts of resilience (Stewart-Harawira, 2015).Historically, Indigenous ethnic peoples have shown remarkable resilience in the face of adverse climatic and social context, Over centuries, Indigenous ethnic peoples have sought through native vernacular techniques and other means to retain traditional characters, including traditional practices, languages and identities. The historical encounters between indigenous peoples and colonizers have led to the development of a range of protective mechanisms that indigenous peoples have deployed in their efforts to assert their sovereignty and self- determination. (Gibson, 2005)

Noam Chomsky (2013), speaking of the global crisis of sustainability, observed, "Throughout the world, Indigenous societies are struggling to protect what they sometimes call 'the rights of nature,' while the civilized and sophisticated scoff at this silliness." He noted in particular that, "Leading the effort to preserve conditions in which our immediate descendants might have a decent life are the so-called "primitive" societies: First Nations, tribal, Indigenous, aboriginal…. The countries with large and influential indigenous populations are well in the lead in seeking to

preserve the planet. The countries that have driven indigenous populations to extinction or extreme marginalization are racing toward destruction." (Chomsky, 2013).

Aspin (Aspin, 2014.) mentioned that resilience "is a testimony to the refusal of indigenous people to accept assimilation or integration as an acceptable strategy for their ongoing survival." They elaborated through the words of Cohen: "The Indigenous reality is one of resilience, refusal to disappear; it is a reflection of the strength and beauty of peoples who have lived here since humans existed on this land and will continue to be so" (Aspin, 2014.)

Within the last few hundred years, indigenous communities around the world have been marginalized and excluded from vital processes that have the potential to bring significant benefit to indigenous communities (McIntosh, 2006). This marginalization has taken place in a number of domains such as the political arena, educational settings, and in the context of research (Smith, 1999). The exclusion of indigenous peoples from these important processes has been accompanied by the imposition of non- indigenous paradigms.

In the area of research, for example, indigenous peoples are reclaiming the right to set the research agenda and to design and implement research paradigms that derive from their cultural context and which, as a result, are more likely to lead to beneficial outcomes for indigenous communities than the non- indigenous research processes which have prevailed since the onset of colonization. Commentators on resilience have noted the cyclical process that indigenous peoples take in adapting to challenging and stressful situations. In their discussion of resilience among indigenous families, McCubbin (1998) make the point that indigenous families respond in vastly different ways to stressors in their lives and that many of these families have an innate ability to adjust to stressors and then respond in a manner that draws on cultural reserves which in turn contribute to enhanced resilience. They describe resilience as the result of positive behavior patterns that emerge from negative events and lead to the building of coping strategies which people harness to deal with future stressful events in their lives (McCubbin, 1998) . As indigenous peoples emerge from several hundred years of oppression, they are now equipped with remarkable survival skills that ensure their survival in the future (Battiste, 1998)

.

3.2.2 Social and ecological resilience

Social resilience is the ability of communities to cope with external force and disruption as a result of socio-political as well as environmental change. There is a clear relationship between social and ecological resilience, particularly for social groups that are reliant on ecological and environmental resources for their livelihoods. Social resilience concern social groups and their abilities to endure, absorb, cope with and adjust to environmental and social hazards of different kinds. Adger (2000) considered it “as the ability of communities to withstand external shocks to their social infrastructure” (Adger, 2000).

There Adger (2000) mentioned Social resilience is an essential element of the situations under which individuals and social groups adapt to environmental and social change. In addition to these concerns, resilience is obviously related to other issues such as vulnerability and criticality, some of which have a certain spatial aspect of this social structure. Social vulnerability is the disclosure of groups to external stress as a result of the shocks of environmental change. For vulnerable communities, such stresses are often extensive and related to the underlying economic and social condition, lack of income and Resources.

For natural ecosystems, the vulnerability can occur when individuals or communities of species are stressed, and where thresholds of potentially irreversible changes are experienced through environmental or social changes. Social vulnerability to environmental change and other causes of vulnerability can be observed at different scales and in relation to a range of phenomena such as human-induced risks or natural hazards (Klein, 1998) (Adger, 1999).Social Resilience increases the capacity to cope with stress and is hence an antonym for social vulnerability. As social resilience has economic, spatial and social dimensions and therefore its appraisal requires understanding at the interdisciplinary level and because of its institutional context, social resilience is defined at the community level rather than being a phenomenon pertaining to individuals. Social and ecological systems are themselves linked, in many ways. Simply taking the concept of resilience from the ecological sciences and implementing it to social structures assumes that there are

no essential differences in behavior and structure between socialized institutions and ecological systems. In determining the parallels between social and ecological resilience, potential indicators for the concept are discussed below, focusing on the links between social stability (of populations within social systems) and resource dependency. Resource dependency is defined by the reliance on a narrow range of resources leading to social and economic stresses within livelihood systems. Stresses and fluctuations associated with resource dependency are manifest in instability and increased variance in income and risk of failure of particular sources. The concept of dependency stems from a rural sociological perspective on communities and their interaction with resources. Resource dependency relates to communities and individuals whose social order, livelihood and stability are a direct function of their resource production and localized economy (Machlis, 1990). There are a number of components by which the consequences of dependency can be measured: livelihood stability, and social stability and migration. The dependency of individuals within a resource system does not depend on reliance on a single crop or fish stock, but in some circumstances on the dependence on an integrated ecosystem. This is particularly the case with coastal resources, as argued by Bailey and Pomeroy (Bailey, 1996) in the context of coastal regions of Asia: ‘fishing communities are best understood as dependent not on a single resource but on a whole ecosystem. This expanded understanding of tropical coastal resources is the key to stability for households and communities in South East Asia’s coastal zones’. As an example of the ties between ecosystem and social resilience, the demand for diverse and resilient resources partially determines the location for settlement. Coastal communities can be dependent to a greater or lesser degree on coastal resources for their livelihood. These resources in themselves may be diversified and incorporate tourism, fishing other extractive uses and transport. It is often argued that coastal ecosystems are more resilient, and therefore coastal communities are more resilient. For other forest-based communities in southeast Asia research demonstrates that commercial logging and other market activities can reduce the resilience of such communities (King, 1996), particularly when rapid market integration is exacerbated by low levels of social capital and infrastructure. In summary, the direct dependence of communities on ecosystems is an influence on their social resilience and ability to cope with shocks, particularly in the context of food security and coping with hazards. Resilience, therefore, depends on the

diversity of the ecosystem as well as a social structure that govern the living pattern of the community.

3.2.3 Livelihood resilience:

All around the world shifts can be observed in livelihoods due to climate change and other socio-cultural changes. Social systems are threatened by global and climate change impacts which leads to changing functionalities and behaviors. For this topic, it was interesting to analyze how people are managing transformations and which creative and adaptive solutions help or support them cope with changes in social as well as natural degradation and threats. A new perspective offers a 'livelihood resilience' approach to social and climate change adaptation that allows greater emphasis on people as well as their community and considers livelihood systems in the context of transformational change. Within the field of development, the sustainable livelihoods perspective has evolved considerably during the past few decades. A livelihood is understood comprising 'the abilities, resources, claims, access and activities required for a means of living or earning basic human needs.

Livelihood in remote rural areas is highly vulnerable and threatened by climate change and other external social events. It is therefore particularly necessary for indigenous ethnic communities to have the abilities to absorb, adapt, withstand and restore the vulnerabilities due to any change in the natural or social system. A resilient livelihood is a sustainable livelihood that can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base (Chambers, 1992). The scientific literature gives assistance in developing ideas about indicators to measure resilience livelihoods. The livelihoods resilience approach emphasizes people's capacity for, and differences in, perceiving risk and taking anticipatory actions, either individually or collectively. Understanding the resilience of livelihood systems of the poor through research and enhancing them through transformational action must now be seen as a normative priority.

3.2.4 Resilience in Bangladesh

Bangladesh has been identified as one of the most vulnerable countries (Huq, 2001) due to its exposure to frequent and extreme climatic events such as cyclones and

associated storm surge. Nearly half of Bangladesh's population lives on the coast, where they face substantial cyclone and flood risks. Frequent cyclones (Gorky in April 29, 1991; Sidr in November 15, 2007; Aila in May 25, 2009; Mohsen in May16, 2013; Komen in July 31, 2015) gave an early indication of increasing natural calamities as well as support the latest observation of the Intergovernmental Panel on Climate Change (IPCC) that frequency of climate change-induced extreme events like cyclone will increase in the future. Globally 606,000 lives have been lost and 4.1 billion people have been injured, left homeless or in need of emergency assistance as a result of climate change-induced disasters (IPCC, 2012).

It is revealed that disasters are the first and foremost local phenomenon where local communities are on the frontlines of both the immediate impact of a disaster and the initial emergency response. In the face of hazard, learning from the previous disastrous events helps to create disaster-resilient community through different disaster risk reduction mechanisms. More importantly, disaster risk reduction activities begin at home throughout the local communities. Yamuna Kaluarachchi mentioned some Case study findings from his study on community resilience of the displaced community of Bangladesh (Kaluarachchi, 2017).

Case Study	Displacement/ relocation	Major findings	Lessons to be learnt
Gaibandha, Bnagladesh, Since 1973	2500 households affected due to erosion of river bank	Raising homes for flood defense during the rainy season tube-wells for safe drinking water and sanitary facilities. Educating families to improve personal health. Loss of agricultural land, livelihoods and asset values near the riverbank affecting communities. Measures proposed to minimise the losses: Sustainable embankment construction and its maintenance, Training on disaster preparedness involving local institutions/ local government, Massive afforestation with the experience of local knowledge and its maintenance, Action against deforestation, Form an alliance among SAARC countries in order to ensure water distribution within the subcontinent [31].	For the short and long term, prevention and mitigation techniques identified and implemented to minimise damage and provide security and stability. Knowledge, training and skill development programmes as a long-term solution. Co-operation and collaborative programmes in-order to identify long-term solutions.
Kutubdia Island, Bangladesh, 1991.	40,000 people displaced due to tidal floods	Preventive physical structures were built to protect houses but the high tides and tidal surges now top the barrier. Livelihoods such as fishing, farming affected and the community displaced.	Long term strategies and policies need to be put in place for prevention and mitigation. Communities need support and alternative income generating avenues for the period that they are displaced.
Cyclone Aila, Coastal Bangladesh, 2009	2.3 million people affected [20]	Communities employed various coping and adaptive strategies with varied levels of exposure and abilities to keep themselves safe in the face of cyclones along with disaster preparedness and response, structural and non-structural measures to mitigate impacts [3]	Awareness and capacity building of the local people to increase their adaptive capability. Urgent collective community action needed with local leadership knowledge.
Char Kabilpur, On going	620 households affected by frequent flooding	Purchase of community boat by resource pooling, the development of community networks, working together to address local problems by local communities.	Local knowledge, local skills and resource pooling to find common solutions to on-going solutions.

Figure 3.4 Community resilience of displaced community of Bangladesh , Source: (Kaluarachchi, 2017)

Figure 3.5 Community resilience of in Bangladesh, Source: Internet

3.3 Decoding Vernacular

Research on vernacular architecture has been carried out extensively, worldwide, over the last few decades. The particular interest in such research lies in the methodology by which we can understand from indifference to function within a socio-cultural context. Notable examples, where a distinguished methodology is used to shed light on vernacular architecture within the domestic domain, are books such as 'Architecture without architects' by Rudovsky in 1964, or Rapoport's 'House, form and culture' in 1969, the 'Illustrated Handbook of Vernacular Architecture' by Brunskill in 1987, or the 3-volume study by Paul Oliver 'Encyclopedia of Vernacular Architecture of the World' in 1997.Other important studies interested in domestic space have provided no less innovative approaches to explore and understand spatial organization within cultural contexts leaving the door wide open for further research. In this regard, Henry Glassie's 'Folk Houses of Middle Virginia' as well as Julienne Hanson's 'Decoding Homes and Houses' -which derives its methodology from Hillier et al' s Space Syntax- are among such leading studies in this field. In Hanson's 'Decoding Homes and Houses' vernacular and cross-cultural examples dwellings are explored in order to illustrate the complexity of human habitation and to suggest ways in which house can carry cultural information in their material form and space configuration. It is proposed that the analysis of domestic space configuration provides the link between the design of dwellings and their social consequences (Hanson, 1998).Hanson mentioned in this book, “Houses everywhere serve the same basic needs of living, cooking and eating, entertaining, bathing, sleeping, storage and the like, but a glance at the architectural record reveals an astonishing variety in the ways in which these activities are accommodated in the houses of different historical periods and cultures. The important things about a house is not that it is a list of activities or rooms but that it is a pattern of space governed by intricate conventions about what spaces there are, how they are connected together and sequenced, which activities go together and which are separated out, how the interior is decorated and even what kinds of household objects should be displayed in the different parts of the home. ” (Hanson, 1998) .

On the general level, Pearson's study (Pearson, 1989) represents an introduction to

what he defines as ‘natural house’, which asserts the integration between the man-made environment and the natural one. He presents cross-cultural forms of houses and the effects of climate in developing certain elements in the house over others. Apart from the interesting introduction to houses in different cultures, the book offers a classification of a typology of houses in terms of their effect upon body, mind, and spirit, and the relation with the surrounding ecological system. Moreover, the book investigates the effect of various climatic zones on health and its reflections on the form and the function of the house. In the last part, which tackles the various living spaces within the house, Pearson defines each space in its relation with the orientation of the sun, and in terms of health and harmony within the natural, rather than the manmade environment. Although the research seems comprehensive in relation to various aspects of a healthy house, supported by illustrations from cross-cultural backgrounds, it still remains general and provides little to understand the spatial organization, or form-function relationships rigorously. Another study on this level is Rudofsky's '*Architecture without Architects*' (Rudofsky, 1964)in which he introduces the concept of 'non-pedigreed architecture'. In this study, he reads vernacular, indigenous, and rural architecture, and attempts to understand the social structure of the building form in a spiritual framework.

Among studies of the architecture of the primitive house, Rykwert's study tackles the idea of the primitive hut in architectural history. The author investigates shelter since early history and makes an analogy with the temple as a spiritual symbol that man has aspired to achieve in the created house. Quoting from Le Corbusier in Vers Une architecture, Rykwert writes: 'Primitive man, has halted his chariot: he has decided that there shall be his home ground. He chooses a clearing and cuts down the trees that crowd it in; he levels the ground about it; he makes a path to the stream or to the settlement of his fellow tribesmen which he has just left, this path is as straight as his tools, the pegs of his tent describe a square, hexagon or octagon: the palisade (of the settlement) forms a rectangle whose four angles are equal, the door of the hut opens on the axis of the enclosure, and the gate of the enclosure faces the doorway of the hut, look at a drawing of such a hut in a book of archaeology, here is the plan of the house, the plan of a temple' (Rykwert, 1972). Starting from this notion of the relation between the need for shelter and spiritual needs, Rykwert projects this idea on a cross-cultural domestic architecture, ranging back to the Romans, Greeks,

Egyptians and to modern ideologies such as Communism, and Judaism. The study is replete with analogies and interesting comparisons, hence marking an approach that reflects on deep spiritual meanings within the physical form. Gardiner's study investigates the evolution of the house since the early cave dwellings to the present time (Gardiner, 1975). He highlights climate, as the main factor among others, to shape the house. However, when he turns to the spatial aspects his description is at best narrative, subjective and un-sustained with no evidence. He writes, for example: 'The design and construction of such architectural devices as gateways and courts reflect the equally human wish to establish a relationship between outside and inside and to show that the huge walls behind which man shut himself away - or the central court plans of the Sumerian houses which enclosed him - were not made from choice but from some kind of fear' (Gardiner, 1975)

Other studies like (Hamdi, 1995)introduce the idea of the house as a micro-social entity created by the local community. Hamdi's study gives rise to social ideas that Hassan Fathy called for; particularly the idea of self-help, which aims to allow the collective local community to participate in the decision-making and building of their neighborhood unit houses and common spaces rather than only the single house.

Oliver's approach is different in *'Dwellings*: *The House Across the World'* in 1987 in which he examines dwellings as a process of building and as artefacts. He investigates dwellings from a social perspective as an activity of living, and as a place or structure attempting to understand their forms as a nonprofessional primitive artefact. However, the author discusses the idea of primitive architecture as 'the most invidious, and also imprecise, implying either a primitive origin to architecture which the buildings represent or primitive peoples who build them; traditional architecture is better, for it acknowledges the inheritance of the past. In his investigation of case studies from different cultures, Oliver states that they imply 'a record of responsiveness to altering lifestyle and societies in change' (Oliver, 1987). According to the author, 'there are many factors that affect the nature of dwellings across the world, such as availability of certain materials, or the varying kinds of climate, altitude and environment in which people live, I have chosen to concentrate on certain principles, both environmental and cultural, which shaped the variety of dwelling types, they involve material resources, forms of dwelling, the technologies and processes by which they are built; climatic and environmental considerations; the

way the space is organized and used within the dwelling to meet the demands of daily living' (Oliver, 1987). However, despite his investigation of a cross-cultural sample of houses, Oliver did not provide a systematic procedure on how to investigate the underlying spatial themes that might reflect cultural habits or lifestyles.

Best known for his leading socio-cultural study of the house, Rapoport considers form as largely determined-object by its culture, whilst other factors that others consider being determinants, he considers mere building form modifiers. He writes:

"My basic hypothesis, then is that house form is not simply the result of physical forces or any single causal factor, but is the consequence of a whole range of socio-cultural factors seen in their broadest terms. I will call the socio-cultural forces primary, and the others secondary or modifying" (Rapoport, 1969).

His major concern was the primitive and vernacular buildings and settlements in order to understand the forces that shape these dwellings. The study attempts to look at the variety of house types, forms and the forces that affect them, and to a certain extent to find implicit rather than explicit influences.

Norbert Schoenauer emphasized on the evolution of dwellings from the dawn of civilization to the end of 20th century in *'6000 Years of Housing'* in 1981.The manuscript of this book was profusely illustrated with the author's freehand drawings, in the belief that indeed a drawing is worth a thousand words (Schoenauer, 1981).Until fairly recently, traditional domestic architecture was not a topic of great interest to architectural historians. Even today, by rejecting the notion that architecture has its roots in the humble beginnings of indigenous dwelling, some contemporary scholars insist that housing is not architecture. (Schwarz, 1959). Nevertheless, it is hoped that it will dispel a persistent myth that the first dwellings were invariably caves when they were far more frequently huts; similarly, the poetic rendition by ex-Jesuit Abbe Laugier that a man invented the primitive rectangular hut has no credence since the earliest huts were round and most likely built by women.

Figure 3.6 Vernacular Architecture in different context (source : Internet)

3.3.1 Primitive huts and elementary building

The Idea of ‘primitive hut’ has been central to architectural history. It is the attempt by succeeding generations of theorists to articulate the primary ideas in which architectural forms have their social origin and therein to give substance to the elementary building blocks. Unlike most previous attempts to speculate on the origins of architecture, the elementary building is not a form drawn from the archaeological records or from ethnography, but a logical construct in space and time.

The elementary building as it was defined in ‘The Social Logic of Space’ is a closed cell-related by permeability to a contiguous open space outside. The open segment

of space may be traversed, while the closed-cell is a dead end. The closed and open cells were seen as made up of two kinds of raw material: continuous space and the stuff of which boundaries are made, which has the effect of creating spatial discontinuities.

In arriving at an ideographic language for architecture, space organized for social purposes was viewed as neither purely continuous nor purely bounded, but some conversion of the spatial continuum by a system of boundaries and permeability to effective space organized for a human social purpose (Hanson, 1998). 'Fire home' of Kung bushmen of the Kalahari Desert is a perfect example of the elementary form of human habitation. It embodies a set of spatial concepts which expressed only the bare essentials of human existence-shelter, cooking, warmth. Marshall described this as," The fire is nuclear family's home, its place to be…. A fire home is always where the family is. Fires are constant, shelters are whims…. It takes the women-only three-quarters of an hour to an hour to build their shelters at all." (Marshall, 1959).

However, the ethnographic record provides us with a rich source of portable dwellings from nomadic cultures which, often needs considerable technical sophistication and provide a living link with the dwellings of our ancestors. Tents are simple and space is not large. Nomad's possessions are necessarily few since they must be transported. A stranger must approach the tent from the front, which is usually orientated to the south or east. The tent is divided into two by a curtain (Figure 3.7 a). The smaller and more opulent men's side is covered with carpets and mattresses. The larger, more functional women's area is used for living and working. The host's camel saddle is set on the mattress in the deepest part of the men's side, and the host and guest of honour sit either side and talk across it, whilst less important guests sit in a semicircle facing them. A space outside is a place for prayer, an activity which ensures that according to Bedouin cultural conventions, it is a male-dominated space. Although the rules governing hospitality are extremely strong -— a Bedouin must entertain even his sworn enemies for three days — there is a strong prohibition on guests seeing into the women's side of the tent (Hanson, 1998). Not only this, access to the open space at the front of the tent is denied to women and reinforced through religious restrictions on its use, so that the inhabitant-visitor interface is controlled by men. The inhabitant-inhabitant relation — that between

men and women — is realized in segregation, effected through the strength of the boundary between their respective domains.

If we compare this with a typical Teda mat tent (see figure 3.7 b) from the Berber tribes of the southern Sahara, again taken from Faegre (Faegre, 1979) and supplemented by reported descriptions of household practices, we find a great contrast. First, although mat tents tend to be orientated towards the west, the space outside is not a ritual space but a practical one. These functions are more orientated to women's work than to masculine activities, and both they and their menfolk receive their guests in the space outside the tent, where the family spends the greater part of its time. The distinction between men and women is not made inside the family home, rather the interior is organized to follow culinary practices.

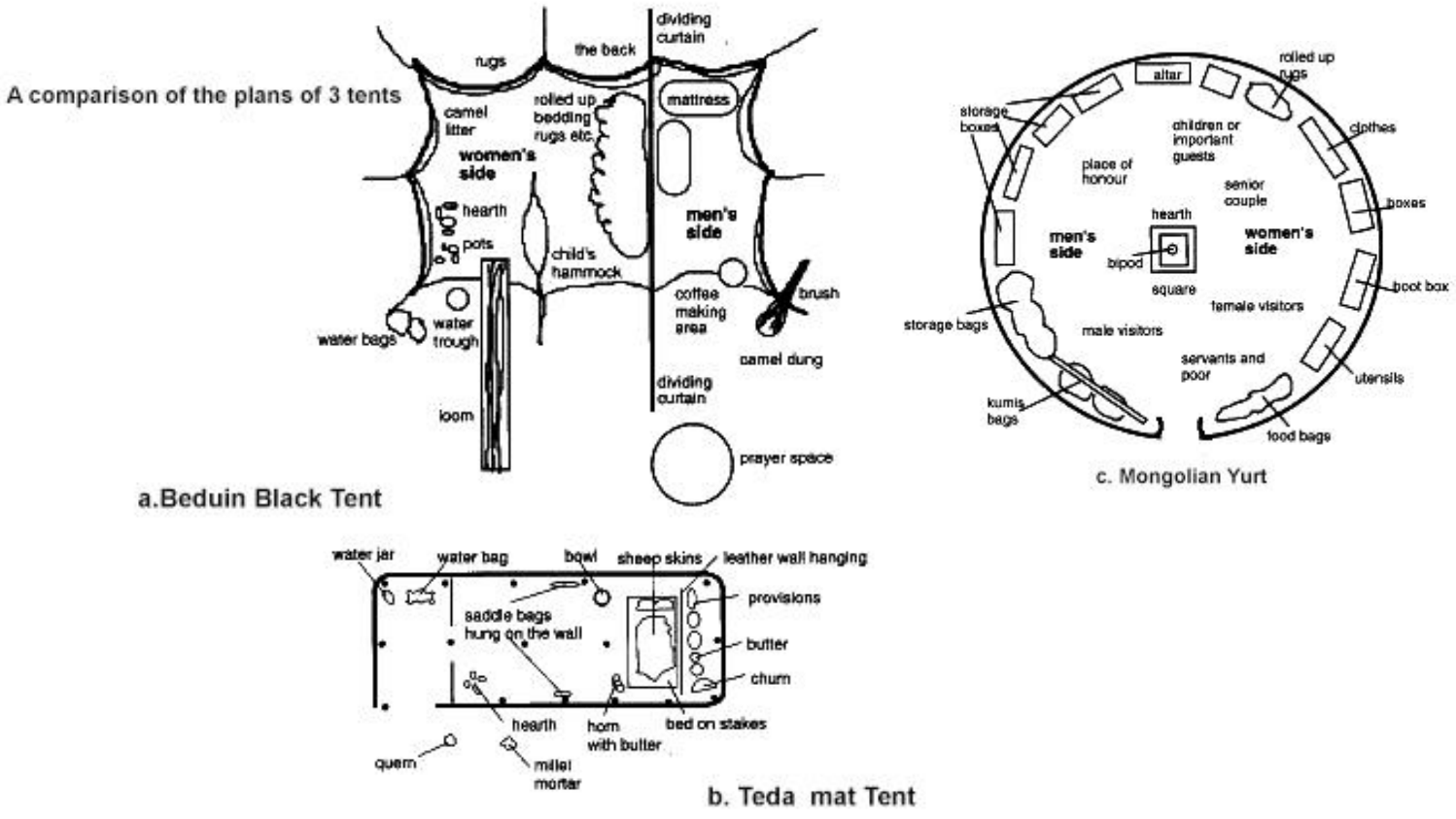


Figure 3.7 A comparison of the plans of 3 tents of nomadic tribes (Source:Hanson,1998,Faegre,1979)

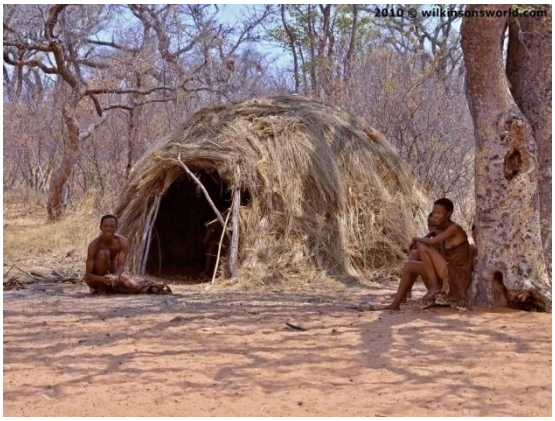


Figure 3.8 !Kung Bushmen Encampment and their hunting style (Source: Internet)

In both its interior organization and in its relation to settlement space, Berber social conventions lack the strong exogenous model which characterizes Bedouin domestic space organization. Women are not separated from men within the domestic interior, and control of the space outside is neutral with respect to its use by men and women. Visitors are not differentiated according to their different roles and statuses. Nonetheless, Teda domestic space is still well-structured. Properly speaking, it builds upon the minimal structure of the elementary building (Hanson, 1998).

Moving halfway around the world, the Mongolian yurt is comparable to the Berber mat tent in its lack of interior subdivisions, but comparable to the Bedouin black tent in the development of its internal organization. Within the yurt, everyone and everything ‘has its place’ (see figure 3.7 c). The entrance always faces south or south-east. Entering, it is considered impolite to step on the threshold. Opposite the entrance, against the north wall in the deepest space from the door, is the household shrine. To the west lies the men’s side, whilst to the east is the women’s side. The center of the yurt is marked by the hearth, while around the perimeter household objects are stored. The tent is further divided into named sections, within which status and gender dictate the correct situation of people and storage of things. Household implements are physically associated with their users. Men’s objects — saddles, guns and ropes — lie in their accustomed places within the men’s domain, whilst women’s possessions — churns, cooking implements and cradles —- are placed in an invariant order around the women’s side of the yurt. Guests are seated in the ‘place of honor’ on the men’s side and to the rear of the central hearth, out of

the cold. Children and animals sit close to the door.

So strong is the symbolic structure of the yurt that through the centuries it has come to represent the cosmology of its inhabitants. To the Mongols, the roof is the sky, and the hole in the roof the sun — the Eye of Heaven. The central hearth is regarded as an embodiment of the five elements from which all life springs: earth on the floor, wood in the framework enclosing the hearth, metal in the grate, water in the kettle on the grate, and fire in the hearth itself. Each morning, as a libation is poured over the hearth, the vapors mingle with the smoke and rise to heaven. The interior of the dwelling is synonymous with a microcosm of the universe, held in common with all other yurt dwellers. The model includes the relationship between people and their gods and is confirmed by the existence of an ‘altar’ in the deepest, most sacred space of the yurt (Hanson, 1998).

The organization of the yurt has key elements in common with the Kung encampment. The elaboration of the ‘elementary building’ is based on its sectioning according to the spatial dimensions of front-back, left-right, high-low, center-periphery. But in contrast to the Kung, among the Mongols, every aspect of the position is developed in terms of social difference, within these broad dimensions. Depth from the yurt’s entrance indicates differences in rank for both inhabitants and visitors, culminating in the ‘altar’ at the rear of the yurt, in the deepest space of all. At the same time, differentiated regions within the interior record every possible difference in status among household members and guests, whether by gender, age or degree of wealth. The center marks the focus of the dwelling, the hearth, and the perimeter regulates the disposition of household objects. Yet all this is done without boundaries of any kind (Hanson, 1998).

3.3.2 Pre-urban house as response to culture

Norbert Schoenauer explained pre-urban house as a response to a socio-cultural phenomenon in *'6000 Years of Housing'* in 1981. He mentioned, “The pre-urban indigenous housing is viewed as an architectural response to a set of cultural and physical forces intrinsic to a particular socio-economic and physical environment. Similarities in building form of two widely separated simple societies are often attributed to some common prehistoric heritage, cross-cultural influence or even

chance or coincidence. In most cases, these notions are not based on fact. A more realistic explanation is found in the history of that similar determinative forces cause similarities in building form. This environmental determinism includes not only the forces of physical and human geography but also those determinants that derive from the relationship between man and his culture, the latter is the product of social, economic, religious, political and physical forces. The phenomenon of similarity resulting from environmental determinism is demonstrated most easily by the dwelling forms found in the simplest social organizations, such as those of the African Bushmen and Australian Aboriginals." (Schoenauer, 1981)

Gabriele Schwarz specified Six categories in her '*Allgemeine Siedlungsgeographie* 'that emerges for such a system, each with its distinct social, economic and political structure complemented by its respective settlement pattern and dwelling prototype (Schwarz, 1959).These are:

1. Ephemeral or transient dwelling – the dwelling of the nomadic band- type societies whose existence depends on a simple hunting/ food gathering economy.

2. Episodic or irregular temporary dwellings-The dwellings of nomadic band type societies whose existence depends on either advanced hunting or food gathering practices; the former is a stepping stone to pastoralism and latter to rudimentary agriculture.

3. Periodic or regular temporary dwellings- the dwellings of nomadic tribal societies with a pastoral economy.

4. Seasonal dwellings-the dwellings of tribal societies with a semi-nomadic way of life-based on both pastoral and marginal agricultural pursuits.

5. Semi-permanent dwellings-the dwellings of sedentary folk societies or hoe peasants practicing subsistence agriculture.

6. Permanent dwellings- the dwellings of sedentary agricultural societies that have a political social organization as a nation and a surplus agricultural economy.

(Schwarz, 1959)

Only at the sixth stage of socioeconomic development are the basic prerequisites provided to foster urban settlement. Predictably simple societies are found in the least desirable regions and more complex societies claim the more favorable regions. Ephemeral and episodic dwellings, for example, are indigenous to arid

tropical deserts, humid equatorial jungles or arctic and subarctic barrens. Periodic and seasonal dwellings are predominantly found in arid marginal areas of the subtropical and temperate zones that have adequate water for cultivation.

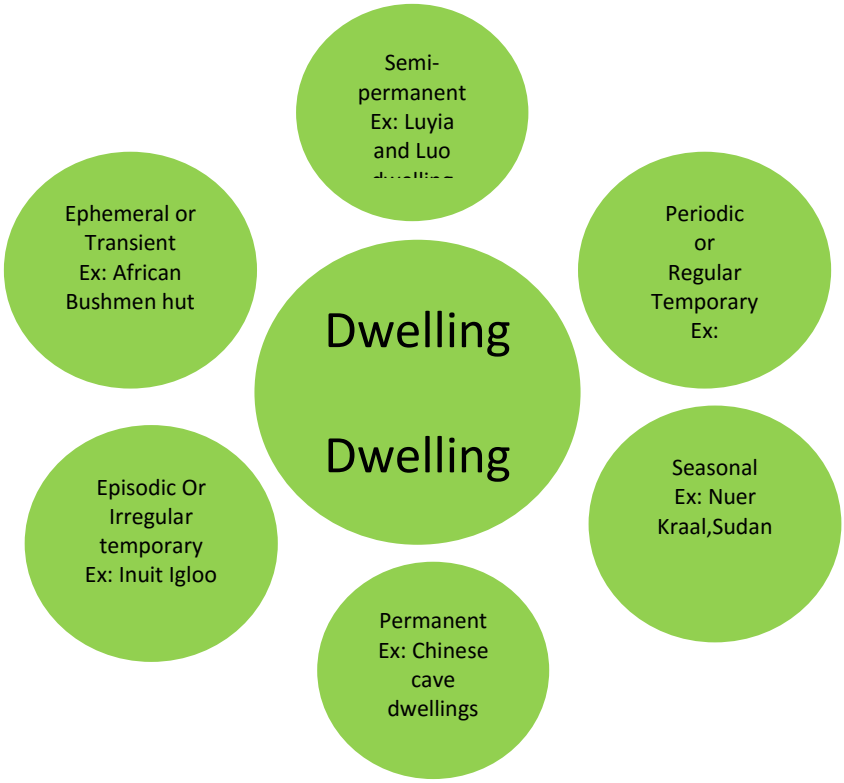


Figure 3.9 Six categories of dwelling (According to Gabriele Schwarz)

3.4 Nomadology

Nomadology is a construction of Deleuze and Guattari's 'counter-philosophy', challenging authenticity and propriety. Deleuze and Guattari are the founders and main proponents of ‘nomad thought’ or ‘Nomadology’ (Deleuze G., 1987). They extensively dwell upon characteristics of nomadic life. Yet it is not their aim to claim that we have become like nomads. Instead, they oppose - in their unfathomable idiom - the ‘nomadic war machine’ to the centralized sedentary state in order to liberate thinking about identity itself. The nomad is invoked to overcome sedentary thinking about subjects and identities as essential and fixed being. Sedentary thinking posits individual subjects who, paradoxically, cannot exist as truly different in itself but only as of the expression of otherness: the state, the territory, universal truth.

Deleuze and Guattari develop a way of thinking about nomadic subjectivity that has

no permanent or rooted essence. This nomadic subject is developed through ongoing becoming along 'Rhizomatic' centrifugal spatial trajectories, as part of temporary "packs". The nomad's relation with technologies is not the traditional subject versus object but composed of man-machine assemblages. Interestingly, this nomad is not the hypermobile person we like to recognize in contemporary road warriors, portable gadget freaks, or global migrants. In fact, Deleuze and Guattari assert that the nomad is not even characterized by movement in the sense of displacement. That would make mobility always relative to sedentary territories, and subjectivity subordinate to fixed and stable identities.

3.4.1 Nomads, Roma or Gypsies and their indigenous ethnic life

It is important to critically consider the problem of defining nomads, who are often considered in a broad sense loosely as 'outsiders' or 'others' – those who are unfamiliar to settled or sedentary peoples. The first meaning given to "nomad" in the Oxford English Dictionary recorded by quotes since 1587 is "a person belonging to a race or tribe which moves from place to place to find pasture; hence, one who lives a roaming or wandering life." However, anthropologists have found it useful to distinguish between the two components — raising livestock on natural pastures and the element of constant mobility — of the term "nomad", referring to raising livestock on natural pastures as pastoralism and the element of constant mobility as "nomadism" (Salzman, 2002).

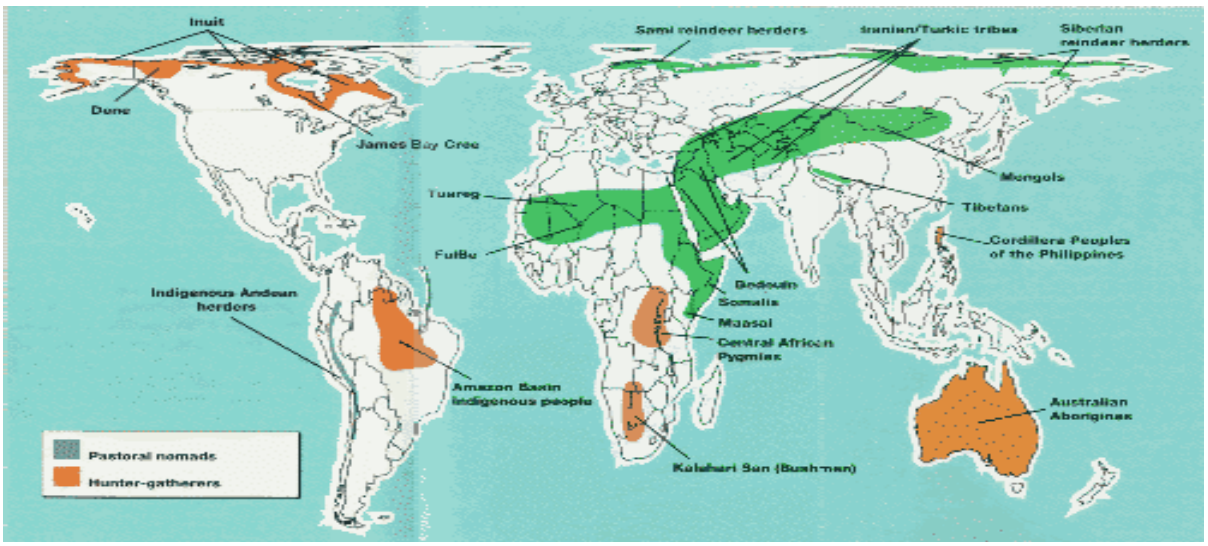


Figure 3.10 Main Nomadic Peoples by Region (Source: Salzman, 2002)

The term nomadic is now a common metaphor for aimless wandering. In fact, the movement of traditionally nomadic peoples is far from haphazard: it is both predetermined and systematic. Most nomads live in marginal areas like deserts, steppes and tundra, where mobility becomes a logical and efficient strategy for harvesting scarce resources spread unevenly across wide territories.

Three main groups of nomads were identified; pastoralists, hunter-gatherers and travelling workers.

1. **Pastoralists**

Some say the word ‘nomad’ is derived from the Greek word for pasture – nomos. Pastoral nomads move with their households in search of pasture for their animals and livestock. There are an estimated 30-40 million of them in different corners of the world. Livestock is central to their livelihood and the basis of their culture. Their movement is seasonal, linked to rainfall and the availability of good forage for their animals. Goat herders in the Peruvian Andes graze their animals on richer grasses at lower altitudes during the wet season, then move to higher altitudes during the dry season (Anon., 1991). Of the 60,000 Sami in Scandinavia, only 6,000 are still nomadic. They may migrate with their reindeer up to 300 kilometers from sheltered forests in the winter to coastal grasslands in the summer (Peter Carmichael, 1991).

2. **Hunter-gatherer**

Populations of hunter-gatherer groups such as Inuit, Kalahari San, Amazonian and Australian indigenous peoples are difficult to quantify, as they are difficult to 'capture' using organs such as Census surveys. Their particular ‘nomadisms’ are characterized performatively by their movement based on hunting or gathering food, rather than racial or biological characteristics.

3. **Travellers, Traders and Craftworkers (Roma or Gypsies)**

The third group, sometimes known generically as travellers, is the Roma, Gypsies or other travelling and seasonal workers, who are neither hunter-gathers nor pastoralists. They are involved in different kinds of works like trading, entertaining or craft working.Roma or Gypsies are supposed to have travelled from North India to Europe about 1000 years ago, elements of these cultures are spread globally today.

The groups of nomads are indicated in the global map of main nomadic peoples. While the first two are identifiable, the Roma or Rom are too widely spread to register as a figure on the mappable zones.

3.4.2 Nomads in Indian sub-continent

In the history of the Indian subcontinent, the nomadic factor is significant. The indigenous pastoralism in India became just an extension of the farming economy and of sedentary society, to such an extent that it even acquired some elements of the caste system. It is true that the collapse of the Harappan civilization is still sometimes attributed to the allegedly nomadic Indo-Aryans. However, this problem remains in the domain of speculation, and in any case, the Indo Aryans could not be pastoral nomads since there was no such thing in the Bronze Age. The ancient nomadic migrations and conquests also did not dramatically change the social, political, and even long-lasting cultural characteristics of Indian civilization, especially if one considers that the Kushanas had ceased to be nomads long before they came to India (Khazanov A.M., 2001).

The spread of Islam and the formation of Indo-Islamic society are considered the main cultural and political factor in medieval India. But it would be amiss to directly connect these changes with the nomadic people. A characteristic feature of medieval Indian development described by Wink (Wink, 1997) was the fusion of the settled society of the agricultural plains with the organizational model of the frontier. High demand for Turks in India was created not by nomadic inflation but by an expansion of the sedentary Islamic society. The Persianized Ghaznavids and some later dynasties, just like their mamluk type elite troops, were of Turkic origin. However, they ceased to be nomads, and states of them were nomadic. Despite the ethnic ancestry of their political and military elites, in medieval India, they were much more Islamic than Turkic, and some institutions of Islamic Middle Eastern society, not nomadic ones, were relocated to the subcontinent through these states. Islam is a mighty social force, but Islamic rule in India mainly affected the political orb without changing such basic institutions of the Indian social order as the caste system. As for the Turks, not unlike the Bedouin during the early Arab conquests, they mainly served as 'fuel for Islam,' and Turkic slave soldiers had much less in common with nomadic pastoralist-warriors. In any case, indigenous nomadic institutions never

took root in India in any distinct and long-lasting way.

“South Asia has the world’s largest nomadic population. Nowhere else is there such a variety of creatures systematically herded … nor is the diversity of peripatetic professions to be matched” (Rao, 2003).Rao and Casimir (2003) write that even though we have come to perceive of the civilized as those who live sedentary, settled lives, the idea of motion, in fact, runs deep in India culture and history: the timeless wheel, the wandering *bhikshus* (monks, mendicants), *jhum* (rotation) cultivation, settlements in steady flux, sages, pilgrims, mobile fairs and *haat* bazaars (travelling, open-air markets), itinerant singers and performers; bards and tellers of myths, all, underpin the idea of movement. (Rao, 2003) We could add South Asian rivers to this list, who are personified goddesses that travel across the parched land giving it life, and the centrality of the *vahan*, the vehicles of gods, in Hindu mythology (Sharma, 2009). Among several early Indian texts such as the *Mahabharata*, the Tamil *Tolkappiyam* — perhaps the oldest extant South Asian literary work (5th-6th century B.C.) — mentions various types of nomads such as peddlers, dancers, itinerant minstrels and dramatists (Berland, 2004).

The element of nomadism in itself does not determine the caste hierarchy in South Asia. The classification of nomads into castes and tribes being a rather random process where at times the same community could be a tribe in one state and classified as a caste in another. Gardner (2003:142) writes that in specific religious contexts, “the hunter-gatherer Paliyans have been accorded a paradoxically high degree of ritual purity by some Hindus, which might have a complex relation to wandering ascetics” (Gardner, 2003). However, this status is not generalized in ways that would elevate their rank in other kinds of encounters with sedentary peoples. The illiterate pastoral Rabaris enjoy a high position in the caste hierarchy, but find themselves disadvantaged in comparison to educated members from otherwise ‘lower’ castes and tribes who have benefited from affirmative action (Dyer, 2006). Unlike most sedentary populations in Pakistan, the notion of *zat/caste* has very little meaning in determining social organization for the Qalandar (Berland, 1982).Berland notes that like other nomads, the Qalandar rely on flexibility in social organization, emphasizing the absence of strong political authority or hereditary office, pliability in-group membership, and individual (and not lineage or group) skills in subsistence activities. Kavoori (1999) observes that it is not always accurate to regard nomadic

‘communities’ as such, since individual members of entire families may stay behind in the camp or village (for several reasons like taking care of the very young, very old and ill, and in many nomadic pastoral communities women, in any case, do not migrate to the highest pastures), while at the same time individuals among so-called sedentary communities may migrate much more frequently and longer in certain years for a variety of economic and ecological reason (Kavoori, 1999). A related concept is that of the *perception* of nomadism itself. Rao and Casimir (2003) discuss that there are communities such as the Gaddis whose mainstay may continue to be nomadic pastoralism but, in their self-perception, they are not nomadic. Even the Mughal imperial capital (comparable to the ‘wandering capitals’ of Ethiopia) could be classified as nomadic owing its frequent movements but is not perceived as such by its inhabitants. On the other hand, the self-image of the Raika of Rajasthan is as much that of ‘wanderers in the wilderness’ as that of ‘hamlet-dwellers’ .Rao and Casimir (2003) thus conclude that the quality, distance and frequency of movement alone do not determine the self-perception or perception by others of any community as nomadic (Rao, 2003).

It must be pointed out that nomads across the world are facing a time of siege today, given the increasing pressure on land and the political economy of globalization. This is aggravated by the fact that perhaps with the possible exception of Mongolia and to an extent Iran (Krätli, 2001), official ‘development’ projects are imposed without a proper assessment of their needs in education, infrastructure and political representation. Conservation programs benefit only the elites who have appropriated resources after the privatization of common lands in India. This was all done in the name of sustainable use of the resource (Gadgil, 1992)

Categorization of nomads in South Asia.

Hunter-gatherers

Khanabadosh/Chaupani/Paliwala (Nomadic Pastoralists)

Semi-settled Pastoralists

Paryatan (Peripatetics)

Mirasi (entertainers, bards, genealogists, singers, dancers, prostitutes impersonators)

Yogi(Jogi), Kanjar (snake-handlers, potion & charm peddlers, terracotta toymakers)

Qalandar (animal trainers, jugglers, acrobats, magicians, impersonators)

Artisans

(Chungar or basket and broom makers, Churigar or bangle and jewellery peddlers, Kowli or tinkers peddlers, Gaduliya Lohar or smiths)

Qafila/Powindah (Caravaneers, Smugglers, Dacoits)

Chuhra/Goghra (Scavengers, Beggars)

Sea Nomads

Chaolay (Sea Nomads)

Semi-settled sea nomads

'Pagan' sea-nomads

Figure 3.11 Categorisation of nomads in South Asia

Note: Communities are mostly endogamous, have their own language/dialect and legal system (Source:revised from Berland, 1982:380).

Yogi

Rabarivas

Banjara

Chaolay (Sea nomads)

Goghra

Figure 3.12 Nomads of Indian sub-continent

Yogi , Rabarivas, Banjara (artisans), Goghra , Chaolay (Source: Internet)

3.4.3 Mobility, a Cultural manifestation

For many nomads in the present climate of change, the aspect of mobility itself is regarded favorably by most nomadic communities, and the time of mobility as a time that denotes adventure, freedom invigoration, and a good source of rejuvenation for the well-being of both individuals and the larger community (Barth, 1956 in Berland 2003:110). Berland writes that: "… the meanings implicit in the sequence of activities related to moving, take on almost ritual significance for the Qalandar by symbolizing the interplay among mobility, freedom, resourcefulness, and honour, that sustains well-being and binds people together. " (Berland, 2003).

The Qalandar often emphasize that if someone gave them land and resources and asked them to settle down in one place, they won't be happy. They compare it to a bird being trapped in a golden cage (Berland, 1982).Thus while some communities may wish to settle down owing to changed circumstances, it does not take away from the sense of vigor and vitality that nomads derive from their way of life, and should not be construed as such.

Even if mobility among nomads may be viewed by governments, developers and the 'mainstream' as a difficult feature of nomadic existence, nomads themselves derive a sense of their traditional values from the movement which gives them self-identification, freedom, well-being, honour and even adventure. Berland (Berland, 2003) writes that among the Qalandar in Pakistan, the loss of mobility is a major source of shame, dishonor, loss of respect and well-being, "and ultimately loss of individual, group, community, and even identity, as a people". He writes that mobility is much more than envisioned... and is in fact "a world view" ... 'I am a *pukiwas*' (nomad), or 'I am a Qalandar' are "necessary and sufficient statements of identity for those who say them — they explain everything among peripatetics". Gooch (2004) writes of similar sentiments emanating from the Van Gujjars (Gooch, 1988). Hence while it is equally true that there are communities who wish to settle down, as Dutt (2004) reports of the Bawarias, she, however, does not inform us of the larger internal semantic ideas related to the movement among the people she reports on.

In the present context nomads such as the Rabaris, however, see their transhumant lifestyle as the cause of their being "left behind". Dyer and Choksi (2006:171) write that it is this mobility rather than the rigidity of government provisions and the nature

of development policies that are viewed by pastoralists, rural communities and educational managers as the reason for Rabaris' 'backwardness' (Dyer, 2006). The Rabaris complain that while they wish to study, there are no provisions for them to do so; and they are ill-fitted to fit onto the system because of its nature and timing. The proposition of mobile learning for the Rabaris was insufficient because the education they sought was not literacy within pastoralism. Their view of pastoralism itself as outmoded made them view the idea of mobile learning itself as retrograde, something that would keep them 'backwards' (Ibid). Since the adaptation of pastoralism along the commercial lines advocated by the government did not make any sense to them, they sought a way forward, out of pastoralism, associating it with formal schooling of children, with its promise of enhanced status and occupational diversity (ibid). Elsewhere, however, Dyer and Choksi (Dyer, 1998) mention that sedentarisation for the Rabaris is indicative of loss of their culture and way of life, splitting up of the community, unemployment and further deprivation. Dyer and Choksi, while insightful on the place and plight of the Rabaris' in the present context, like Dutt, do not inform us of the internal meanings of what mobility actually means to the Rabaris, and it is an area worth exploring in future research.

Physical mobility is also reported as a strategy frequently employed by nomads to get out of conflict situations and undesirable circumstances, especially when facing police brutality or officialdom (Gardner, 2003).Accordingly, both physical and cultural mobility, pliability, flexibility are all hallmarks of nomadic culture and aid their resilience and adaptability in a continuously changing world. Research on nomads should reflect the relationship nomads have with mobility, not least to impress upon states and developers the need for mobility-sensitive mechanisms in health and education; the lack of which, in literature, is said to be the single most important factor why nomads often shun such provisions.

We can assume that the reservoir of knowledge on classification of other communities, and other information held by nomads and *how* it is acquired and transferred to the next generation, as pointed out by Berland, is yet to be adequately documented by researchers and this is an area that could be covered in future research: covering the gap in the existing knowledge about nomads themselves and on the knowledge that nomads hold on other people.

3.4.4 Local knowledge of nomads

Anthropological research has continually shown that economic development comes in many shapes and forms and we cannot generalize about transitions from one type of society into another. Yet modernization strategies rarely pay heed to local knowledge. Local culture is generally ignored by planners or treated as a constraint. From nomads to other indigenous community, all possess some local wisdom and knowledge that can help to research field and policymaking to cope with changing climatic condition and adapt resilience. This is a grave failing, (Pottier, 2003) shows how local knowledge — in this case, aqua-culture among low-income fish-seed traders in Bangladesh — may be harnessed in a way that effectively reduces poverty.

More recent debates on indigenous knowledge have moved from a static idea of indigenous knowledge to one that is dynamic and evolving. For example, both Rural People's Knowledge (RPK) and western agricultural science, as Scoones and Thompson (Pottier, 2003) argued, are general *and* specific, theoretical *and* practical. Both are value-laden, context-specific and influenced by social relations of power. The Bakkarwals are unmatched in their depth of knowledge of Kashmir's terrain, flora and fauna, but they have not been able to accrue full advantage from this. Native Kashmiri shopkeepers receive government contracts to extract medicinal herbs whose price is fixed in advance. They employ Bakkarwals, who are paid in grain while the shopkeepers make a large profit (Sharma, 2009). Berland (1982:4) similarly notes how "impressed" he was to learn that the subjects of his investigation (peripatetic specialists in Pakistan) "were extremely curious and knowledgeable about ... the nature of group differences in behavior," he remarks that their knowledge about other social groups was far superior to the curiosity and information that he observed among sedentary people he previously conducted research with. Their diversity and skillfulness in interpersonal as well as intercultural perception "are basic behavioral skills characteristic of this type of subsistence strategy" (Berland, 1982). Just as perhaps with groups such as hunters and some seafaring peoples must be skilled in identifying and organizing a wide range of perceptual cues, such as the horizon, clouds, winds, stars, sounds, and tracks. A sensitive and supportive attitude is key to gaining the trust of nomads and all development and education

initiatives have to be geared towards such a framework to make any progress.

3.4.5 Resilience practice of Nomads: livelihood resilience

Nomads have a fluid identity allowing them to adapt constantly to changing situations. Their identity is strengthened by the changes they go through. Nomads do not try to dominate their environment. Their strategy is rather one of adaptation. Nomads are not exterior to their environment, they are part of it. There are however situations to which nomads refuse to adapt. Where their identity and freedom are in danger, they are ready to fight. All over the world, societies traditionally dominated by pastoral activities have increasingly become subject to far-reaching transformations and partial disintegration, including the complete or near-total breakup of nomadic systems (Humphrey, 1999).

Daniel J. Miller, a rangeland and livestock specialist has been working on the Tibetan plateau and nomadic tribes of there since 1988.According to Miller, Transformation and adaptation are two resilient strategy that most nomadic tribes follow in changing socio-economic context of livelihood (Miller, 1995). Rangelands of the Tibetan Plateau in Western China encompass about 168 million hectares, 42 percent of China's total rangeland area, and support an estimated two million nomadic pastoralists. As such, the Tibetan nomadic pastoral area, a sub-region of the Tibetan Plateau, is one of the world's largest pastoral areas. Tibetan nomads developed quite sophisticated range-livestock management systems that balanced livestock with the rangeland resources, enabling them to inhabit the rangelands for centuries without destroying their resource base

Mobility was a central characteristic of traditional Tibetan nomadic pastoralism and is still a vital element in production practices for most nomads, although with the escalating settlement of nomads, livestock movement patterns are being curtailed. The pastoral system is designed around the movement of livestock to different pastures at different seasons of the year and the tracking of favorable forage conditions. Nomads rotate between different pastures to utilize growing forage during the summer and to reserve grass growth for fall and early winter grazing in order to prepare animals for the long winters. All nomads have a home base, usually the traditional winter area where most have now built houses and simple sheds for livestock, and make established moves with their livestock from

there to distant pastures throughout the year (Miller, 2000). This mobility to adapt with changing scenario is considered as a resilient livelihood strategy by Miller.

During the second half of the twentieth century, the living space of Tibetans has undergone not just one breakup but several transformations (Miller, 1995) which in part has led to a revival of traditional systems of pastoral activities. Besides the shifting policies in China, many other factors influence the livelihoods of Tibetan nomads. The integration of the pastoral areas into the Chinese market and of the Chinese market into the world market, a growing population in an ecologically difficult environment, and the risks of a transformed society have induced part of Tibetan nomad society to change its scope of economic activities. At the same time, other communities uphold traditional ways of managing their economy. Until now, Tibetan herders adapting to contemporary life have been predominantly perceived as suffering from changes brought about by the Chinese government, while hardly any attention has been given to the changes actively generated by the Tibetan pastoralists themselves.

Contrary to negative stereotypes that Tibetan nomads are unsophisticated, backward, and ignorant, the fact that many, prosperous nomad groups still populate the inhospitable steppes of the Tibetan plateau is evidence of their extensive knowledge about livestock and the rangeland ecosystem. Nomads may be illiterate, but they, nevertheless, possess incredible indigenous knowledge and wisdom. Local climatic patterns and key grazing areas are known, enabling herders to select favorable winter ranges that provide protection from storms and sufficient forage to bring animals through stressful times. Forage plants that have specific nutritive value are known and other plants are recognized for their medicinal properties or as plants to be avoided since they are poisonous. (Miller, 2000)

Climate change is now recognized as a threat to nomadic communities all over the world. It is a global phenomenon, but impacts are local and so do the adaptation capacities, preferences and strategies. The Northeastern states of India are expected to be greatly affected by climate change because of their geo-ecological fragility, strategic location vis-à-vis the Eastern Himalayan landscape and international borders, their trans-boundary river basins and the inherent socio-economic instabilities. More recently, adaptation to climate change and variability has also come to be considered an important response as resilience (Kane, 2000).

Sanjit Maiti and Sujeet Kumar Jha conducted research on transhumance system of livelihood of the Brokpa pastoral nomads inhabiting in the yak tracts of Arunachal Pradesh with special emphasis on climate change adaptation. A representative sample of the 240 Brokpa pastoral nomads from all the yak rearing tracts of Arunachal Pradesh was selected randomly. The Brokpa pastoral nomads mainly depend upon livestock, like yak, yak-cattle hybrid etc, rearing for their livelihood. They perceived that the seasonal cycle has been changed in lower and mid-altitude. They also perceived that the onset of summer is getting started 1-2 months earlier than before and also extended by 2-3 months. Therefore, Brokpa pastoral nomads of Arunachal Pradesh have expanded their migration duration by 2-3 months in searching for a congenial environment for their livestock especially yak and yak-cattle hybrid. They adopted 10 coping mechanisms to cope up with a negative impact of climate change. Among the coping mechanisms, 'duration of migration has expanded by 2-3 months' and 'change in pasture utilization practice was found to be mostly adopted (Sanjit Maiti, 2014).

The Brokpa pastoral nomads adopted several subsidiary income-generating activities like collection of star fruit from the forest, laborer of apple & kiwi orchard and in Border Road Organization. They adapt these subsidiary income-generating activities mainly in the winter season for marinating their livelihoods. Transhumance system of livestock rearing is considered as difficult, tough and devoid of modern amenities. Therefore, the younger generations of yak herdsmen are now not willing to continue with the age-old yak rearing as their profession.

During extreme climatic events like severe draught, pastoralists cope up by engaging in non-pastoral activities and increasing their off-farm income (Gebresenbet F, 2012). Different researchers reported several such activities like charcoal making, collection of wild fruits, engaging in petty business and sale of assets (Orindi VA, 2007).Florian Stammler conducted research on "Reindeer Nomads in the Russian Arctic" to understand the ways of being mobile and mobile technologies practiced among them and outlined some narratives of adaptation and innovation (Stammler, 2013).Ethnographies of material culture have focused on describing tools and technologies used within a certain society that was thought to be essential markers of their livelihood. Among the Yamal-Nenets and other Arctic nomads, such markers are the conical tent (Anderson, 2007),the sledge for moving through the land, and

the male and female clothing that permits surviving in the cold during long migrations. On the other hand, much of the material culture of Nenets nomads today is the result of technological innovations imported from neighbors and then creatively adapted to fit the nomadic lifestyle of the reindeer pastoralists. The import of wheat (bread) and iron into the nomadic culture of West Siberia happened much longer ago than can be remembered today (Gusev, 2010), but talking to elders clarify the influence of more recent innovations, such as the iron stove in the chum, the introduction of black tea as a beverage, rubber boots as footwear, and the replacement of birch bark by canvas as a cover for the summer tent. The position of these innovations in individual lives helps to understand the more general trajectory of narratives of change in society. In a nomadic society, such as that of the Nenets reindeer herders and fishermen, every technology is mobile technology – if it is not, it is either not used or made mobile. Only innovations that can be used in a nomadic lifestyle are adopted (Stammler, 2013).

Human phenotypic adaptations to extreme environments have been the subject of much research (Beall, 2006) in part because locally adapted populations provide an opportunity to study the genetic and physiological consequences of environmental perturbations. For example, research on adaptations in the people of Tibet and other high altitude populations (Beall, 2006) has revealed new insight into the physiology of hypoxia with a broad range of implications in medically relevant fields (Grocott M, 2007) including intensive care treatment (McKenna H, 2016) and tumorigenesis (Rankin, 2008). Another possible system of human adaptation to extreme environments with implications for hypoxia research is that of humans who engage in breath-hold diving. The Bajau people, often referred to as Sea Nomads, have lived an entirely marine-dependent existence, traveling the Southeast Asian season houseboats for over 1,000 years (Sather, 1997) . Their marine hunter-gatherer existence depends notably on the food they collect through free diving. They are renowned for their extraordinary abilities, diving to depths of over 70 m with nothing more than a set of weights and a pair of wooden goggles and spending 60% of their daily working time underwater (Schagatay, 2014). The unique lifestyle of the Bajau relies on a number of cultural traits and technical innovations, but may also be facilitated by physiological adaptations to diving and diving-induced hypoxia (Clifton, 2011). Physiological effects of this response include bradycardia, which lowers

oxygen consumption (Elsner, 1966).

Peripheral vasoconstriction, which selectively redistributes blood flow to the organs most sensitive to hypoxia (Lin, 1983) and contraction of the spleen, which injects a supply of oxygenated red blood cells into the circulatory system (Hurford, 1996). It has therefore been hypothesized that the purpose of this contraction is to provide an oxygen boost, prolonging dive time (Hochachka, 1986). In a study of diving seal species, a positive correlation was observed between maximum dive time and spleen mass (Mottishaw, 1999), suggesting that spleen size could be an important trait affecting diving time. It is entirely unknown whether the Sea Nomads are genetically adapted to their extreme lifestyle. The only trait that has been investigated in populations with a lifestyle dependent on diving is the superior underwater vision of Thai Sea Nomad children (Gisle´n, 2003)

Of all the organs in human body, the spleen is perhaps not the most glamorous. Human can technically live without it, but while they have it, the organ helps support their immune system and recycle red blood cells. Previous work showed that in seals, marine mammals that spend much of their life underwater, spleens are disproportionately large. Study author Melissa Llardo from the Center for Geogenetics at the University of Copenhagen wanted to see if the same characteristic was true for diving humans. During a trip to Thailand, she heard about the sea nomads and was impressed by their legendary abilities. She took samples and collected data on spleen size of Bajau people who dives into sea.

She also took data from a related group of people called Saluan, who live on the Indonesian mainland. Comparing the two samples back in Copenhagen, her team found that the median size of a Bajau person's spleen was 50 percent bigger than the same organ in a Saluan individual (Ilardo, 2018). She discovered the first evidence that people can genetically adapt to deep diving, as shown by the unusually large spleens in indigenous people of Indonesia known as the “Sea Nomads,” according to a new study. The spearfishing Bajau people regularly free-dive to depths of up to 70 meters, with only weights and a wooden mask. They spend up to 60 per cent of their workday diving for fish, spearing octopus and gathering crustaceans - an amount of time rivalled only by sea otters — and can stay underwater up to 13 minutes at a time, said the report in the journal Cell. (Ilardo, 2018)

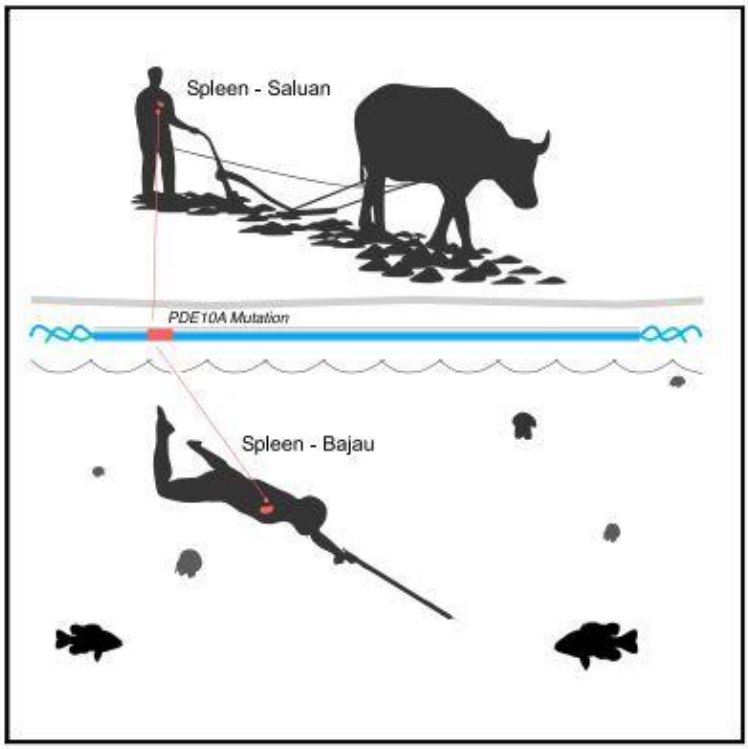


Figure 3. 13 Natural Selection has increased Bajau spleen size, providing an oxygen reservoir for diving (Ilardo, 2018)

Irteja Hasan, Ibrahim Khalil, S. Hossain and Ali Adnan conducted a research on Water nomads (Bede community) to understand their survival strategies in disasters like a Cyclone (Irteja Hasan, 2014).As they mainly resided in the boat and embankment of the river and also waterways is the main communication system therefore they get easily affected by a devastating cyclone. The coastal Bedes' perception, prediction and survival strategies against cyclone were an area of interest in this paper. The aims of the study were to find out the perception and prediction indicators used by the Bede people during cyclones; examine their survival strategies at the face and pace of cyclones; assess the problems they frequently face for being a marginalized group of the society and highlight important findings that can be used by the disaster management programmers/ planners of NGOs and GO line agencies. *Water Gypsy* of Dasshmina Upazilla under the Patuakhali district was selected for intensive in-depth investigation. Besides this selected coastal area was having the experience of cyclones repeatedly for a long time and almost every cyclone that passes Bangladesh damages the selected area.

Among the indigenous marginalized communities of Bangladesh, *Water Gypsy* live in the coastal region with a considerable number and are also dependent on the sea for their living, and this made them more experienced in reading sea behavior before and during cyclones (BK, 2009).

The coastal water gypsy (Bede) people have made use of several powerful practices to lessen the negative impacts of cyclones. Apart from modern cyclone forecasting, Bede people can understand forthcoming danger by looking at natural signs (Gregg, 2006) .Coastal water gypsy of Dashmina, Patuakhali can predict impending cyclones by using age old indigenous knowledge gained from nature and their families through their experiences of frequent cyclones. Such knowledge varies significantly from person to person and to survive from the cyclone, they face some common problem (Ali, 1999).

The research revealed that, generally, the water gypsy of Dashmina have a variety of Indigenous Knowledge, beliefs and practices and they use these for the purpose of surviving cyclone. Those indigenous knowledge and beliefs of water gypsy in Dashmina is proved as an important basis for facing the even greater challenges of natural disasters like cyclone. Those surviving strategies are given in following figure.

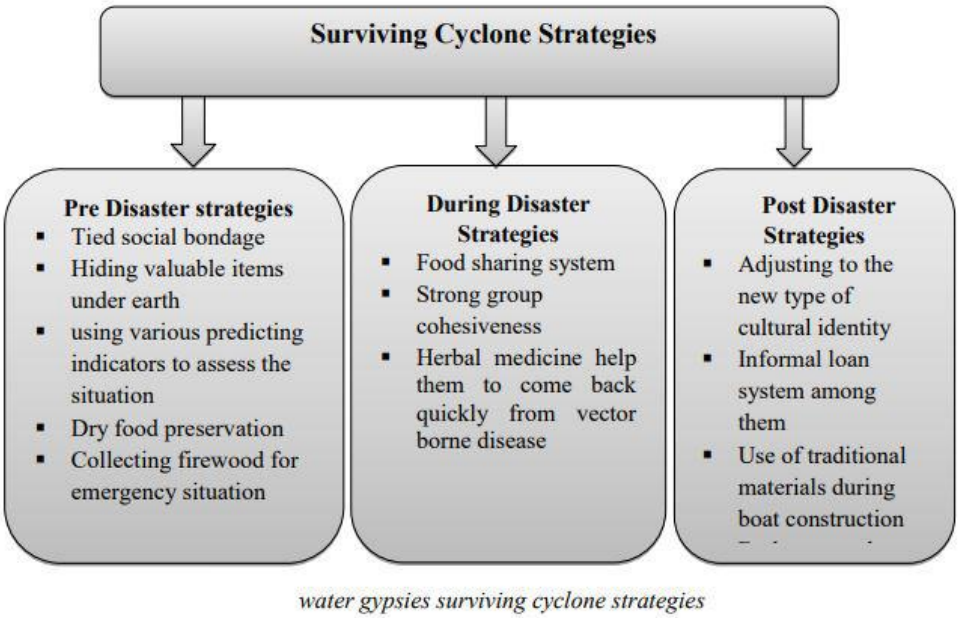


Figure 3. 14 Surviving strategies of Water Nomads of coastal areas, Bangladesh (Irteja Hasan, 2014).

Having close contact with the nature, Bede community of the study area have developed an indigenous perception and prediction strategy for cyclones and, there by possess effective survival strategies. Water gypsy community of the selected study area take all aspects of their communal, racial and conservational environments into account as well as a chain of risk-related dynamics in responding to cyclones. And their perceptions have terrestrial, social, fiscal, traditional and factors such as the extent of the consequences of the hazardous event, the degree of the perceived control over the consequences, the degree of personal exposure and other social costs and benefits. So, for effective disaster management planning and programming input at both local and national level, it is essential to explore the rationale of their actions (Irteja Hasan, 2014).

3.4.6 Ignored in policy

Nomads have been ignored in matters of policy in both colonial and post-colonial South Asia, and legal mechanisms have largely favored settled agriculturalists, urban planning and infrastructural development and forest ecology and preservation. The Criminal Tribes Act and the Habitual Offenders Act demonstrate how policy formulations have dehumanized nomads for generations (Dandekar, 2009.).The policies of the Indian government with regard to wildlife conservation involve a ban on grazing, felling, foraging and hunting, and have led many national parks and forest reserves to expel foragers and pastoralists (Rangarajan, 1996); (Rao, 2002b). The bias is perceptible and Rao notes that forest departments have been forced to adopt this attitude of alienating pastoralists. Gadgil (1998) write that the impact of deforestation on Indian hunter-gatherers is one going from “decline to extinction” (Gadgil, 1992).

This has also had a catastrophic impact on the lives of many peripatetic communities who earned a living by moving from place to place exhibiting animal acrobatics and tricks, like the communities of Saperas or snake-charmers, and Kalandars/Qalandar, who train animals such as sloth bears and monkeys to perform tricks. Berland (2003:106) has called them the “masters of diversity” (Berland, 2003). The International Animal Rescue news bulletin reports that on 18th December 2009, a

coalition of conservation and animal rescue groups made “animal welfare history” by taking the last dancing bears off the streets of India — bringing an end to a centuries-old tradition that inflicted terrible cruelty on endangered sloth bears”. However, there was no mention of the centuries-old cruelty meted out to the Kalandars. Similarly, nomads who depend on making and selling traditional medicines are sometimes harassed by authorities under the Drugs and Magic Act. And, while the Prevention of Atrocities Act applies to SCs (Scheduled Castes) and STs (Scheduled Tribes), the Act does not apply to Denotified Tribes (DNTs). The Rajasthan Forest Act, 1953, prohibits local communities and traditional foragers to hunt most wild species in the state but grants rights to the “Rulers or members of their families” to hunt in specified areas (Rao, 2003). A national park created in Sri Lanka in 1983 expelled the Vedda and reserved hunting there exclusively for tourists (Stegeborn, 1999 in Rao and Casimir, 2003:153). Nomadic and Denotified tribes were grouped with other advanced sections of the society in the Mandal Commission Report (Budhan, 2000). The 1991 amendment to the Indian Wildlife (Protection) Act 1972, banned trapping of all birds except the crow and has further affected a range of foraging and peripatetic communities such as the Baheliya, the Chirimar (literally bird-killers), the Paydami and some among the Pardi (Gadgil, 2008). These communities have long been working within a bird-market right across South Asia, snaring and selling birds to people who keep them in cages as songbirds or let them fly again to gain merit (Ibid). In a recent study the environmental historian Madhav Gadgil (2008) writes: “The enactment of the Wildlife Protection Act of 1972 (paid) no thought also to how the many nomadic communities dependent on hunting, would subsist once these activities were declared illegal. No attempts were made to find for them alternative livelihoods. Instead, the Government machinery turned to extort bribes to permit them to continue their traditional hunting practices. There is no data on the extent of such corruption. As follows, in the present climate of state atrocities on ‘non-assimilating’ ‘traditional’ communities nomadic communities are caught in a vicious cycle: those who remain nomadic are unable to access basic development measures as these are designed for sedentary populations, and nomads who would rather settle down given the often harsh environment of remaining nomadic are seldom able to do so because of a severe lack of legal and development measures catering to their needs. Many such peripatetic peoples are reduced to being beggars today. Often, their past label of criminalization continues to haunt them and nomads are

seldom able to foster relations of mutual goodwill and respect with sedentary communities. Other civil society bodies, NGOs, and the administration take on at best a patronizing attitude when dealing with nomads — treating them as people who need to be 'reformed', or people who are simply a "nuisance" to the public (Dutt, 2004). Indeed, the fear of many nomads, such as the Rabaris, is scarcely misplaced when they feel that sedentarisation may, in fact, lead to loss of culture, identity, splitting up of the community, unemployment and adverse economic conditions (Dyer, 1998) but as significantly, bearing out the conclusion of other scholars, sedentarisation often lowers levels of health and nutrition (Leslie., 1999). The sweeping proposal of the Nomadic Commission to sedentarise all nomadic communities should, therefore, be questioned and re-examined.

3.4.7 Gender based space in Nomadic tents

Privacy of the household members has been often discussed as a basic ingredient of domestic space emphasized by segregation of private and public spaces in a house. In the socio-cultural context of Bangladesh, privacy is an important factor and is attained with the separation of male and female zone. (Imamuddin, 1982)

Privacy of household members was preserved in the introvert courtyard type house forms with the separation of male female zone, placing the male zones near the entrance and female zones at the deepest part. The court acts as the most integrating space that is also the most visually integrated. It has a higher visual control over the adjacent spaces that are used mostly by the women. (Gomes, 2014).

Nomadic Tents are illustrated as examples of ephemeral, mobile and collaborative architecture. The way they are diagrammed by anthropologists and experts outside architectural theory such as Torvald Faegre offer something to the study of nomadic architecture (Faegre, 1979). The plan is understood in a new way as a kind of privileged view which equally can be understood as a kind of critical system of living. The elements of the architecture all share these qualities of impermanence.

The diagram of the Bedouin tent above is essentially a 'lay-out', more like a furniture layout, than an architectural 'plan' *per se*. A diagram depicts a provisional strategy for living, rather than a definitive prescription suggested by a plan. The omniscient or privileged view of the tent plan, more so than in a hut, is completely unlike the actual experience of the tent spaces and the critical separation of the interior of the

dwelling. The diagram suggests a detached strategy, while the plan allows the critical division of visual contact between male and female by the Qata – the dividing curtain – to be violated. There is an ambiguity here; where does the 'architecture' begin and end? It seems that the loom, bedding and hearth must all be considered strategically and diagrammatically as part of the architecture. The Qata, for example, is not structural in the load- bearing sense, yet is clearly a critical element of socially structuring the architecture of dwelling – visually separating the occupants by gender (Cowan, 2002).

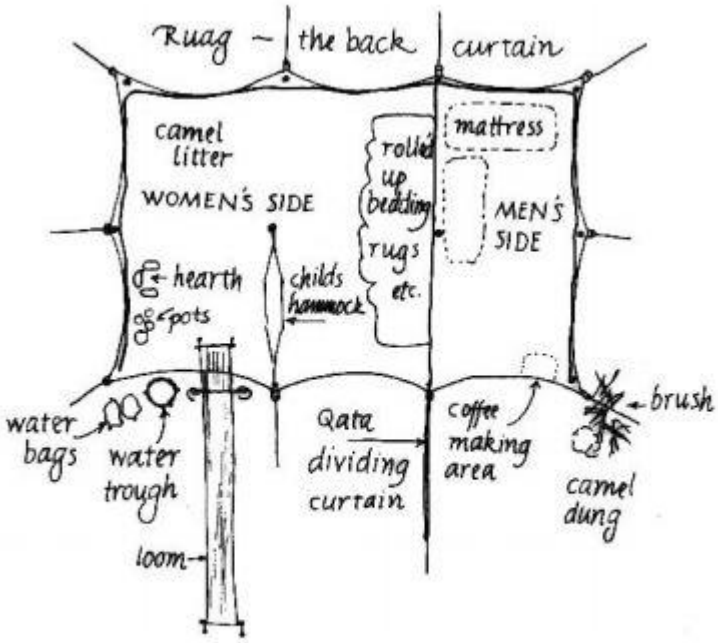


Figure 3.15 Plan (layout) of a Bedouin tent (Source: Cowan, 2002)

Drawings of the interior layouts of Black tent types in the literature show the placement of many important household implements associated with (house)work, cooking and eating, and sleeping, indicating the gender allocation of the most essential daily activities and rituals. Primary activities would be weaving, preparing food and coffee, eating and sleeping on bedding which has been stowed during the day. The men folk, who are generally afforded less privacy than the others, mainly direct and organize, especially while travelling, while women do the majority of physical work associated with maintaining the camp. Some of the women's work would consist of making tent fabric, of pitching tents and arranging the interiors, of

cooking, of minding the infants and presumably other family including husbands. As in most of the tent plan layouts, those of typical Bedouin tents show clearly the gender-based separation of inhabitants: men, women and children. The women's quarters (called “Mu'harram" locally) are much larger and separated from the men’s quarters (called "Raba'a") by the internal screen wall the “*Qata*”. The women’s domain is forbidden territory to all others, while the women may watch the men through a small viewing hole in the Qata (Cowan, 2002).

3.5 Water nomads (Bede community) of Bangladesh

The Bede is a nomadic community. They are regarded as “Water Gypsy” or “River Gypsy” or “Nomadic People”. Dalton in his brief report mentions *Bede* as a gipsy-like tribe. (Dalton, 1978).Anthropologist H.K.S. Arefeen mentioned *“Bede”* as a marginalized Muslim community in Bangladesh perspective. (Arefeen, 1992).Wise calls the *Bedes* “bands of vagrants, who correspond to the Gypsies of Europe”. (Wise, 1883).Though Banglapedia mentioned them as descendants of `Montong’ tribe of Myanmar. Nomadic Bede community has a different culture than the other ethnic groups in Bangladesh. So the cultural diversity is the prime constituent of the nomadic Bedes’ identity in Bangladesh. The diversity of cultural realities of the nomadic Bedes was never taken into consideration in development strategies in Bangladesh though UNESCO Declaration on Cultural Diversity proclaims that “Cultural diversity is one of the driving forces of development”. Bedes are around 500,000 in Bangladesh. More than 95% of Bedes are still illiterate. About 98 % of Bedes live below the poverty line. Only 2 % of Bede children got the opportunity to be immunized against vaccine-preventable deadly diseases. More than 90 % of Bedes still could not enlist themselves in the voter list since they are nomad and they don’t have any house on the land.

3.5.1 History of Water nomads

Bede a community belonging mainly to the ethnic Mong-tong (Mangta) of Arakan, who in 1638, accompanied the fugitive king of Arakan, Ballal Raja, and later settled in Bikrampur area near Dhaka. Many of them were converted to Islam over time. Later, the Bedes spread out to remote areas of Bengal and Assam. The Mangta people were popularly called Bede after the Bangla word “Baidda” meaning village

doctor. Bedes themselves argue that the term "*Bede"* has similarity with the Arabic word "Bedouin" and they claim that they have come from Arab. They think that they were a group of "Beduine" in the time of prophet Muhammad. During that time that group of "Bedouin" accepted "Islam" as their religion by Prophet Mohammad.Like most of the nomads, Bede(The Water Nomads) community, travel in groups and never staying one place for more than a couple of months. The majority of the Bedes live on snake related trading, such as snake charming, snake catching, snake selling, etc. They also sell lucky heathers and herbal medicines, which they claim have magical properties. *Bede*s' other occupations are in the entertainment services (e.g. monkey shows, magic shows) and petty trading.

3.5.2 Locations of Yearly Gathering (Chourashi) of Bede community in Bangladesh

Though Gypsy Bedes travel for 10 months of a year for their livelihood they have a place to meet with all of their community people once a year. All the members come to this fixed place especially before Eid ul Azha (Qurabnir Eid) for yearly gathering by the order of Sardar (Headman). In that area some of the community people have land but the rest of the people don't have land of their own. They live in another's

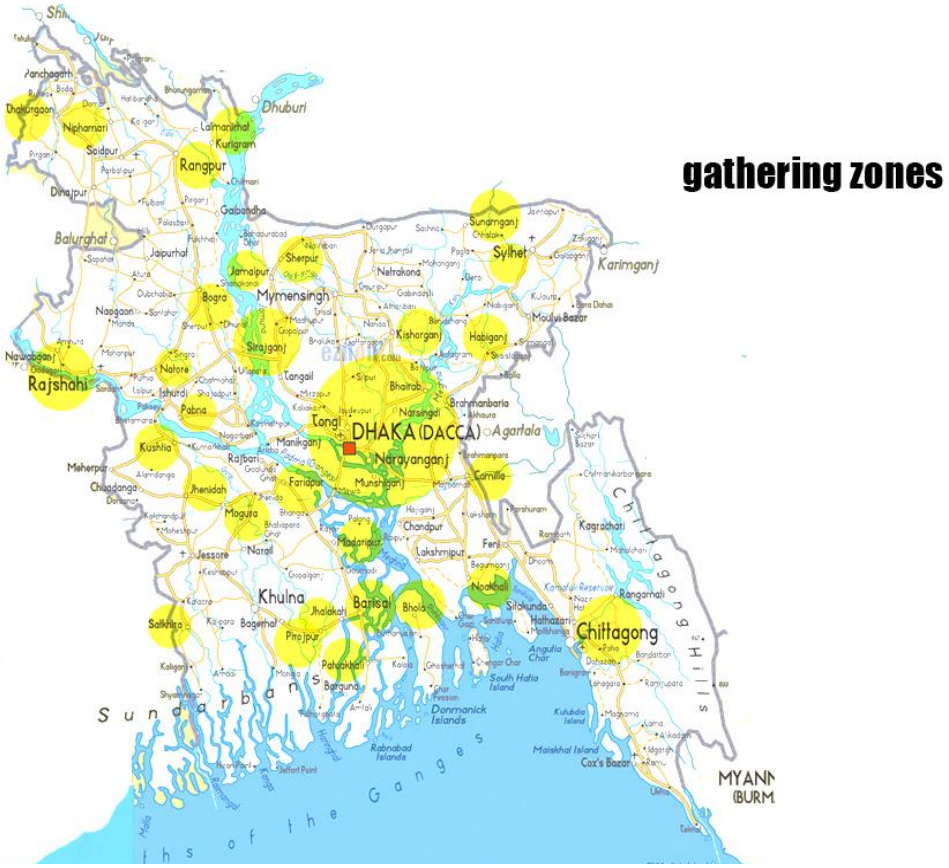


Figure 3.16 Geographic locations of Water Nomads in Bangladesh (Maksud, 2002)

house or fixing tents in the courtyard or open spaces or on the boats of the nearby river and canal of that area. Many of the spots were visited by the development workers of Grambangla Unnayan Committee and the names of the other spots were collected from Gypsies through lis6tening. Gambangla Unnayan Committee has identified 75 where Gypsy Bedes come for yearly gathering. It is estimated that 5,000 Gypsy groups roam around Bangladesh for 10 months but all these Gypsies gather in 75 prominent spots. (Maksud, 2002)

3.5.3 Types of Clans and Hereditary Occupations of Bedes

There are several types of sub-classes of nomadic *Bede* community in Bangladesh. Different writers wrote about a different number of their clans.And some other identified these clans as types of Bede or Mangta community. Outsiders or sedentary people call them Bede but they call them Mangta. And they resides in different portions of Bangladesh. However, to have a general understanding about Bede clans and their hereditary occupations a brief description is given below on 9 major clans of Bedes e.g. 1) *Mal Bede, 2) Sapuria,* 3) *Shandar*, 4) Toula or *Bandarwala,* 5) *Bazi-gar*, 6) Mirsikari, 7) Boiral, 8) *Kurindar and* 9) Gain.

Mal:

This group of Bedes earn though selling healing services using Singa (a horn made an instrument to suck out so-called poisonous blood from a body part where some feel pain). They also cure a toothache by bringing out tooth worm using cotton and magic. In addition, this group also sells Kabiraji medicine. Most of the male persons of this group earn through “Jhai Tana” i.e. rescuing lost ornament from pond or water using some instruments.

Sapuria:

This group catch snakes and earn as a snake charmer. Snake catchers are often hired for catching venomous snakes where people see that snake in their locality and as a phobia of snake, their day to day activities are getting hampered due to fear of snake bite.

Bazigar:

Bazigars work as magician, spellbinder or magic healer. Most of the magic of the bazigars are shown with the techniques of hands.

Sandar

Sandars are good divers and pearl collectors, small traders, and some of them are live on fishing. Most of them are petty traders. They sell bangle, tape for fastening girls hair, utensils, cosmetic items. A good number of this community repair key and lock and sell the same items. A major part of these groups collect oysters from the river, canals and wetlands and search pearls.

Toula :

Toula or Bandarwala group usually earn their livelihood by showing games with monkeys. They arrange a monkey show in the hat-bazaar and in the community. This group of Bedes purchase monkeys from the hill areas and train those monkeys on different issues of acting e.g. how police torture a prisoner, how a bridegroom goes to his father-in-law's house, how Moushumi (a renowned actress) smiles, how Honumans crossed the sea to reach in Lanka etc.

Mirsikari:

This group of Bedes provide traditional healing services. In addition, this group of Bedes cheat the greedy people. Some people of this group convince their clients to make their money and gold manifold through their magic power. As a result, their clients bring to that Bede all their money or gold with the hope to get five or ten times money or gold. Eventually that Bede flees in the midnight with that money and gold. This group also gives different types of traditional healing services to drive out the possessed evil spirits or to prevent the evil spirits.

Boiral:

This community is known as Boiral or Manta. This is a fishing community in the southern region of Bangladesh. Though this group likes to introduce themselves as "Manta", but the local people name them as Boiral. The Bengali people call them "Boiral" because they see this group as a Boiral, a person who engages himself or herself in fishing all day.

Kurinder

This group of Bedes pick up valuable goods from well or ponds those have been lost in the water. They have their traditional instruments to search the lost ornaments. This group usually claim one-fourth of the total value of the recovered ornaments.

Gaain:

The females of this group sell betel leaves. This group is mostly found in Comilla district. Males of this group work as a Boirals (fishing people).

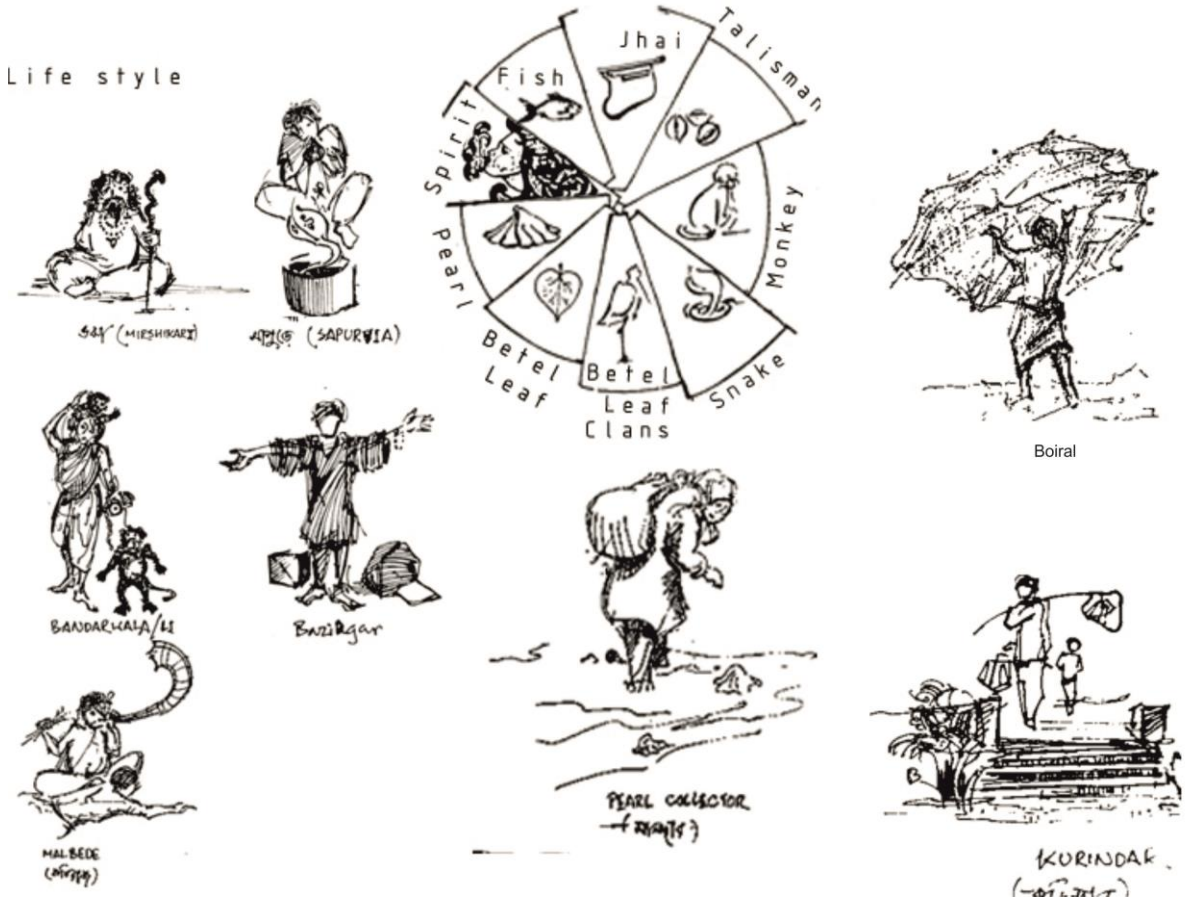


Figure 3.17 Hereditary occupations/Livelihood of Water Nomads

Currently, Bedes are earning through snake charming, snake catching, snake trading, petty trading of trinkets, bangles, toys and cosmetics; hunting of birds, catching of fish, searching of lost ornaments in ponds and rivers, selling of herbal and kabiraji medicine, traditional healing services, magic show, monkey show. Almost all these occupations are a traditional mode of earnings.

Snake charming is a traditional entertainment service which is strongly associated

with the culture of both the Bedes and Bengalis. In the Hat-bazaars snake charmers usually arrange snake charming to entertain the people and thereafter ask for money for his/her services. In the rural areas, Bede men and women arrange snake charming and village people pay in cash or in-kind (paddy, rice etc.) for their entertainment services. Similarly, Bedes who live on monkey show and magic show arrange these shows in the courtyards of the villages. Villagers enjoy those snake charming, monkey show or magic and pay the Bedes in cash or in kind. Bedes also arrange snake charming, arrange monkey, a magic show in the Hat day (weekly bazaar) or in the bazaar. (Maksud, 2006) Nowadays some Bedenis are found to carry snakes in wooden boxes in the Dhaka city. They drag out snakes from their boxes and hang those snakes in front of the pedestrian so that the pedestrians get afraid and subscribe to some money. Sometimes pedestrians unwillingly give money to those Bedes because until they give money the Bedenis obstruct their way. These Bedes have to do it currently but formerly community people loved to pay money the Bedenis after enjoying the snake charming.

A K M Maksud mentioned in his report, Bedes do not want to share their knowledge of their hereditary occupations. They consider many issues of their hereditary occupations as secret skills. Bedes think that they may get into trouble if outsiders know their business secrets. To drag out insect from a painful tooth, to drag out poisonous blood from the body with Singa and to give talisman for infertility are the examples of their business secrets. They think that if outsiders like Bengalis get acquainted with their business secrets and if it gets published in the print or electronic media then people will know the secrets and then some non-Bede people will also start earning using their skills. In such circumstances, Bedes will lose their service market and livelihood. So their community will fell into great trouble for their livelihoods. (Maksud, 2006)

According to Maksud, Bedes or water nomads have diversified livelihood patterns based on the rural economy. They have some skills which are related to traditional healing services, entertainment services e.g. snake charming, magic show, monkey show, petty trading, but their traditional profession are now losing their market demand. (Maksud, 2006)

Some existing livelihood patterns of water nomads are selling talisman (Baro Chander Tabij),Najar Mala, Kori Mala,rubbing ointment (Batani), Shibphal, betel leaf,

Snake Charming, Monkey Show, Magic Show, curing pain of rheumatism using Singa ,trading of bangle, trinkets, toys, recovering lost ornaments from pond and canal etc.

Bede community have some skills that are rare in other ethnic groups or sedentary community. The Appropriate skills they possess are as follows:

_Bede women have very high-level interpersonal communication skills

_Bede women can motivate people in a very skilful way

_Bede women have a very good skill in marketing products and services

_Bedes usually travel almost all parts of the country, therefore they have a very good geographic and market information

Due to the spread of science-technology and better communication, the demand for their traditional professional services is gradually losing demand and this thing eroding their livelihood security. So livelihood security is a current threat for this community. Because with the increasing rate of education and access to media people are getting more scientific-minded and seeking modern medical services for health avoiding traditional health services like *Bedes'* health services, *kobiraji* treatment or spiritual healing services.

3.5.4 Socio-Cultural context of water Nomads

The Bede community has strong socio-cultural issues that need to be studied to understand their nomadic life. Bede community face strong social exclusion that forces them to stay away from sedentary peasant community. The root of this social exclusion is poverty, and the deprivation that impoverishment causes. Often this causes conflict and fight between nomads and sedentary community. They used to maintain distance from the sedentary community as they consider them outsider and threat to their territory. Most of the time Bede community settle in a remote area so that they can maintain a secured distance from mainland people and operate their business from there. The Bede community is severely deprived of all types of basic necessities of life e.g. food, shelter, medical care, education etc. Therefore, they are subject to severe racial discrimination and poverty. They face economic insecurity and lack of opportunities which constitute inequalities and poor social life. Survey findings show that 69 % of the *Bedes* never went to a school and more than 95 % of

them cannot read or write (Maksud, 2002).Among females almost 100 % are illiterate (Maksud, 2004). The national literacy, as claimed by the government, is around 65 though the UN Agencies say the rate as 39. A large majority of the children (95%) can not attend schools because they stay all the months of a year with their parent outside the home, and travel from one place to another. *Bede* people usually stay few days in one spot. During this time, they stay in their boat or tent. So *Bedes* have to be excluded from the government's intervention to ensure universal education for all the children. Since Bedes are nomadic so no existing intervention of government and NGO could address the special needs of education of this nomadic group. Because of the early marriage of both boys and girls, they fail to think of getting an education and have to start earning at an earlier stage of their life. The early marriage eventually entails early childbearing and this makes the Bede children lose the opportunity to get education forever as most of them become parents at the age of 14-17. Bedes children who roam around the county with their parents on boat fail to avail the opportunity of getting vaccinated and health services. A very few of the Bede use contraceptive method and as a result, their household size is around 7.5. Excessive childbearing imposes serious health effects on Bede women. Almost all (99.3%) respondents were unable to tell the names of all the six deadly childhood diseases. A large majority (around 80 per cent) of the respondents could not tell the correct age for marriage and childbearing. It was found that a large majority of the respondents (76.8%) could not tell any name of a Sexually Transmitted Disease (STDs). A very few of the Bedes (9%) have heard of the name of AIDS and only 5 per cent of them could tell about the causes and preventive measure of AIDS (Maksud, 2002)

One remarkable problem in Bede community is water and sanitation. Those who live on a boat have to defecate and urinate in the river water. At the same time, they have to bathe and wash utensils in the same river water. When Bedes travel from place to places they have to search sources of safe drinking water i.e. tube well. The owners of the tube wells sometimes do not allow the *Bede* women to fetch drinking water from their wells. In such a situation they either have to fetch water from other sources of safe drinking water if available within reachable distance or have to drink unsafe water from the river or canal. (Maksud, 2006)

Being the inhabitants of Bangladesh, *Bedes* are deprived of service coverage of all

the government administration and social service departments. According to the findings of the study, no government department has a plan to reach this socially excluded group. Most people of Bangladesh nowadays accept that the political authorities are accountable to the citizens through periodic democratic elections.

The total amount of *khas* land and *khas* water bodies in Bangladesh is nearly 3.3 million acres. But 88.5 % of the agricultural *khas* lands are illegally occupied by the rich and powerful people in Bangladesh (Barkat, 2001).For *Bede* community, no incidence was found where a nomadic *Bede* was allocated *khas* land for rehabilitation except one exception at Louhajang. It should be mentioned here that the government and NGOs have different housing programs for the poor, but this community never got privileges from this type of schemes. They reported that to get *Khas* land and housing material political patronization was needed but they were always neglected by the politicians e.g. Parliament Member or Union Parishad Chairman and Members.

Most Bedes have a little tradition with democratic processes. According to most of the Bedes, a *Sardar* is nominated for his life, and his function is hereditary, while a few respondents told that a *Sardar* is selected on the basis of a collective discussion among community elders and young people through a democratic process. As we said above, women do not take part in this selection. *Bedes* hardly ever go to the Union Parisad, the police or the court for settling their problems or conflicts. They reported that the *Sardar* along with the elders of the community settled their disputes and punished the criminal among their community. The informal judicial system is very strong among the *Bede* community. Sometimes the *Sardar* invite all the male persons from each of the boats to discuss the dispute and settle the problem. Most of the Bedes reported that members of the *Bede* community usually do not commit the crime, and if someone commits a crime, he has to pay fines.

Empirical evidences on women's income generation across developing countries, despite their invisibility in the national accounts, defy the myth that portrays women as domestic worker. (Ghafur, 2001)

A K M Maksud found that, unlike sedentary domestic women, Bede women are not bound to domestic chores. They are traditionally business entrepreneurs (Maksud, 2006) . Women are engaged in their traditional profession e.g. healing services using Singa or herbal medicine, spiritual healing, selling of talisman, selling of trinkets,

snake charming etc. They travel in a group and go to “Gawal” -a business trip in a group to villages. Bede women usually walk around 10 miles a day for their professional earning. Most of them go out early in the morning with a cane or bamboo made basket (Saji) on their head containing Bangle, Mala (necklace), “Phita” (coloured tape to bind hair), snake, singa or talisman and come back at dusk.Traditional occupations of Bedes are laborious and hazardous for themselves and for their children. Almost all the Bede women have to carry their youngest child with them when they travel in the villages for earning. In addition, for earring through their traditional profession, they have to walk in the villages 10-15 kilometres a day. Bengalis and they themselves consider that their healing services are based on cheating and fake assurance i.e. they do not have respect for this profession. So, they don’t want to involve themselves with their traditional profession any more (Maksud, 2006). Bengali women usually receive treatment from the Bede women for a toothache (43%), waist pain, ankle pain, other body-ache (37%), infertility (21%), effects of evil eyes, possession by evil spirits etc. The Bede women provide these services in exchange for cash or kind, such as rice, paddy, a sari, blouse, chicken, hen, coconut, goat or even a golden ornament. It has been reported by the Bedes that they have to tell lies for their business. Majority of the Bede service providers believes that their healing services are beneficial to the service recipients but a few of them think that they have to deceive Bengali community people i.e. the client of their business. Women work harder and longer than the men of this community. Although the *Bede* women earn for their families, they are also the victim of a male-dominated society. In decision making their role is negligible. Women e.g. don’t take part in selecting the leader *(Sardar)* of the community. In a *Bede* community, no women inherit paternal property. No marriage is registered with a government-approved marriage registrar. Marriage and divorce are decided upon by the Sardar. This tradition can cause major violence against women. *Bede* women work hard for earning, maintaining family, cooking and rearing children. The males are less responsible for their families. They usually and traditionally do nothing. *Bede* women bear a double burden i.e. income-earning work and unpaid caring work in the home. (Maksud, 2006)

3.5.5 Identity and Stigma

In a group discussion conducted by A K M Maksud,community members of Bede community acknowledged that identity as Bede always carries stigma and discrimination for them so they preferred not to be identified as Bede in the society. (Maksud, 2006) It has become evident from the findings that Bedes are gradually losing their identity and interest to continue their hereditary living. A major portion of the Bede community (38.5%) informed that the Bengali people misbehave with the Bede people when they meet them for business purpose. The mentioned reasons for such misbehavior or hatred had to do with being Bede, i.e. a different type of community with low prestige and social value and with the lack of social support from the community where they temporarily stay. It is obvious that the Bengali community considers Bedes as a culturally polluting agent in their society and a lower caste-like the Hindu caste system (Maksud, 2006).That's why many Bede families are now camouflaged in mainstream sedentary community and they allow marriage with mainstream sedentary community which was rare once. Many community members now get involved in local Politics to get benefit from Government.









Figure 3.18 Water Nomads (Bede Community) of Bangladesh

Photo: Md.Nazmul Hoque Nayeem, Mahmud Rahman, A K M Maksud

3.5.6 The changing context of water nomads: Diminishing Market Demand

The Bedes are facing crisis to live on their traditional livelihoods. To cope with the crises associated with their traditional professions Bedes now are naturally trying to diversify their livelihood. (Maksud, 2006) Even without any development intervention, Bedes are diversifying their livelihoods which indicates a strong adaptation, therefore, livelihood resilience. Bedes do not have any quota in jobs and enrollment in government educational institutions like ethnic minorities e.g. Chakma, Santal etc. From different ministries and special affairs division of Prime Minister different development projects are being implemented for the ethnic and religious minorities of Bangladesh but not a single development project was implemented for this socially excluded and stigmatized Bede community. Though everybody acknowledges the cultural diversity of the Bedes and its associated special identity but absence of official recognition unable them to establish their special needs for education and health and deprives them of establishing their rights as a citizen. Every year a large number of Bedes migrate seasonally to India for earning their livelihood without any passport. (Maksud, 2006)Because of their lack of knowledge of citizenship and risks of illegal border crossing Bedes fall into risks and become victims of violence frequently. Bedes often get jeopardized during the rough weather and climatic situations. Due to storm and heavy rain and wind, their boats sometimes get drowned in the river. Since they live on small and unsafe boats so they are at risk of drowning of their children into the water and it's a common phenomenon in this society. In the famines, they don't get any relief materials orfood from the Government and other relief agencies because they are nomadic or gipsy people. Since most of the time of the year they used to travel around the country with their spouse and children sometimes the extortionists and hijackers take away their money and marketable goods. A large number of Bedes of Bangladesh live on Khas land that is on the bank of the river so this community becomes badly affected by flood and river erosion. Vulnerability to flood, shortage of food during the flood, chances of snake bite by wild venomous snakes, loss of shelter are the common vulnerability issues in this

community.

In this changing context, Bede people are changing their hereditary nomadic mobile culture and are trying to settle down in land which is against their livelihood and social practice. Many are now travel in small groups and without their family. They have some gathering spots and they leave their families there. Some of them settle in a spot for 10 or 12 years even which lands are vacant. They prefer lands which is Government property or they pay the landlord of that land. Some Bede villages or “Gucchogram” has been established in different locations like Louhojong, Savar etc where they live permanently. The next generation of Bede community is in livelihood threat and they try to hide their nomadic identity as they face discrimination in that identity. As a result, more and more members are leaving their hereditary business and getting involved in sedentary professions like driving, garments industry etc. Some are seen begging in big cities claiming that they are transgender as people give more alms to transgender than Bede community. As they have started hiding their original identity, soon they will be extinct from the scenario and we will lose one of our cultural ethnic heritage.

3.6 Conclusion

Social, economic and cultural realities have a major influence on the capability to cope and have varying effects on individuals and communities as well as their build form. The more resilient the community, the less the risk and impact of displacement experienced. Over centuries, Indigenous ethnic peoples have sought through native vernacular techniques and other means to retain traditional characters, including traditional practices, languages, and identities. There is a clear relationship between social and ecological resilience, particularly for social groups that are reliant on ecological and environmental resources for their livelihoods. Social resilience concerns social groups and their abilities to endure, absorb, cope with and adjust to environmental and so-cial hazards of different kinds. Social Resilience increases the capacity to cope with stress and is hence an antonym for social vulnerability. The direct dependence of communities on ecosystems is an influence on their social resilience and ability to cope with shocks, vulnerability, hazards, etc. Resilience, therefore, depends on the diversity of the ecosystem as well as a social structure that governs the living pattern of the community. It was interesting to analyze how

people are managing transformations and which creative and adaptive solutions help or support them cope with changes in social as well as natural degradation and threats.

The study shows, the architectural form of primitive huts and nomadic tents have their social origin. Pre-urban houses were seen as a response to the socio-cultural phenomenon.

The Study of different nomadic tribes reveals that they live in marginal areas where mobility becomes a logical and efficient strategy for harvesting scarce resources. Nomadic pastoralist, hunter-gatherer, and traveling workers of south Asia, as well as other parts of the world, share some common traits and practices that enable them to cope with vulnerability and becomes resilient. And that is their mobility and temporary settlement practice. This practice enables them to deal with natural and other social hazards better than any sedentary community. The gap in this research field deprived us of obtaining local knowledge and wisdom practiced by nomadic tribes. As nomads do not try to dominate the environment and their strategy is rather an adaptation –they have a wide variety of resilient skills to be recorded.

Understanding the resilience of livelihood systems of the nomadic poor through research and enhancing them through transformational action must now be seen as a normative priority. There is no specific research on socio-cultural resilience and it's impact on the vernacular dwelling making of water nomads in Bangladesh. Vernacular dwelling or house form is not simply the outcome of physical forces or any single causal factor, but consequence of a whole range of socio-cultural factors seen in their broadest terms. And in the context of water nomads of Bangladesh, the social factors shaping the spatial organization and physical form of their dwelling need to be studied along with their resilient features. This section tries to find out the research gap in the field that deals with socio-cultural issues and resilience guiding the organization of space as well as the use of technology in vernacular architecture.

4. Case Studies

4.1 Introduction

4.1. A) On water

4.1.1 Tenants profile

4.1.2 Livelihood

4.1.3 Settlement pattern

4.1.4 Space and activity

4.2. B) On land

4.2.1 Tenants profile

4.2.2 Livelihood

4.2.3 Settlement profile

4.2.4 Space and activity

4.1 Introduction

This part of the study accommodates the settlement, individual units, spaces, domain as well as materials and construction techniques of studied twenty-eight (28) dwellings from 2 distinct settlements to relate the samples with the research question:

How does the vernacular architecture practice of water nomads stimulate resilience indifferent adverse situations through adaptation and collaboration in Bangladesh?

There are different types of the settlement of water nomads in different regions of Bangladesh. Some live on the water, some on land. In this research, 2 types of settlement were selected as sample around Dhaka.

A) On the water at Gazipur

B) On land.at Keranigonj

Both case studies are studied thoroughly to understand the settlement profile, individual units, space use, domain, material use and construction techniques. Though the nomadic Bede community used to lead a mobile life and travelled in a group with their fleet, they are now being static on land. The community members of these two settlements are still mobile to some extent. But within 3-5 years they will be also static and settled somewhere on land.

As the settlements are located near the capital of Bangladesh, they have certain features that can be diagnosed as an impact of rapid urbanization. The inspection was carried out to analyze the vernacular practice of this nomadic tribe in terms of lifestyle, space use, material and technology influencing resilience. They are changing rapidly along with the city. More and more families are choosing static life to secure their future. The nomads living in remote areas of Bangladesh may have different living condition and settlement profile than this.

4.2. A) On water

Site: Gazipur

A group of water nomads reside on boats at Torag river in Pubail, Gazipur. They belong to Sandar clan and still maintain a mobile life on the water. They stay temporarily on water and still depends on natural resources. They live on boats and their activities are outdoor-oriented. They eat and sleep on boats and their children play in the water. Both male and female members work outdoor for livelihood. Female members sell cosmetics and jewelry items and male members either repair locks or sell cosmetics. In day time most of them go for a business trip and their children stay on or around the boat.

Figure 4.1 Location of Case A – Settlement on water

4.2.1 Settlement pattern

Human Settlement means a cluster of dwellings of any type or size where human beings live. For this purpose, people may erect houses and other structures and command some area or territory as their economic support-base. Thus, the process

of settlement inherently involves grouping of people and apportioning of territory as their resource base. The settlement of this case study is located at Pubail, Gazipur- around 3-4 kilo from Tongi station road. This nomadic group used to stay at a location for 2-3 months in past. But recently their period of staying at this site increased by 7-8years. During this time they run their business around the site. Mostly they cover the areas that are in walking distance. Their fleet consists of 35-40 boats on the water and 4-5 huts on land. In this fleet, there are 27 boats that are used as dwelling units and the rest of them are used as transport for a small trip for business or fishing. The boats are anchored in the Torag river near Tongi-Ghorashal highway.

4.2.2 Settlement size

The settlement consists of 35-40 boats and most of the boats are used as a dwelling unit. The total area covered by this settlement is almost 2800 sqm which includes their boats, some huts on land, adjacent land as well as a water body. Each family own a boat that is used as a dwelling unit and each family consists of 4-5 members. So total members of this settlement are approximately 130-150.

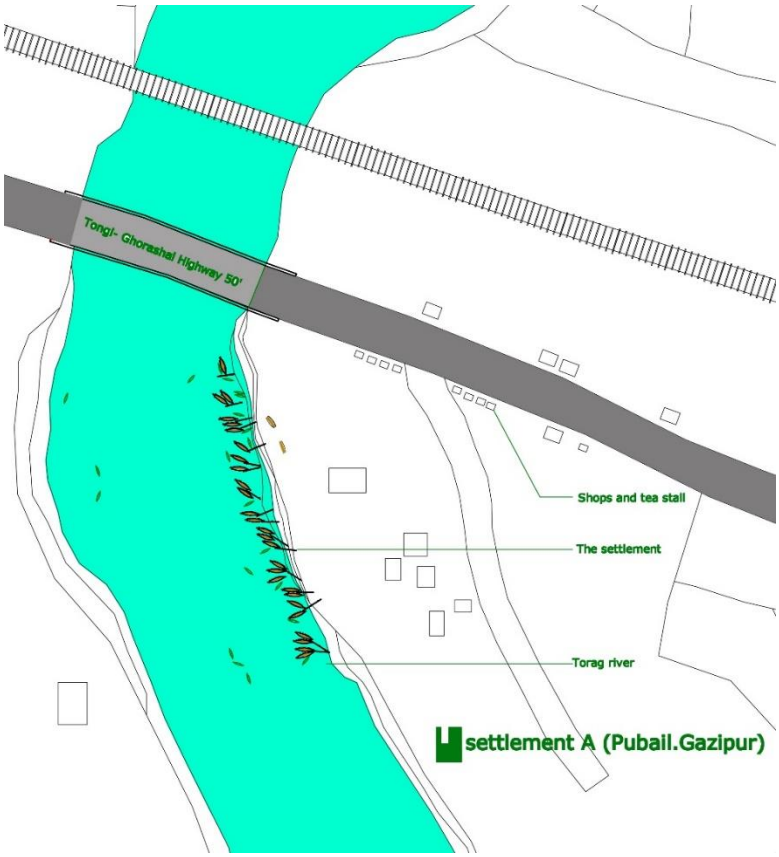


Figure 4.2 Settlement size and surrounding of case A

Figure 4.3 Settlement pattern of Case A

4.2.3 Tenants profile

In this settlement on water, most of the family consists of 5-6 members. To be more specific 36% families have 4 members, 20% families have 5 members ,21% have 6 members and 15% have more than 6 members. Most families consist of Father, mother and their children. Each family has 2-4 kids. Some family has a grandfather or mother as well. When the children grow older, they have to shift to a new boat. Most of the girls get married early in childhood. The average age of getting married is between 12 to 16 years. Polygamy is common in this community. Some of the male members are found married several times. Gender ratio of Man and woman is 36.605 and 63.30%. That indicates this community is female dominated in terms of number. All the member of this community belongs to “Sandar” or “Sowdagor” clan of Bede community.

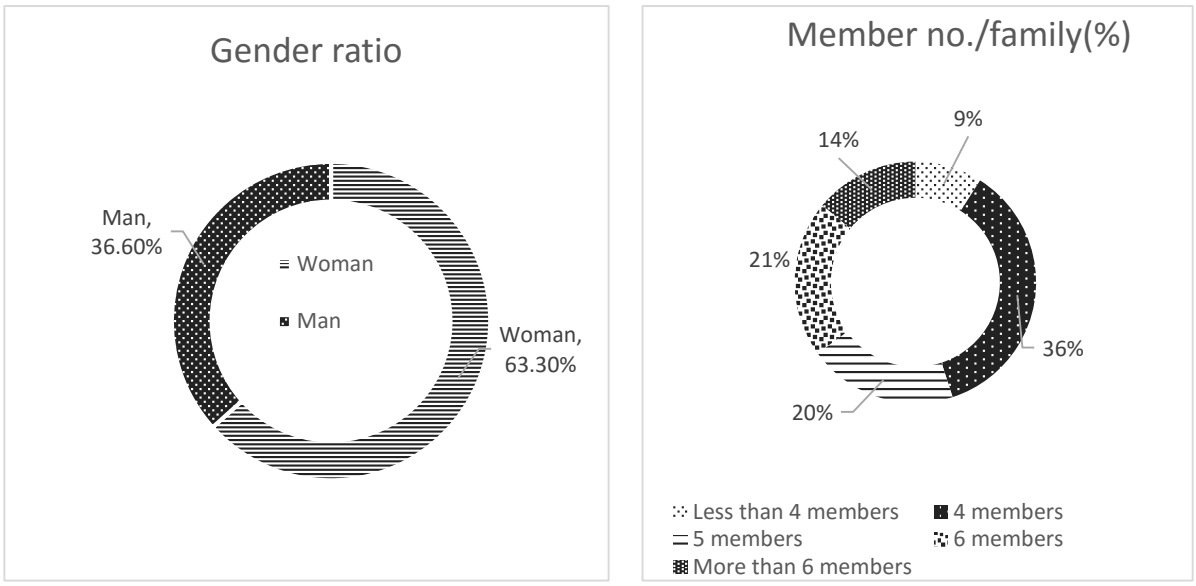


Figure 4.4 Gender ratio and Family member in percentage

4.2.4 Livelihood

The hereditary livelihood or profession of “Sandar” clan is business. Mostly their business is village oriented and door to door service. They go to remote villages with their products or services. They are small traders, and some of them live on fishing. They sell bangle, tape for fastening girl’s hair, utensils, cosmetic items. A good number of male members of this community repair key, lock or umbrella and sell the cosmetic items. In this fleet women and men work equally as they said. Sometimes women go for a business trip and Men stay at the fleet. Men look after the children during day time when their wives go to “Gawal”- a business trip to local villages. Women return to the fleet in the afternoon and then start the cooking. Sometimes men go on a business trip for a few days in a distant location and women stay at home. Male members go too far away villages to participate in ‘Mela’ – a local village fair and festival oriented market place. When the business fall or the service loose demand, they move to another place. That’s why their children can’t continue their education in most cases. Some parents still maintain their schooling by leaving them to a relative’s boat who stays there or to a local friend of them.

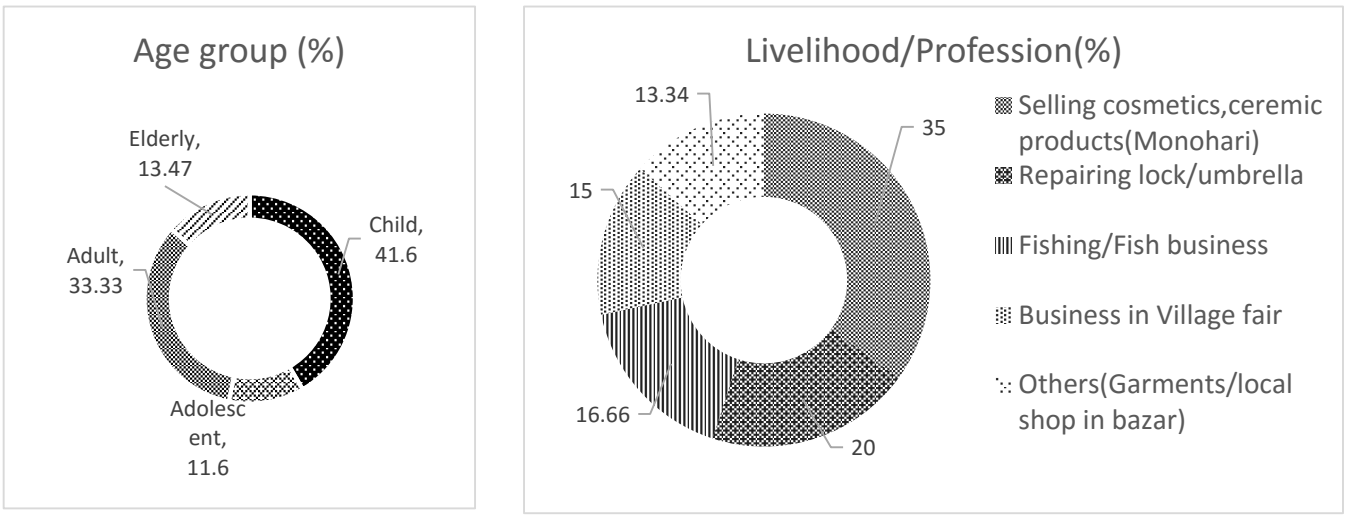


Figure 4.5 Age group and Livelihood

In this settlement 41.6% members are child,33.33% are adult (mainly wage earners) and 13.47% are elderly (who are retired from work mainly).35% members of this case are involved in selling cosmetics or ceramic products,20% in Repairing lock/umbrella,16.66 5 in fishing,15% in business in village fair and 13.34% in other miscellaneous works. Their diversity of profession is maintained to keep a balance in income generating works and some members are found involved in several works. For example, some people said during the interview, they are involved both in lock repairing and fishing. Some go for fishing as a leisure activity. In the past they used to move with whole fleet but now only the member (man/woman) who is the main wage earner, go for business trip. That's why frequency of moving with whole fleet is less now and day by day they are becoming settled in this area.

4.2.5 Activity pattern –Identifying Personal and shared

The activity of the settlement can be categorized under 1) personal activity and 2) shared activity. The personal activities are more seen inside boat (mostly inside "Choi" or shaded part) and shared activity are seen in outdoor spaces (mostly at "Pata" or entry platform of boat).The settlement has specific activity pattern for men, women and children. Women mostly stay in cooking and living area –which is more personal in type when back from a business trip. They spend time with their child and neighboring women in those personal spaces. They are very much loyal to their

Figure 4.6 Activities of Nomadic Life on a Boat fleet

husbands and try to take all the responsibilities on their hand to keep their husbands free and happy. Men prefer to gossip, play cards or even gambling in shared spaces. They spend time watching TV in nearby tea stall or in the bazaar area. The boats are too small to accommodate the different need of space and activity and they have to use the same space for multiuse. They even don't have any tube wells or any pure drinking water sources. They use the water body as a washing area-which is also a shared space. The children are found diving and swimming in the river and use the water body as a playing zone. They collect drinking water from a nearby neighborhood and make temporary solutions for toilet facilities around the fleet. Time to time the user changes inside the boat. When they are in the settlement female members cook, washcloths or dishes and male members go for fishing around or take care of children. Children dive and swim in the water or read inside the boat. From 30 boats 10 boats were selected randomly to analyze.

4.3. B) On land

Site: Teghoriya, Kodomtoli, Keranigonj

Another group of water nomad, reside near Dhaka mawa highway at Teghoriya, Kodomtoli near keranigonj on land. They belong to “Mal” clan and still maintain a mobile life on land. They stay temporarily in a place. They live on huts built on stilts and their activities are also outdoor-oriented. They call this small dwellings “Chiuri” that have 2 cells called “Khop”. They used to live on a boat as well in the past. 10-15 years back they were seen on boat near Aminbazar and Savar on Buriganga river. But as the river was occupied and narrowed down in most of the parts there, they had to choose land for temporary dwelling and settlement. Their relatives are still there in Aminbazar and Savar residing in small settlements or villages. Most of them now believe that life on the water is now impossible and they don’t want their next generation to suffer like their forefathers. They now prefer land to settle and gradually adapting techniques from the sedentary mainstream community.

Figure 4.7 Location of Case B – Settlement on land

4.3.1 Settlement pattern

Typically, the bede community choose a less crowded and calm place to settle. This settlement is situated near a bus stop and around the settlement, a small bazaar with few shops has been developed. A small lake is there beside the site and Burigonga river is not very far from this site. They said, once upon a time this place was very deserted and lonely.When they first settled here this place was not this much busy and crowded, but recently so many development projects have been

started and many more people are being settled around. Rajuk's "Jhilmil" residential area is within 2 kilometers of this site. They have to choose a lonely site to settle so that the landowner will not have the plan to develop any projects in the near future.

The land of this settlement has a local owner and they used to pay rent for their stay. But recently the owner has asked them to move from this site as he has the plan to make a new building here.

The settlement consists of 41-42 families and most of the family have been living here for 10-12 years. Some families leave, some join from other community as they don't have any legal ownership of the land. The landowner let them reside here and if he wishes he can make them leave. Each family own a shelter called "Chiuri" that is used as a dwelling unit and each family consists of 4-6 members. There are 38 huts or chiuries in this settlement.

Figure 4.8 Surrounding of Case B – Settlement on land

4.3.2 Settlement size

The settlement consists of 38huts or dwellings and most of the dwelling units are on stilt. The total area covered by this settlement is almost 3700 sqm which includes their dwelling units, some small tents and adjacent courtyard. Each family own a dwelling unit and each family consists of 4-5 members. So total members of this settlement are approximately 220-230.

Figure 4.9 Settlement pattern of case B

4.3.3 Tenants profile

This group of Bede community belongs to “Mal” clan and all are Muslim. The settlement is located at Teghoriya, kodomtoli in Keranigonj district around 5 kilometres from Babubazar bridge, Sadarghat and 3 kilometres from Gendariya. This nomadic group used to stay at a location for 2-3 months in past. But recently their period of staying at this site increased by 4-5 years as they have left the boat and changing a whole settlement frequently have become complicated. During their stay on a location, they run their business around the site-mostly they cover the areas that are in walking distance. Sometimes they take auto-rickshaw or travel by bus to reach Sadarghat or Gendariya.

Their community consists of 41-42 families. In this community, there are 2 sub-groups one consists of 21 families another of 20 families. From these 2 sub-groups, one was selected as a sample to study thoroughly. The family consists of 5-6

members. Father, mother and their children. Each family has 2-4 kids. Some family has a grandfather or mother as well. When the children grow older, they have to shift to a new hut or ‘chiuri”.

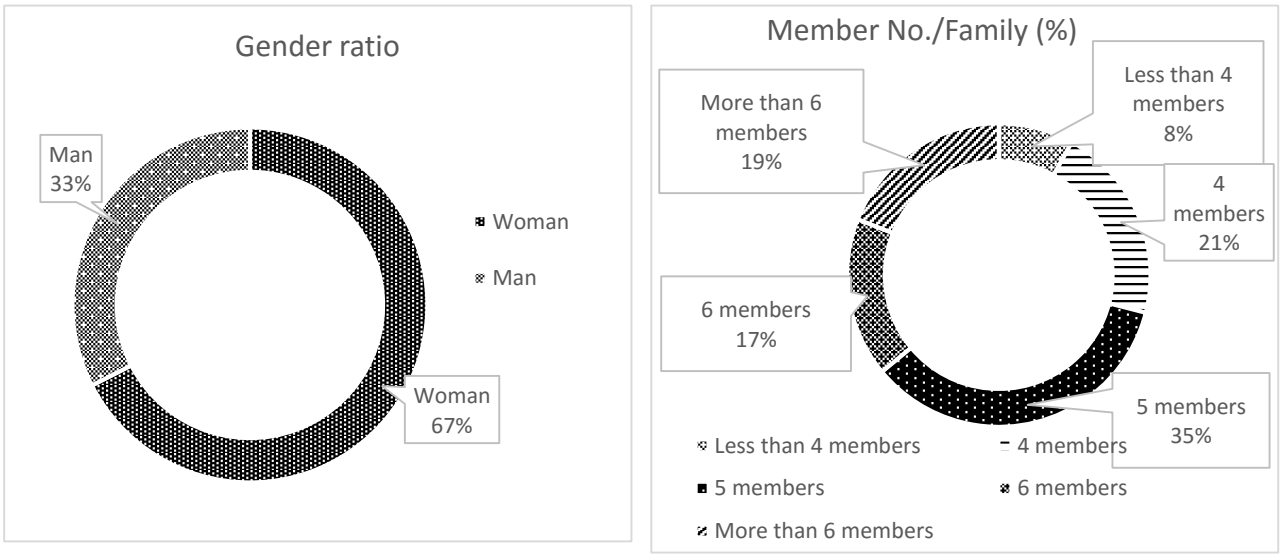


Figure 4.10 Gender ratio and Family member in percentage of case B

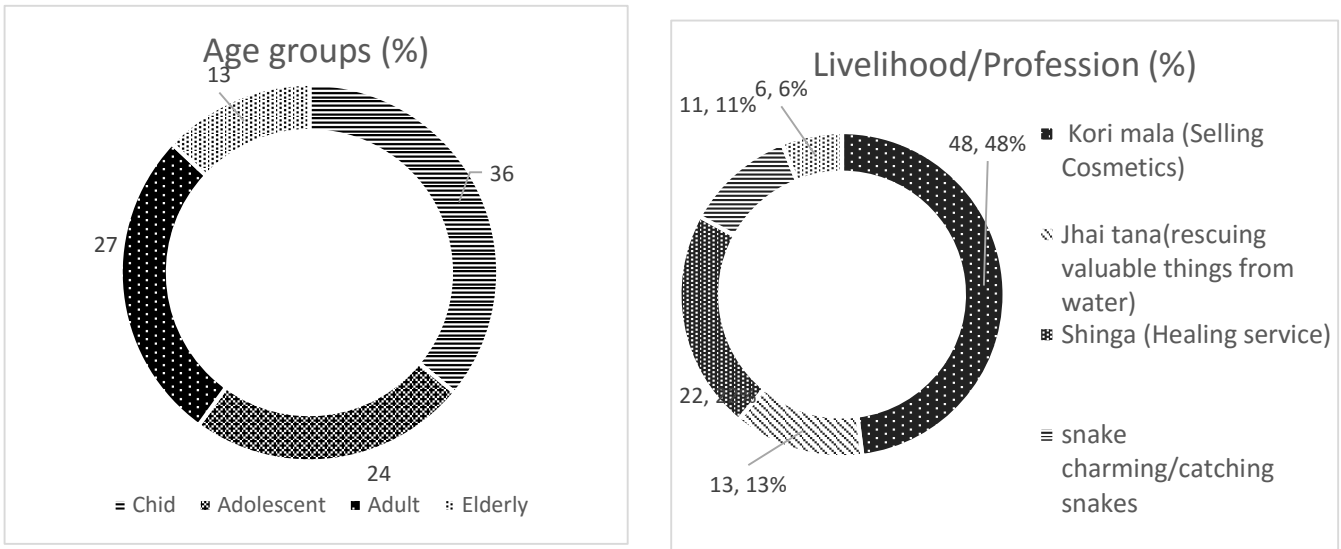


Figure 4.11 Age group and livelihood of case B

4.3.4 Livelihood

Both male and female members work outdoor for livelihood. Female members sell cosmetics, jewelry items and provide healing service with herbal means. Male members either sell cosmetics or other utensils like “kori”,”Mala”, “Tabij” or “Talisman”, ”Bracelet” etc. Male members go to faraway districts in bachelor group that they call “Probas” and female members sell products in nearby villages or go to remote areas in Dhaka.

They are small traders, and some of them live on healing service. They sell bangle, tape for fastening girls hair, utensils, cosmetic items. Some members of this settlement are associated with snake collection and produce medicine from snake venom. A good number of male members of this community go out to far districts for business purpose in the bachelor group. They mainly run the business around Jurain, Komlapur railway station,shyampur and sadarghat.

In this fleet women and men work equally as they said. Men look after the children during day time when their wives go to “Gawal”- a business trip to local villages or towns. Women return to the fleet in the afternoon and then start the cooking. Sometimes men go to a business trip for a few days in a distant location and women stay at home. When the business fall or the service loose demand, they move to another place. In this case, the settlement is almost settled for 8-9 years. That’s why in this settlement some school-going children are found.

4.3.5 Activity Pattern –Identifying Personal and shared

In case B , activity can be identified as personal and shared activity as well. Women mostly stay in cooking and living area which is more personal as type. They spend time with their child and neighboring women there. They try to take all the responsibilities on their hand to keep their husband free and happy. Men mostly stay outside the “Chiuri” (hut) around the courtyard area which is mostly shared space in type. They prefer to gossip, play cards or even gambling there or in entry veranda at the front of “Chiuri”. They spend time watching TV in nearby tea stall or in the bazar area-which is also a shared space.

The settlement components comprised of the dwellings, the tools that they use to run their livelihood and other items that they need to manage their day to day life. They have very little material possession and use no furniture inside the hut or dwellings. Everyday women go out for business at 8 am and come back home at 4-5 pm. Male members of the community do not go out daily for works. The children

Figure 4.12 Activities of Nomadic Life in Chiuri (on land)

play with tires or other found objects and sometimes go with their parents to learn the business. They use the courtyard and in-between space as playing zone and community gathering arena and thereby, we can identify them as shared space. They welcome guest and arrange any communal gathering (Mojma/Chourasia) in this courtyard. “Mojma” is a small gathering arranged for seeking attention of others and “Chourasia” is a traditional gathering of this community that annually held during any festival (Eid/election).All the entries of different dwelling units are courtyard facing and when any communal gathering takes place this entry veranda turns to a gallery space for community members to enjoy or participate in shared activities.

4.4 Discussion and Conclusion

Bede community who have settled on land has courtyard-based arrangement to ensure privacy. As they are Muslim, they maintain a certain privacy though not as strict as other sedentary Muslim community. Women has defined domain and male members have defined one. Women domain generally located inside the “Chiuri” or boat and mostly personal space in type. The courtyard is not seen in settlements on water. As on water they stay in boat, the women prefer to stay inside the boat and interior of boat is basically their personal domain in that case. Some boat has defined door but others don’t have door or window. When they need privacy, they use a

curtain that is made of tin, polythene or fabric at both end of the boat if there is no door or control.

The settlement pattern of 2 case studies on water and land indicates some findings. On water (case A), gender ratio shows 36.60% are men and 63.30 % are women. That ratio indicates, number of female members in nomadic community is high in both cases. Most of the family have 4-6 members. The members of this settlement on boat belong to “Sandar” clan. Female members earn livelihood by business and sell cosmetics or utensils items. Male members repair lock or go for fishing. Settlement profile shows they live on boat and in a fleet, there are 35-40 boats. Number of members of this settlement varies from 130-150.They use the small mono-space inside the boat for multipurpose use. The findings from the case A can be concluded through following diagram.

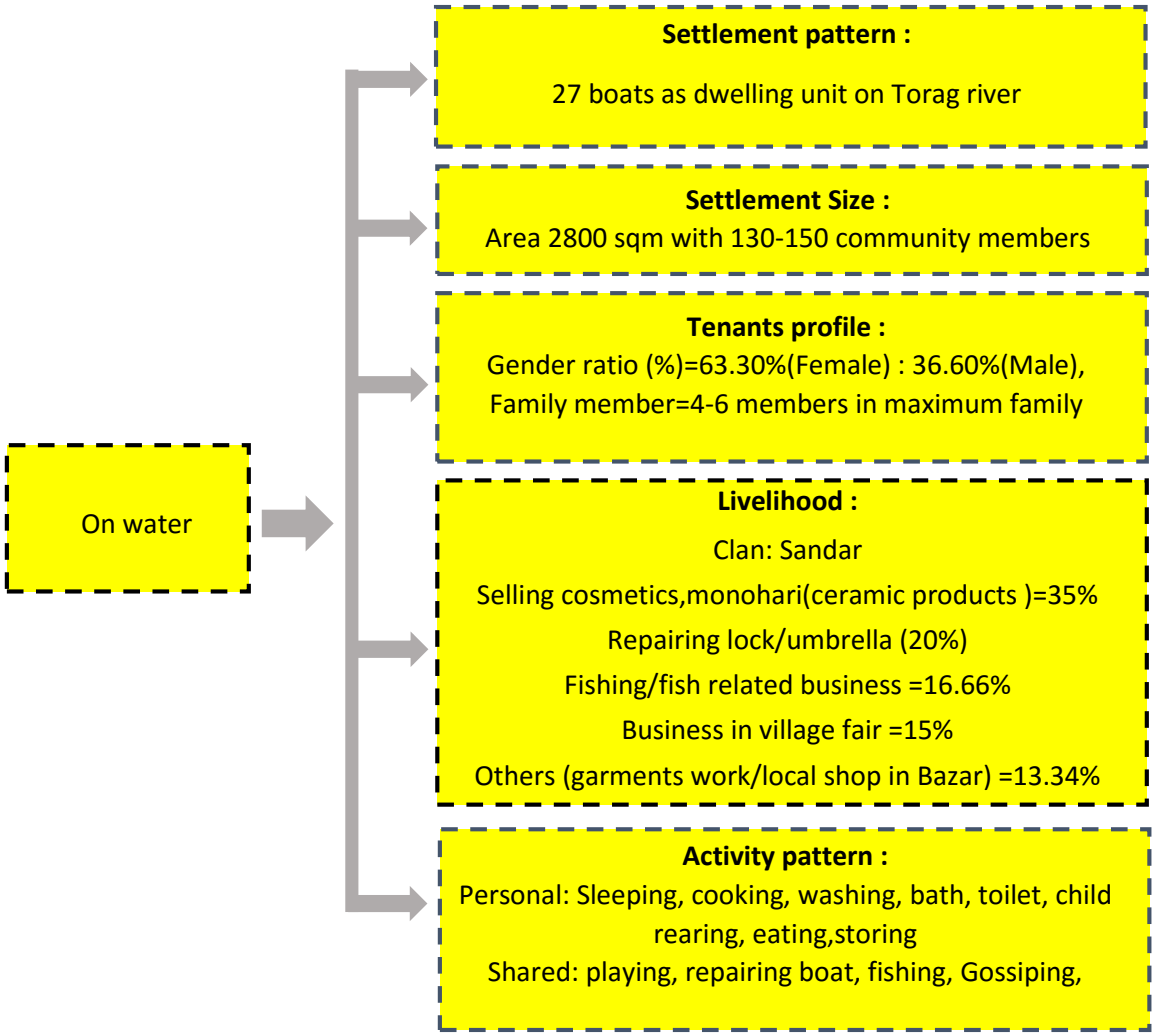


Figure 4.13 Findings from case A

They ensure maximum use of space by utilizing each space for several uses in that tiny boat. The boat has one mono-space that has 2 curved façades with storing facilities. Beneath the floor they have also storing space. There is no furniture inside and space is sitting oriented. They eat, play, swim on or around water and maintain a nomadic life with mobility. Their settlement and shelter move with their living. Observation shows that activities inside boat consists of sleeping, storing, cooking, playing, gossiping etc. Activities outside the boat includes –bathing, swimming, repairing boats, gossiping, washing clothes, playing outdoor games etc. If the activities seen from personal and shared perspective- we can say sleeping, cooking, rearing child, bathing, toilet, eating, storing etc are personal activities and repairing boat, fishing, gossiping, playing etc are shared activity in this case.

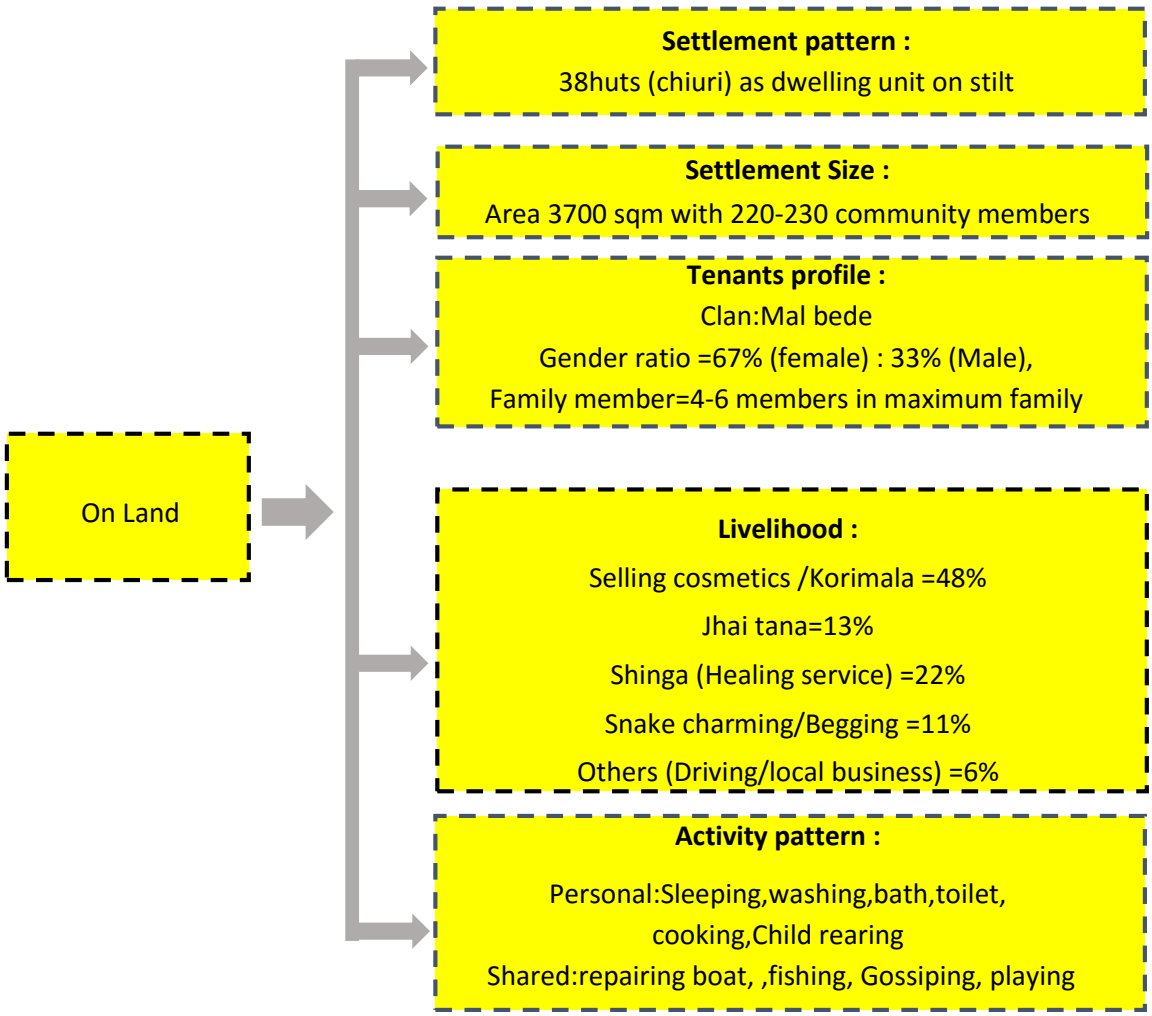


Figure 4.14 Findings from case B

On the other hand, another type of nomadic settlement is found near Keranigonj who resides on land. This group belongs to “Mal” clan and resides on huts on stilts called

‘Chiuri”. They used to live on a site for few months earlier but now they stay on a site for few years. Gender ratio of men and women is 67% and 33% in this settlement. This community consists of 41-42 families and each family have 5-6 members on average. The earn living by selling korimala,cosmetics,Jhai tana,healing service (Shinga lagano),snake charming or begging etc. Members of this settlement spent 8 hours or more in the settlement and rest of the time they spent for business. Activity inside the hut includes sleeping, storing, cooking, dinning, gossiping, reading etc. which is mostly personal as type. And activity outside includes community gathering, washing, toilet, playing, fishing etc. which is shared mostly. Leisure activity includes roaming around, gossiping, watching TV/cinema, sleeping, fishing or playing etc.Their leisure activities are also mostly shared in this case. The settlement has specific domain for men, women and children. Women mostly stay in personal domain like cooking or living area while men stay in shared realm mostly like courtyard, veranda or Bazar area. The dwelling huts looks like upper part of boat (Choi) and placed on stilt to protect it from termites, dampness or insects. The dwelling have 2-3 spaces and they have no furniture inside. They have dedicated sleeping, dining, cooking and washing zone unlike the prior settlement on water. The findings from the case B can be concluded through following diagram.

From physical field study, observation and questionnaire survey of the studied boats and dwellings a new finding can be found which is, family members use a personal space for multipurpose use and share a space with others that allows them to enhance group interaction. Another thing is as sharing or multiuse allow them to spend more time together unlike users with single use space. They have a tendency to use outdoor space as shared space for activity that also allow them to interact more with other community members through gossiping or interactive conversations.

We can summarize the activities under personal and shared activities- on one hand sleeping, cooking, rearing child, bathing, toilet, eating, storing etc are personal activities, that is mostly held inside boat or a shaded indoor space. On the other hand, repairing boat, fishing, gossiping, playing, preparation for business trip etc are shared activities that are seen mostly in open or outdoor spaces.

Yuval Noah Harari in his book “sapiens: A brief history of humankind” explains why human race survived by their gossiping and common belief in a chapter called “The Cognitive revolution” (Harari, 2011). In both cases outdoor spaces perform as

interactive shared activity zone enhancing collaboration and indoor compact spaces perform as major spaces for holding personal family activities. On one hand by keeping the personal space limited, they are more inclined to shared activity. On other hand, multiuse and less use of cellular type space are increasing family and communal interaction as well as sharing, which help them to achieve social resilience.

Table 1:28 studied dwellings (10 on water, 18 on land)

(A1)	(A2)	(A3)	(A4)
Name :Chan mia Age: 37 Religion:Islam Clan:Sandar Family member:4 Profession:key repairing,fishing Business Hours:11 hrs Leisure activities:Roam around/Gossip Activities inside boat:cooking,storing,sleeping,washing mode of transportation:boat,walk,bus	Name :Fazlu Age: 37 Religion:Islam Clan:Sandar Family member:5 Profession:Monohari(cosmetics),key repairing Business Hours:11 hrs Leisure activities:Roam around/fishing Activities inside boat:cooking,storing,sleeping,washing mode of transportation:boat,walk,bus	Name :Lucky Akter Age: 32 Religion:Islam Clan:Sandar Family member:4 Profession:Monohari(cosmetics) Business Hours:10 hrs Leisure activities:Roam around/Gossip Activities inside boat:cooking,storing,sleeping,washing mode of transportation:boat,walk	Name :Toka mia Age: 44 Religion:Islam Clan:Sandar Family member:5 Profession:Key repairing,cosmetics Business Hours:12 hrs Leisure activities:Roam around/fishing Activities inside boat:cooking,storing,sleeping,washing mode of transportation:boat,walk
 	 	 	 

A5

Name :Beauty Begum
Age: 70
Religion:Islam
Clan:Sandar
Family member:2
Profession:Monohari(cosmetics),key repairing
Business Hours:10 hrs
Leisure activities:Roam around/Gossip
Activities inside boat:cooking,storing,sleeping,washing
mode of transportation:boat,walk,bus

A6

Name :Abdur Rob
Age: 73
Religion:Islam
Clan:Sandar
Family member:2
Profession:Monohari(cosmetics)
Business Hours:10 hrs
Leisure activities:Roam around/Gossip
Activities inside boat:cooking,storing,sleeping,washing
mode of transportation:boat,walk

A7

Name :Amena Begum
Age: 46
Religion:Islam
Clan:Sandar
Family member:5
Profession:Monohari(cosmetics)
Business Hours:8 hrs
Leisure activities:Roam around/Gossip
Activities inside :cooking,storing,sleeping,washing
mode of transportation:boat,walk,auto

A8

Name :Abbas
Age: 50
Religion:Islam
Clan:Sandar
Family member:6
Profession:Monohari(cosmetics)
Business Hours:10 hrs
Leisure activities:Roam around/Gossip
Activities inside
boat:cooking,storing,sleeping,washing
mode of transportation:boat,walk,bus

A9

Name :Roksana
Age: 55
Religion:Islam
Clan:Sandar
Family member:5
Profession:Monohari(cosmetics)
Business Hours:8 hrs
Leisure activities:Roam around/Gossip
Activities inside
:cooking,storing,sleeping,washing
mode of transportation:boat,walk,auto

A10

Name :Torab Ali
Age: 65
Religion:Islam
Clan:Sandar
Family member:2
Profession:Monohari(cosmetics)
Business Hours:8 hrs
Leisure activities:Roam around/Gossip
Activities inside
:cooking,storing,sleeping,washing
mode of transportation:boat,walk,bus

B1	B2	B3
Name :Sheuli Akter Age: 45 Religion:Islam Clan:Mal Family member:7 Education:No education Profession:shinga lagano (relieve pain by horn of animals),sell kori mala,snake charming Business Hours:10 hrs Income: 4500-5000 /month Leisure activities:Gossip Activities inside Chiuri/hut:cooking,storing,sleeping,washing,dinning mode of transportation:walk,bus	Name :Gedu mia Age: 40 Religion:Islam Clan:Mal Family member:5 Education:No education Profession:Jhai Tana(rescue valuable goods from ponds),kabiraji,Sell Kori-mala-tabij Business Hours:10 hrs Income: 4000-4500 /month Leisure activities:Roaming around/Gossip,Gambling Activities inside Chiuri/hut:cooking,storing,sleeping,dinning, washing mode of transportation:walk,bus	Name :Md. Muktar Age: 35 Religion:Islam Clan:Mal Family member:6 Education:No education Profession:kabiraji,Sell Kori-mala-tabij,collect snake Business Hours:10 hrs Income: 4500-5000 /month Leisure activities:Roaming around/Gossip,watching TV Activities inside Chiuri/hut:cooking,storing,sleeping,washing mode of transportation:walk,bus
		

(B4)

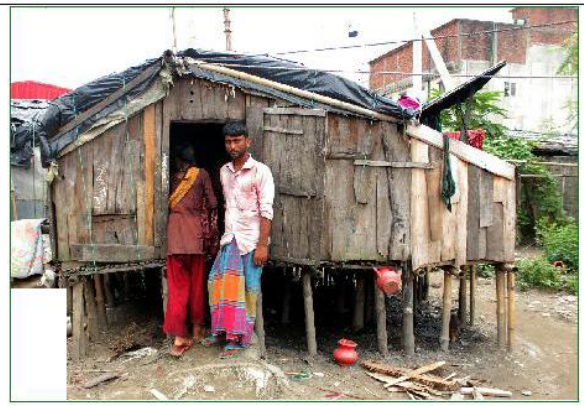
Name :Sonia
Age: 30
Religion:Islam
Clan:Mal
Family member:4
Education:Went to primary school for 2-3 classes
Profession:shinga lagano (relieve pain by horn of animals),Sell Kori-mala-tabij,snake charming
Business Hours:10 hrs
Income: 4500-5500 /month
Leisure activities:Roaming around,Gossip
Activities inside
Chiuri/hut:cooking,storing,sleeping,Dinning
mode of transportation:walk,bus,CNG/Auto

(B5)

Name :Pitol mia
Age: 33
Religion:Islam
Clan:Mal
Family member:6
Education:No education
Profession:Snake charming,kabiraji,Sell Kori-mala-tabij
Business Hours:12 hrs
Income: 4000-4500 /month
Leisure activities:Roaming around/Gossip,watching TV,gambling
Activities inside
Chiuri/hut:cooking,storing,sleeping,washing,Dinning
mode of transportation:walk,bus

(B6)

Name :Md. Muksed
Age: 35
Religion:Islam
Clan:Mal
Family member:6
Education:Went upto ssc exam
Profession:Teacher in community school, Jhai Tana(rescue valuable goods from ponds),kabiraji,Sell Kori-mala-tabij
Business Hours:10 hrs
Income: 4500-5000 /month
Leisure activities:Roaming around/Gossip,watching TV/movie in cinema hall
Activities inside
Chiuri/hut:cooking,storing,sleeping,washing
mode of transportation:walk,bus



(B7) Name :Kathal mia Age: 70 Religion:Islam Clan:Mal Family member:8(Married 5 times) Education:No education Profession:kabiraji,Sell Kori-mala-tabij Business Hours:11 hrs Income: 5000-6000 /month Leisure activities:Roam around/Gossip,play cards or gambling Activities inside Chiuri/hut:cooking,storing,sleeping,washing mode of transportation:Auto,walk,bus		(B8) Name :Md. kalam Age: 50 Religion:Islam Clan:Mal Family member:6 Education:No education Profession:kabiraji,Sell Kori-mala-tabij Business Hours:11 hrs Income: 4500-5000 /month Leisure activities:Roam around/Gossip,play cards/ludu,betting Activities inside Chiuri/hut:cooking,storing,sleeping,washing Mode of transportation:walk,bus,auto
	(B9) Name :Ashiq Age: 30 Religion:Islam Clan:Mal Family member:6 Education:went to school upto class 5 Profession:kabiraji,Sell Kori-mala-tabij Business Hours:11 hrs Income: 4500-5500 /month Leisure activities:Play cards or gambling,Adda in tea stall Activities inside Chiuri/hut:cooking,storing,sleeping,Dinning mode of transportation:CNG/Leguna,walk,bus	

B10 Name :Touhidul islam Age: 35 Religion:Islam Clan:Mal Family member:5 Education:Upto class 7 Profession:kabiraji,Sell Kori-mala-tabij, Goes to bachelor trip in different district called "probas" Business Hours:10 hrs Income: 4500-5000/month Leisure activities:Roam around/Gossip,take care of child Activities inside Chiuri/hut:cooking,storing,sleeping,Dinning,washing mode of transportation:Leguna,CNG,walk,bus	B11 Name :Hiron Age: 36 Religion:Islam Clan:Mal Family member:6 Education:No education Profession:kabiraji,Sell Kori-mala-tabij, Goes to bachelor trip in different district called "probas",Went to india several times in business trip Business Hours:11 hrs Income: 5000-6000/month Leisure activities:Roam around/Gossip,play cards or ludu Activities inside Chiuri/hut:cooking,storing,sleeping,washing mode of transportation:walk,bus	B12 Name :Abdur Rob Age: 60 Religion:Islam Clan:Mal Family member:2 Education:No education Profession:kabiraji,Sell Kori-mala-tabij Business Hours:12 hrs Income: 3000-4000/month Leisure activities:Roam around/Gossip,Adda in tea stall Activities inside Chiuri/hut:cooking,storing,sleeping,Dinning mode of transportation:Leguna,walk,bus (Is not present in the picture)
		

B13	B14	B15
Name :Md. Shakil Age: 43 Religion:Islam Clan:Nal Family member:5 Education:went to Aliya madrasa and completed a degree there Profession:Canvaser,Sell medicine,Goes to india frequently for business Business Hours:11 hrs Income: 5000-5200 /month Leisure activities:Roam around/Gossip,play cards,Adda in tea stall,watch movies Activities inside Chiuri/hut:cooking,storing,sleeping,washing mode of transportation:walk,bus,CNG/Leguna/auto	Name :Gobi/Goru Age: 50 Religion:Islam Clan:Nal Family member:5 Education:No education Profession:kabiraji,Sell Kori-mala-tabij Business Hours:11 hrs Income: 4500-5000 /month Leisure activities:Roam around/Gossip,play cards or gambling Activities inside Chiuri/hut:cooking,storing,sleeping,washing mode of transportation:walk,bus,Rickshaw	Name :Ridoy mia Age: 30 Religion:Islam Clan:Nal Family member:5 Education:passed class 8 Profession:kabiraji,Sell Kori-mala-tabij Business Hours:11 hrs Income: 4500-5000 /month Leisure activities:Roam around/Gossip,play cards,Watch movies in cinema hall Activities inside Chiuri/hut:cooking,storing,sleeping,washing mode of transportation:CNG,walk,bus,Auto Others: Went to Soudi Arab but forced to return few months later
		

(B16)	(B17)	(B18)
Name :Titna khatun Age: 30 Religion:Islam Clan:Mal Family member:6 Education:No education Profession:Shinga lagano,Sell Kori-mala-tabij,snake charming,produce medicine from snake venom Business Hours:11 hrs Income: 4500-5000 /month Leisure activities:Gossip,spend time with children Activities inside Chiuri/hut:cooking,storing,sleeping,washing mode of transportation:walk,bus,auto	Name :Satar mia Age: 33 Religion:Islam Clan:Mal Family member:5 Profession:Kabiraji,Sell Kori-mala-tabij Education:completed a degree from madrasa Business Hours:10 hrs Income: 5000-6000 /month Leisure activities:Roam around/Gossip,Spend time in tabliq jamat Activities inside Chiuri/hut:cooking,storing,sleeping,Dining mode of transportation:Nosimon (motorized van)walk,bus	Name :Porimon Bibi Age: 50 Religion:Islam Clan:Mal Family member:6 Education:No education Profession:Shinga,Sell Kori-mala-tabij,Snake charming Business Hours:11 hrs Income: 4500-5000 /month Leisure activities:Roam around/Gossip, Activities inside Chiuri/hut:cooking,storing,sleeping,Dining,washing mode of transportation:walk,bus

5 Analysis

5.1. Introduction

Domestic spaces possess many symbolic and cultural dimensions besides being a physical shelter. Spatial organization of the domestic space is a physical manifestation of the activity and cultural values and they carry cultural information in their material form and space configuration. (Lawrence, 1993). The cultural symbolic aspects of the nomadic group are expressed in their domestic spaces and they are identifiable with the pattern of spatial organization that gives a picture of the social relations of the inhabitants. Due to the socio-economic change in the users, the spatial organization of the dwellings of water nomads around Dhaka shows a changed living pattern today where the resilient aspects are addressed in a significant way different from the prevailing cultural practices. To understand this change in socio-economic status and its consequent impact on the pattern of space in dwellings as well as settlements of nomadic group of Bangladesh a study of the spatial organization focusing resilient aspects is necessary.

In the built environment an order of the space is created and according to Hillier and Hanson, this ordering of space in building is really about the ordering of relations between people (Hillier and Hanson, 1984).Space Syntax, which is an approach developed for analyzing spatial configurations, helps to explore this ordering of space and interpret the spatial and symbolic dimension of dwellings and houses. The main proposition of syntax analysis is that social relations and events express themselves through spatial configuration. It aims to describe spatial models and to represent these models in numerical and graphical form. (Gomes, 2014)

In the first part of the analysis observation, questionnaire and field survey was used to analyze activity pattern, family profile, profession and social dimensions of water nomads. In second part Justified permeability graph (JPG)is used for analyzing the nature of permeability in the domestic space using ‘depth’ and ‘integration’ as variables to calculate the characteristics of spaces.

Analysis was diagnosed under two objectives of this research. One objective was to understand how the lifestyle can influence resilience in vernacular practice of water nomads and another objective was to find out how the community practice resilience

through material use as well as technology of construction. These two objectives can be discussed under socio economic resilience and ecological resilience. Lifestyle, community formation, interaction spaces, livelihood etc can be understood under socio-economic resilience. Material and construction technique can be understood under ecological resilience.

Analysis was diagnosed under two objectives of this research. One objective was to understand how the lifestyle can influence resilience in vernacular practice of water nomads and another objective was to find out how the community practice resilience through material use as well as technology of construction. These two objectives can be discussed under socio economic resilience and ecological resilience. Lifestyle, community formation, interaction spaces, livelihood etc can be understood under socio-economic resilience. Material and construction technique can be understood under ecological resilience.

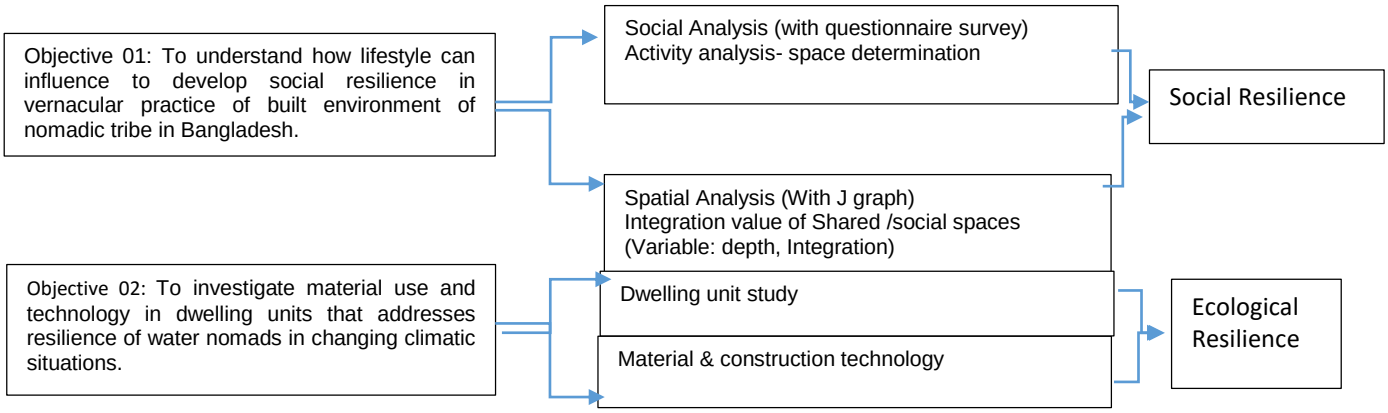


Figure 5.1 Research Objectives

5.2 Socio spatial analysis

The socio-spatial perspective in research addresses how built infrastructure and society interact. It assumes that social space operates as both a product and a producer of changes in built environment. Society form the principles of space and built environment through traditional way of living. And space as well as built environment configures the skeleton of society through spaces. In the settlements of nomadic tribe, some social factors influence community formation and interaction. From observation and interview these factors are identified and analyzed in first phase. Community gathering and sharing of space is common in both

settlements and social activities are identified to find out the reasons of their community resilience through a qualitative approach. Hillier and Hanson explained, from the theoretical grounds, a set of related basic orders of generating spatial patterns that can be expressed mathematically. According to Hanson (1998), spatial relations exist where there is any type of link between two spaces. Configuration exists when the relations that exist between two spaces are changed according to how we relate each to a third configurational descriptions, therefore, deal with the way in which a system of spaces is related together to form a pattern. Morphological studies try to clarify these configurational properties and their meanings by mathematical and graphical analysis. Hillier and Hanson analyzed the morphological characteristics of a plan layout with the help of graphs called “justified access graphs” as the basis for structural and syntactic analysis (Hanson, 1998)

In the procedure adopted justified graphs from the outside have been drawn for each house as quantitative approach. The basic syntactic values were calculated automatically by using a software application "Jass" developed for this purpose at the Bartlett School of Architecture, University College London.

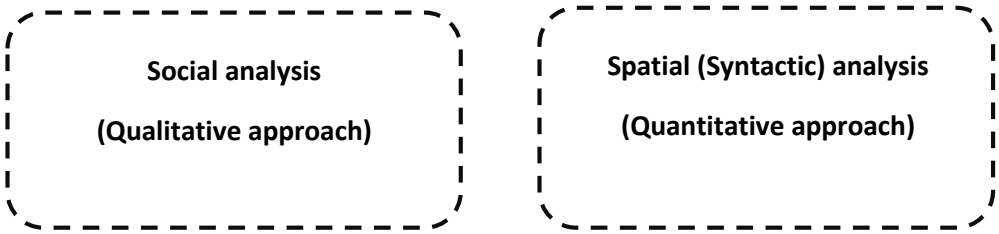


Figure 5.2 Structure of Analysis

The transcription begins from the exterior of the dwelling which is a stair or raised platform space from where each dwelling is accessed. This is shown as a blue point to differentiate it from the interior point spaces. Gendered spaces in the configuration are shown as a red circles and shared spaces are shown with yellow circles to differentiate in the graph. Spaces like toilet, verandahs which hold personal activities are shown with purple circles in the graph. The justified graph is used to check the integration of a space by checking segregation and integration of spaces and their depth to locate the personal and shared spaces in the spatial organization. In space syntax theories configurational variables “depth” and “rings” turned out to be fundamental properties of architectural space configuration, and also the means by which architecture can carry culture. (Hanson, 1998)

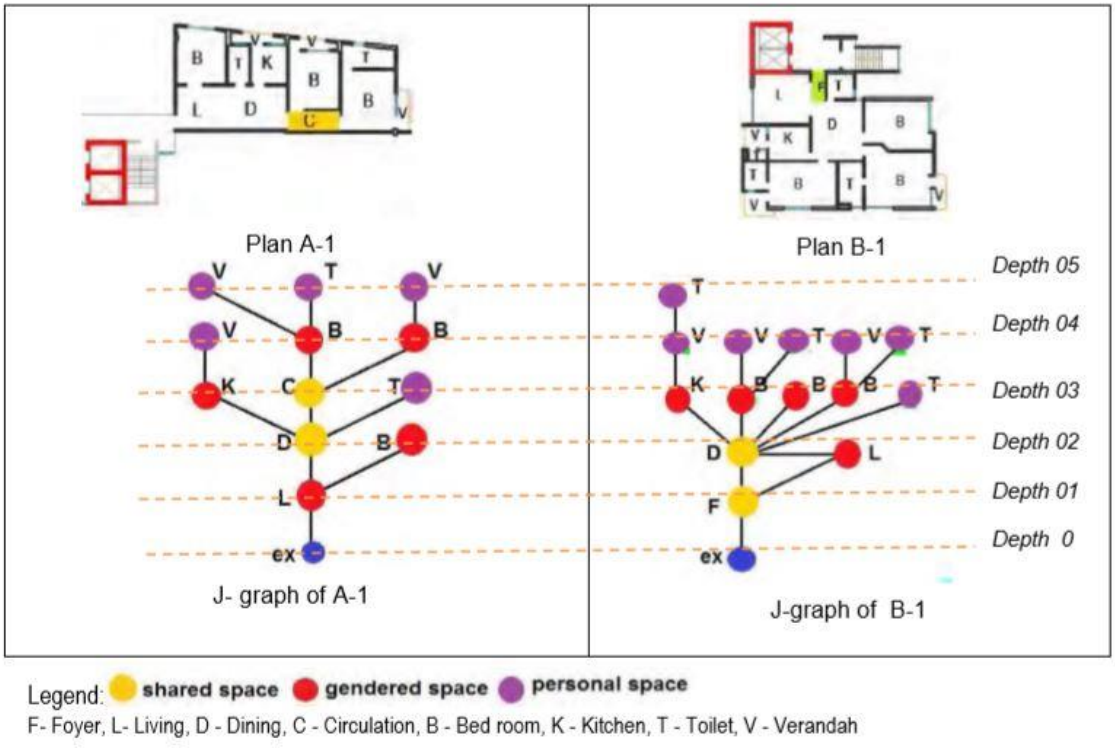


Figure 5.3 Configurational analysis with Justified graph (J-graph) (Gomes, 2014)

5.2.1 Community formation and interaction spaces

These two case studies show strong community life with collaborative sharing practice. In both cases the settlement is observed and identified with strong community bonding. These two cases are analyzed one by one here accordingly.

Case-A Pubail, Gazipur

In case-A, at Pubail, Gazipur the community lives on water and they lead a community-based living where one family is dependent on another. If one family face scarcity of resource or any trouble, another family come forward to help. If one family face a problem with their boat, another family give them their extra boat or materials. Sometimes if they need to repair their boat by themselves, they seek help from their neighbors. Thus, they practice a strong interdependent community life.

When they go out for business trip, they make variations in their product choice. If one go out for repairing key lock, another will go out with “Monohari”(cosmetics and jewellary items) products. If one group go out for business trip, another will stay at home. Sometimes they choose the locations with community discussion. The “Matobbor” or community leader decides, where they will go next week for business.

They are strong believer and muslims. They arrange “Mahfil” regularly.Mainly they are follower of “Maij-vandari”.Both male and female members attend the mahfil that starts at night. These “Mahfils” are strong interaction place for both male and female. Sometimes relatives from other settlements join in these “Mahfils”.

They solve their internal problems and issues with their internal laws. They have community leader or “Matobbor” who solves their internal problems and legal issues. They arrange “salish” or small court to solve the legal or internal any issues. That is another interaction place where they shout, fight with other or come closer to another. Sometimes some members leave the fleet and form another community when the size of the settlement become larger. Still they maintain strong connection and communication with their distant relatives. And if they face problems, they try to help them. One case was observed in this study period. One group of Bede community settled on riverbank in Tongi near Abdullahpur bridge. They left boat and constructed houses like sedentary community. The Government decided to clear the river bank and evict them from land. Within oneday, they became homeless and without any roof. Immediately the community living in this settlement in Pubail help them with their leftover extra boats overnight. This incident clarifies how strong their community bonding is. They practice a community life that make them socially resilient. Even without any land and resources of their own, they can survive in any context.

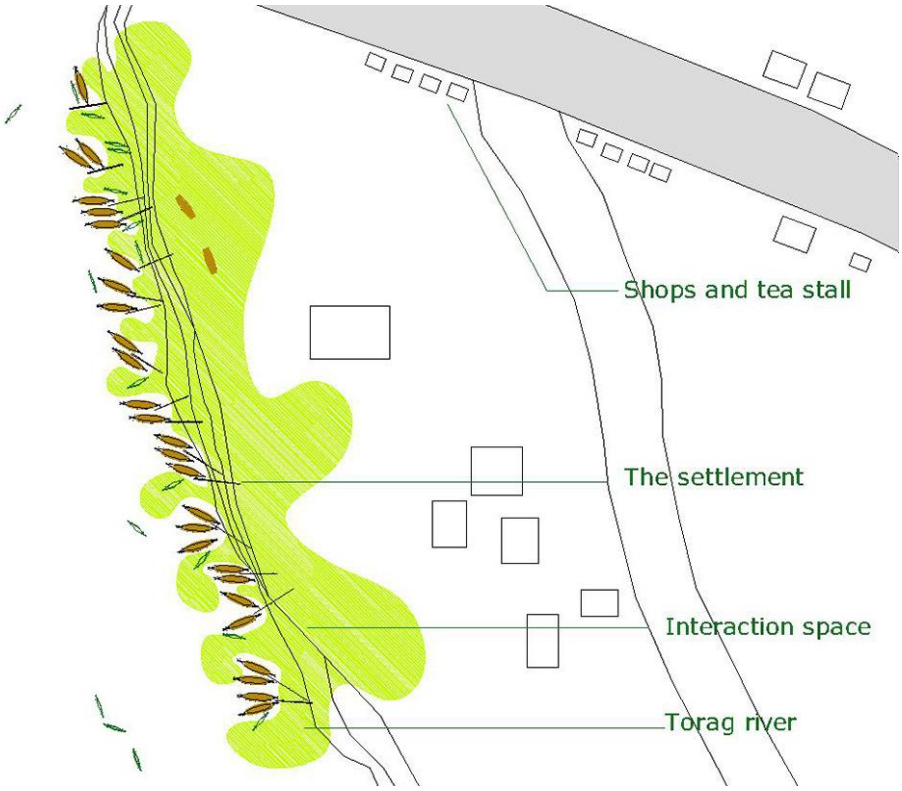


Figure 5.4 Interaction spaces in case A (on water)

Figure 5.5 Anchored nomadic boat as dwelling unit of settlement in case A (Pubail,Gazipur)

Case-B Teghoriya,Kodomtoli

In case-B, at Kodomtoli, Keranigonj the community lead a life in collaboration as well. They live in group and run their business from this settlement. They built their houses by themselves or take little help from local craftsman. When one family

needs to repair their house, they call a meeting and ask help from others. Then 2-3 family members come forward to help and on that day they don't go out for business. But as they need to manage meal for next day, the employer family-who is repairing house take all responsibilities of their food and needs. They have courtyard in front of their dwelling where they gather for meeting or their children play. This court act as community bonding adhesive for them. Each dwelling is visible from this court. When they come back from works, they sit and gossip in their front entry space of their dwelling which is connected visually from other spaces and central courtyard. This entry space act as living, dining and cooking area. Both male and female members spent most of their time in this space. Female members spent most of the time in kitchen or courtyard space when they are back from works. And male members stay around them either taking care of their child or gossiping with neighbors. When they need to move the whole settlement from one location to another, they form a small team with expert members from the community. They roam around in different locations and find a suitable place by negotiating with land owner and local authority. They prefer Govt. khas land for their transient settlement. All the entry spaces of different dwelling are court yard facing to enhance the interaction. Like other nomadic tribe they solve their internal problems and issues with their own laws. They have community leader whom they call "sardar" who solves their internal problems and legal issues. They arrange "salish" or small court to solve the legal or internal any issues. When they need to extend the settlement, some members leave the fleet and form another community. But they maintain strong communication with their distant relatives and members. They share resources and help each other to survive. From food to building materials, they share with other community members and they get share in return when are in need. They gather for any occasion like marriage or Eid that they call "Mel". In this get together members who left the community and live in a different settlement also join to rejoice and meet others.

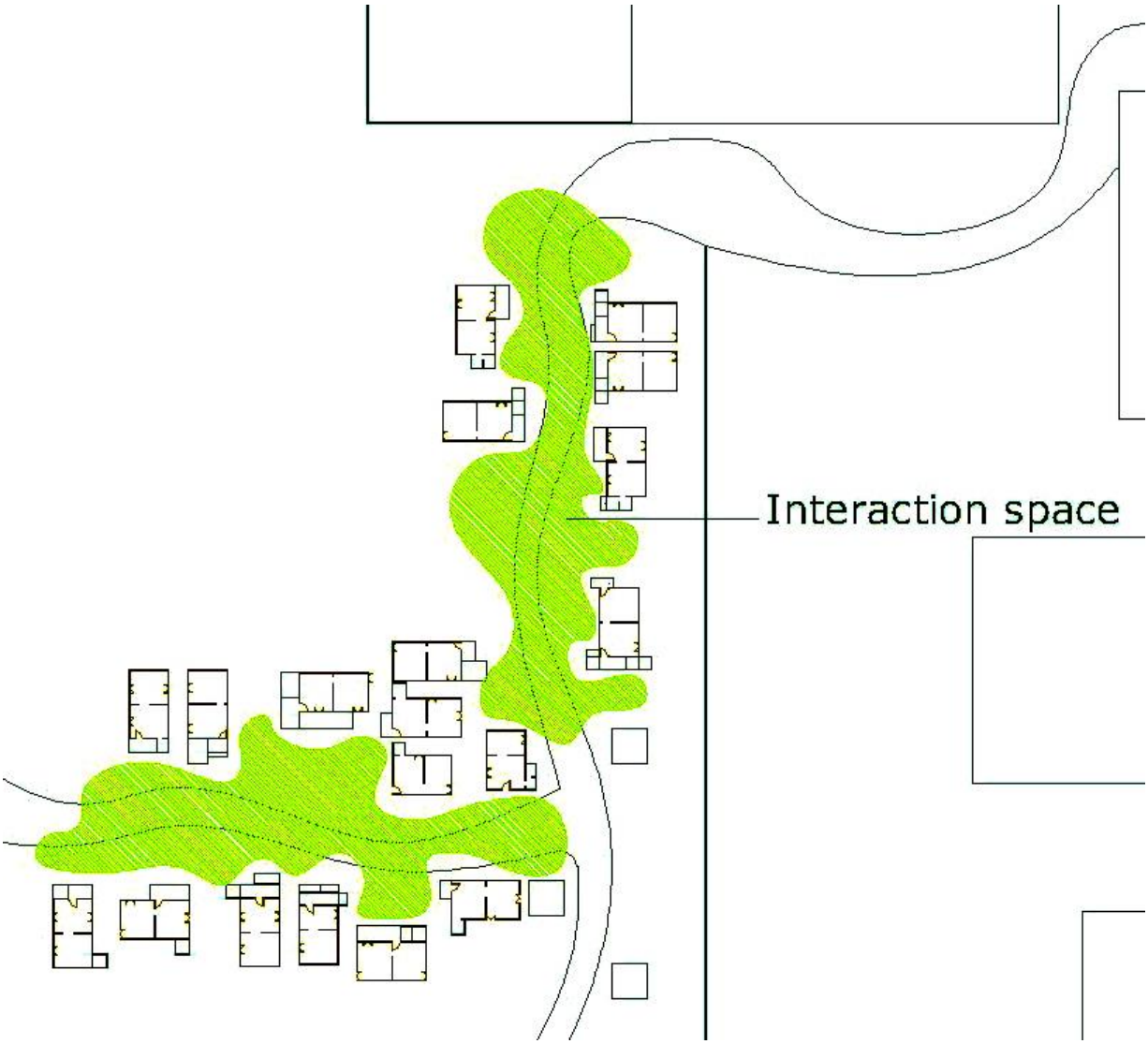


Figure 5.6 Interaction spaces in case B (on land)

Figure 5.7 Hut/Chiuri as dwelling unit in case B (Teghoriya,Keranigonj)

5.2.2 Orientation of units

Case A- Pubail, Gazipur

This settlement is formed on the bank of a river and boats are main dwelling unit. As boat floats, the spaces float with them. The in between spaces of boats and bank of the river is their main outdoor spaces of interaction. The smallest unit of the settlement is boats and these boats are oriented differently at different times according to need. Sometimes they settle on the shore, sometimes they move and sometimes they need to arrange gathering for meeting. Few orientations of their boats are identified from observation and interview with community members. When they move from one place to another, they move in a row one after another. The leader or “Mattobbor” stay at the front and other boats behind him. When they need to gather for community gathering, they form a semi-circle with their boats and leader’s boat is placed at the middle. When they decide to settle on the bank of a river, they align their boats along with the bank. The threshold between water and land become their interaction ground.

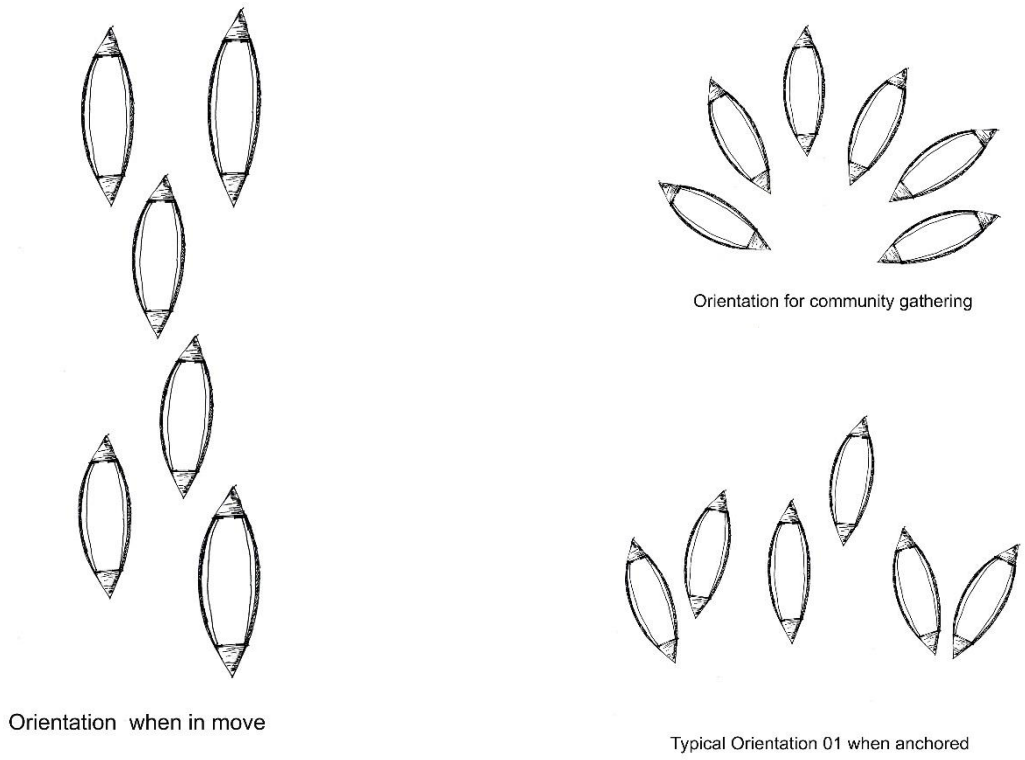


Figure 5.8 Orientation of dwelling units on water

Case B- Teghoriya, Kodomtoli

From observation it is clear that the orientation of the dwelling units or huts are oriented towards the communal court that is located at the center. From Fig.5.9 it is clear that, each and every unit's frontal entry is from the court that helps them to enhance internal interaction and thus community resilience is reinforced. In many occasions they use this court as gathering place and take decision together. Children are found playing in this court, women use this for extended household chores. Orientation of the units support them to be more connected to the neighbors as well as other community members. Activity in front entry or veranda of from one unit is visible from others and visual connectivity enhance their interaction. When a guest appears to a unit, immediately other members get notification. Similarly, any act or activity that seems as a threat to a member of a unit, may be identified easily for this visual connectivity. In any circumstances they react and stand together and this can be identified as community resilience. This resilience is definitely result of this practice of orientation that keep them close and connected.

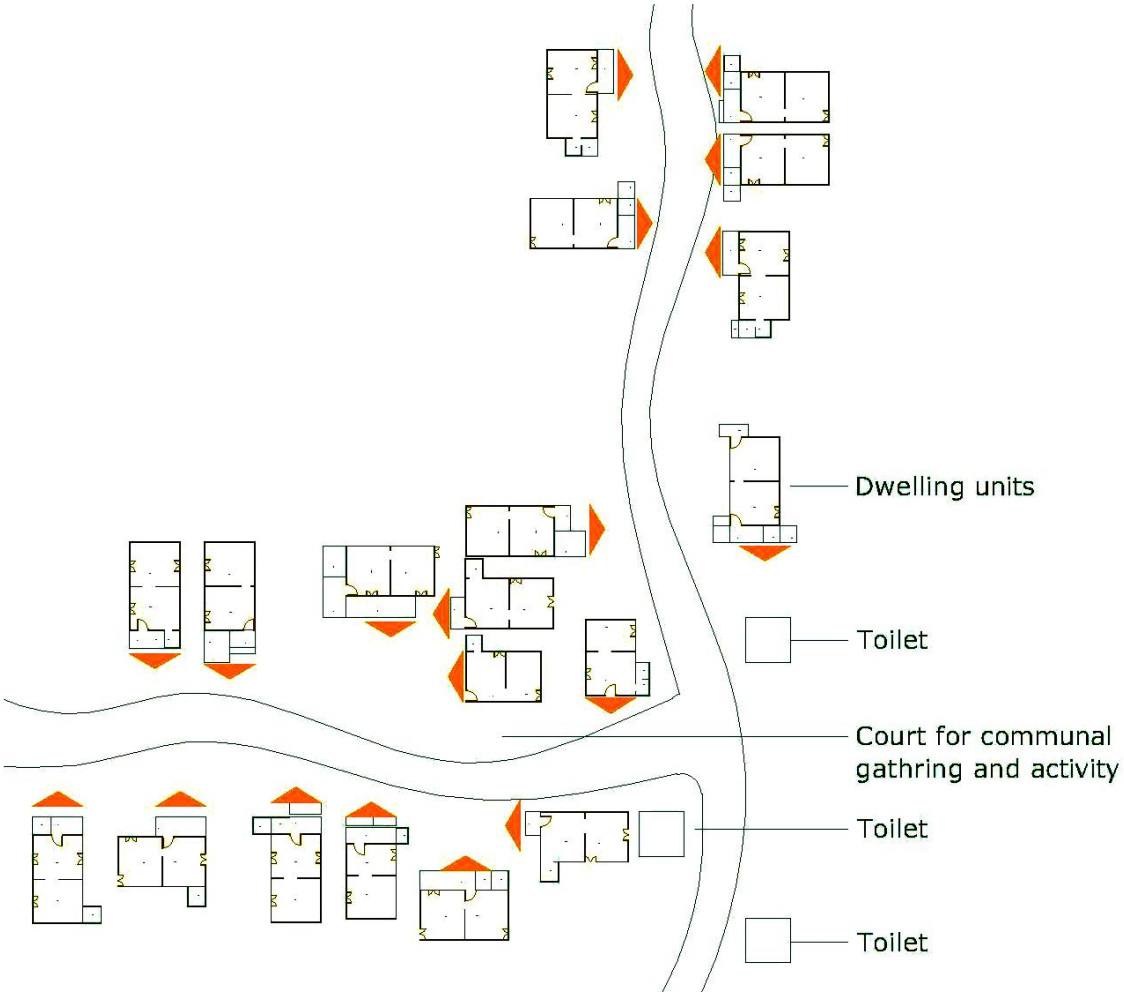


Figure 5.9 Orientation of dwelling units on land

5.2.3 Space and activity

Case A- Pubail, Gazipur (On water)

The settlement has specific space and activity for men, women and children. Women mostly stay 75% of their time in cooking and living area when back from a business trip. They spend time with their child and neighboring women. Men mostly stay outside the boat and in nearby bazar area. They prefer to gossip, play cards or even gambling. They spend time watching TV in nearby tea stall or in the bazaar area. The boats are too small to accommodate the different need of space and activity.

So, they have to use the same mono-space for multipurpose use and adapt according to need. They have very little material possession and use no furniture inside the hut or dwellings. All the spaces are seating oriented and use floor to sleep, sit, eat, gossip, play or read. Only furniture they use is some shelves to store their utensils and other items along boat wall. They use the bottom and rooftop of the dwelling to store items as well. Time to time the user changes inside the boat. When they are in the settlement female members cook, washcloths or dishes and male members go for fishing around or take care of children. Children dive and swim in the water or read inside the boat. From 30 boats 10 boats were selected randomly to analyze. Through a questionnaire survey, interview and observation some findings have been recorded to study their spaces and domain.

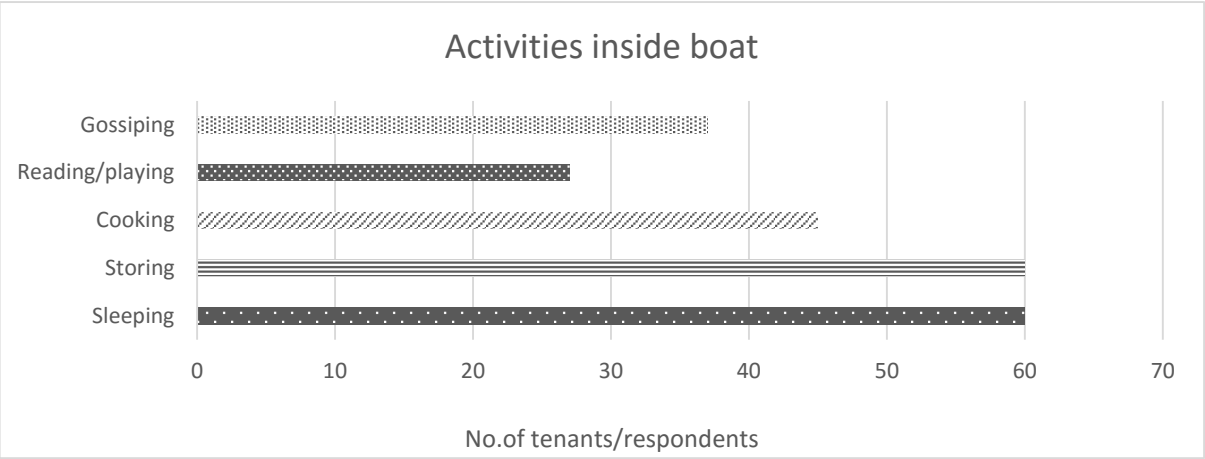
Early in the morning, some members of a unit are found in sleep and female members are found in the cooking zone preparing breakfast. Most of the members rise early in the morning as they go out to work at 8 am in the morning. Typically, most of the members are out of the settlement by noon. But who stays at home, found having lunch and children are found playing or reading at noon. Sometimes the male members go for fishing at noon and children dive and swim in the river. By afternoon most of the member comes back from works or business trip. Some are found having a nap and some are found gossiping or fishing from a boat. At evening the female members are found cooking and others having dinner inside. At night most of the members are found as sleep. As they have to rise early in the morning, they go to bed early. In this small boat, they perform multiple activities. They cook, sleep, store, wash in this small unit. Sometimes they use the same space for a different purpose. For example, they use the sleeping area as living and dining space as well as the store at daytime. The cooking area is placed at the end of the boat. They enter from one end and use the other end as cooking and washing area. They use the bottom and rooftop of the boats to store the items. Items that are valuable and sensitive are stored at the bottom with locker facility. Items that are weatherproof or not so valuable are kept on the rooftop. They use the rooftop as a place for drying clothes and other things as well.

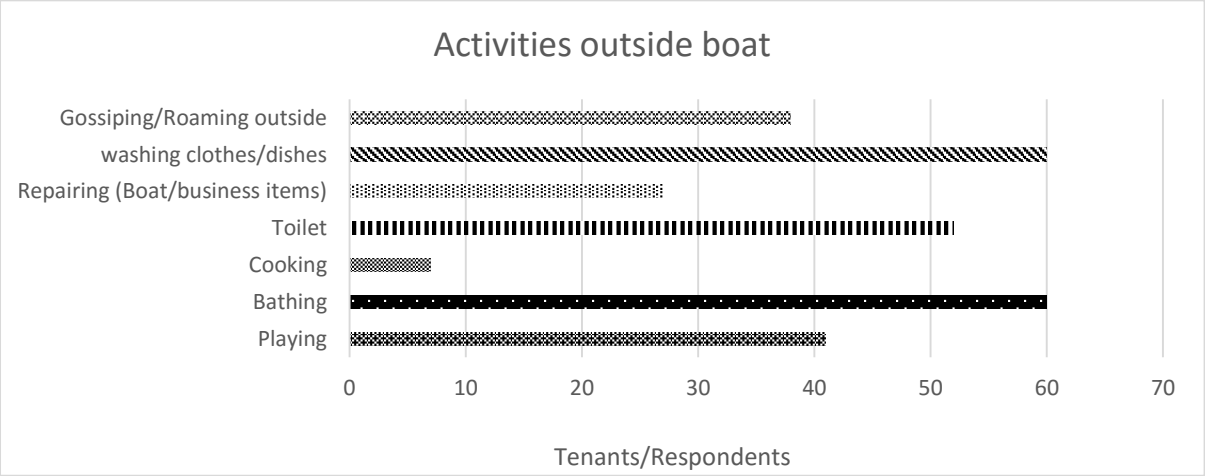
They have to keep so many things inside and they manage to sleep in this tiny space. Inside the boat,2 curve walls have storage selves and they keep the household crockeries item there. They use a lamp that uses kerosene oil as fuel. For cooking,

they use firewoods that their children collect from neighboring areas. As the boats don't have any doors, they use tin sheets to block the boat during the night to keep them safe. During daytime they use fabric, tin sheet or blankets on doorways of the boat to ensure privacy. In their leisure time, most of the members are found either as sleep or fishing. Some of them like to go for bird hunting in their past times. Men are found in local tea stall gossiping or watching TV. Some of the members mentioned they like to play some indoor games like "ludu" or "cards" in their past times. Children are found playing games outside or diving on the water to swim. They play games on water as well.

Figure 5.10 Activities on Boat

(Photography: Md. Nazmul Hoque Nayeem)





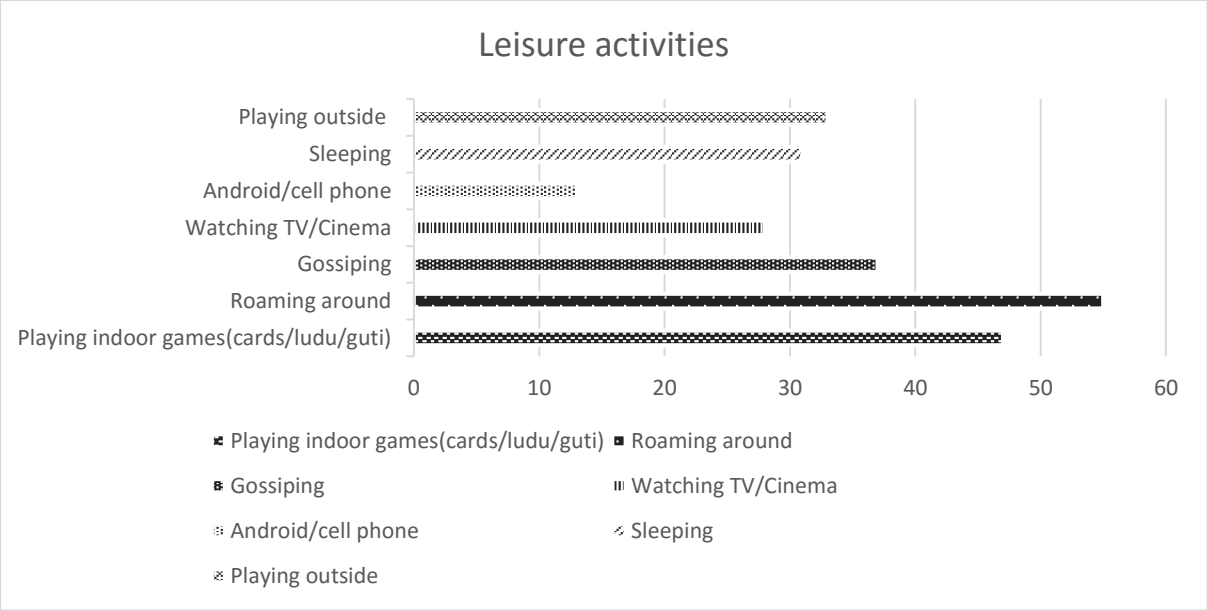


Figure 5.11 Activities of water nomads on boat

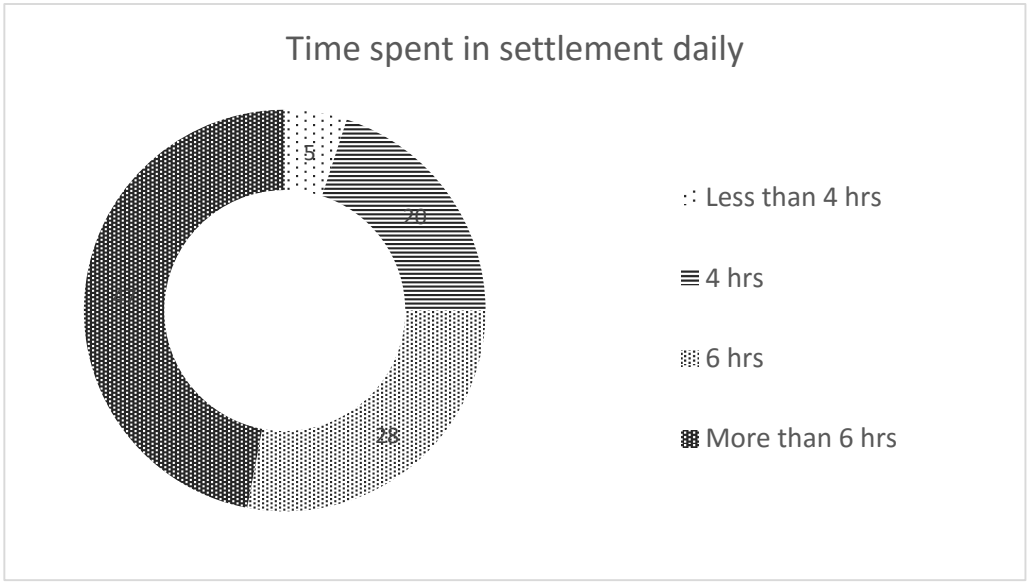


Figure 5.12 Time spent in settlement daily by tenants (on Boat)

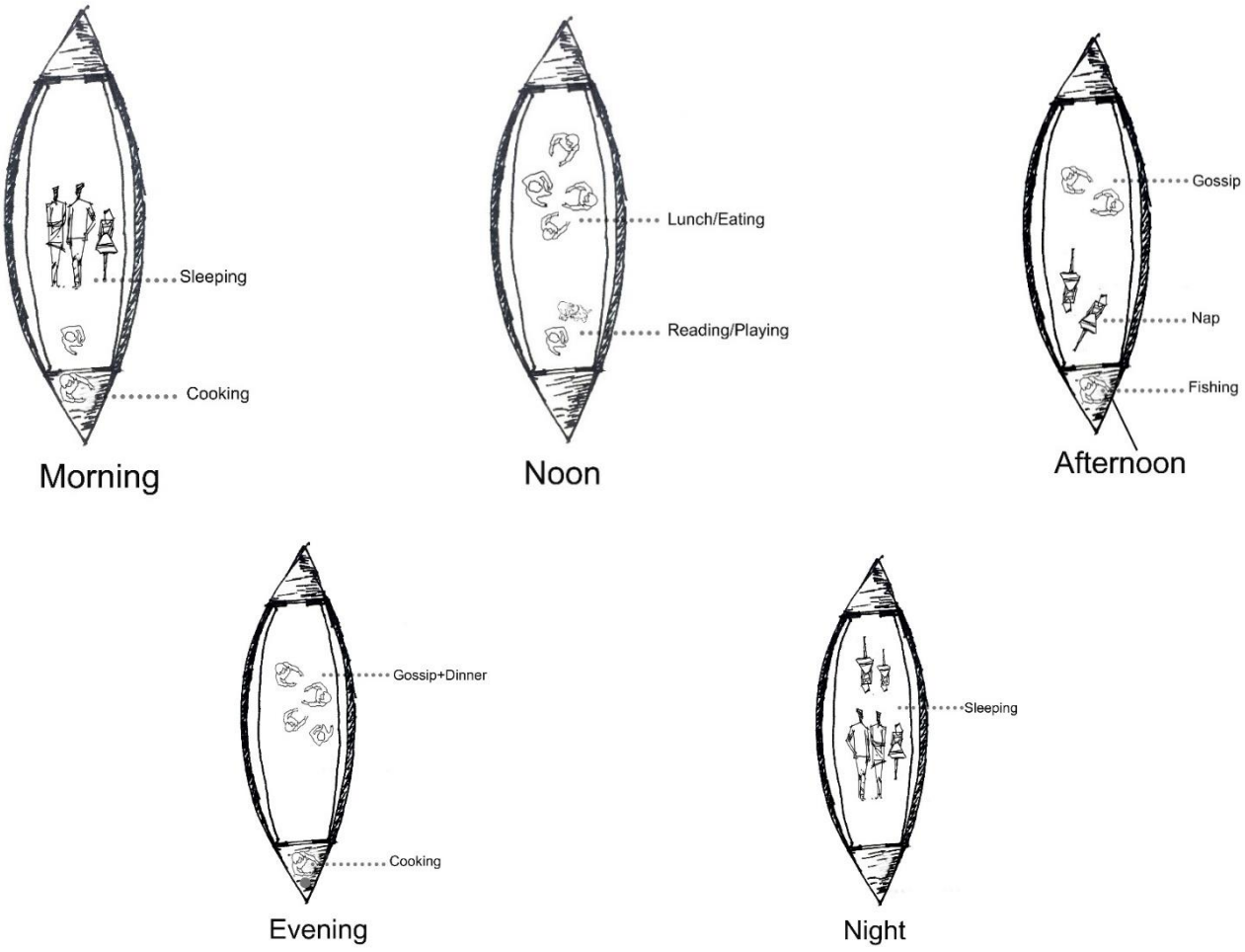
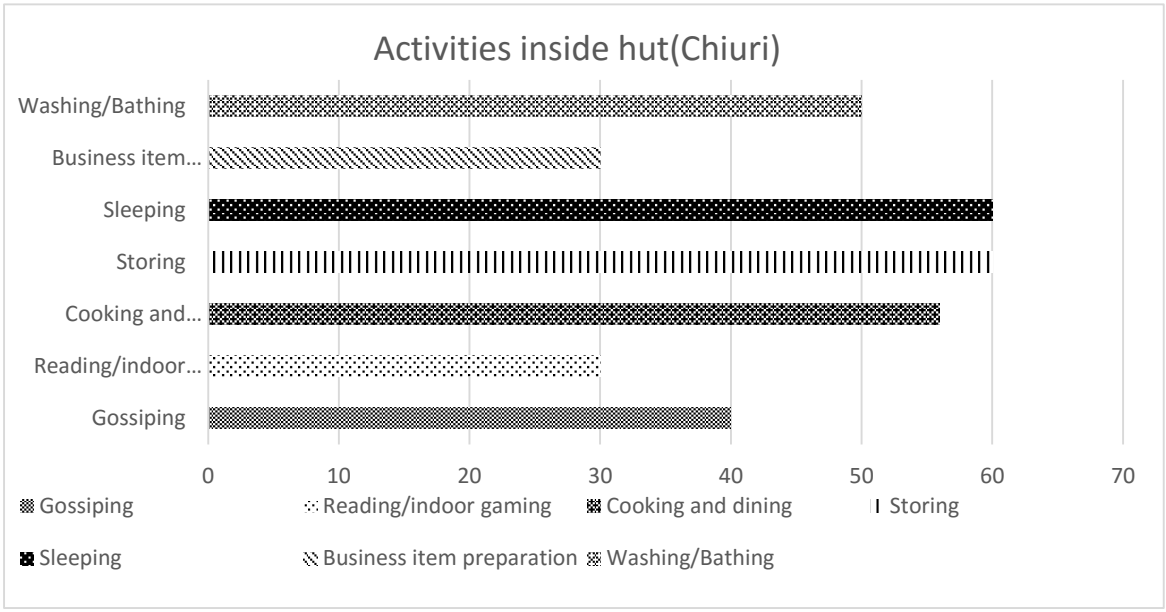


Figure 5.13 Multiuse of same space inside boat at different times of day

Case B- Teghoriya, Kodomtoli (On land)

The settlement has specific space and domain for men, women and children. Women mostly stay in cooking and living area. They spend time with their child and neighboring women. They are very much loyal to their husbands and try to take all the responsibilities on their hand to keep their husband free and happy. Men mostly stay outside the boat and in nearby bazar area. They prefer to gossip, play cards or even gambling. They spend time watching TV in nearby tea stall or in the bazaar area. The settlement components comprised of the dwellings, the tools that they use to run their livelihood and other items that they need to manage their day to day life. They have very little material possession and use no furniture inside the hut or dwellings. All the spaces are seating oriented and use floor to sleep, sit, eat, gossip, play or read. Only furniture they use is some shelves to store their utensils and other items. They use the bottom and rooftop of the dwelling to store items as well. Sometimes space below is used to keep the domestic animals. They use the rooftop as a place for drying clothes and other things as well. Everyday women go out for business at 8 am and come back home at 4-5 pm. Male members of the community do not go out daily for works.

They have dedicated cooking and washroom area. It is located at the entry part of the dwelling. They have community tube-wells and sanitary latrines provided by some NGO. An elementary school was established in 2016 by ‘Gram Bangla Unnayan Committee”. A teacher from Bede community was employed as the only teacher for this school. The children play and sometimes go with their parents to learn the business. They use the courtyard and in-between space as playing zone. The space inside the chiuri is congested. They have to keep so many things inside and they manage to sleep in this tiny space. Inside the dwelling, sidewalls have storage selves and they keep the household crockeries item there. They use a lamp that uses kerosene oil as fuel. For cooking, they use firewoods that their children collect from neighboring areas.



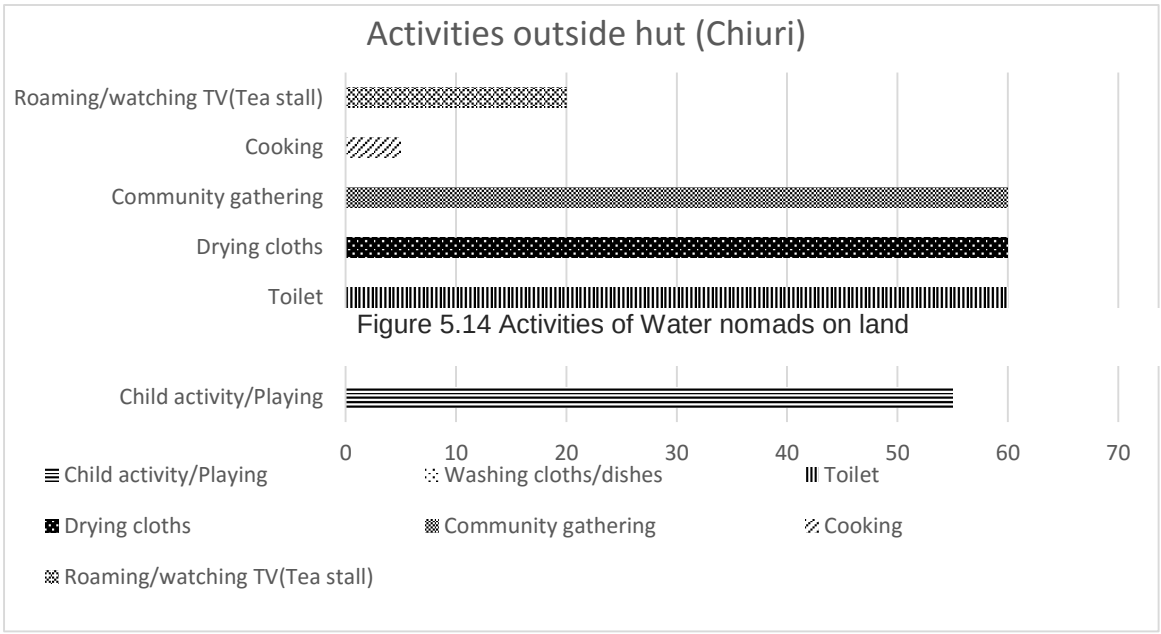


Figure 5.14 Activities of Water nomads on land

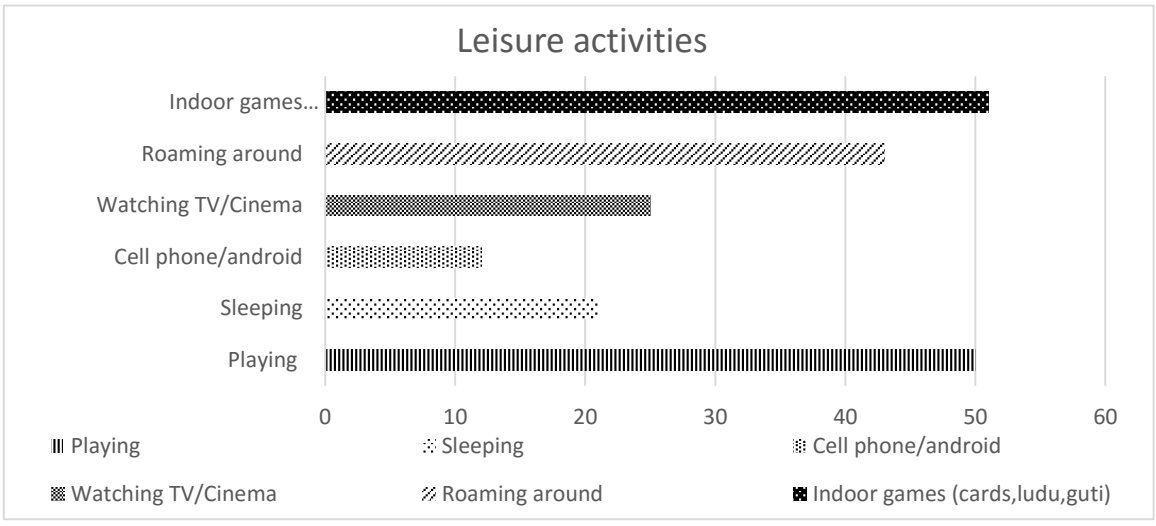


Figure 5.14 Activities of Water nomads on land

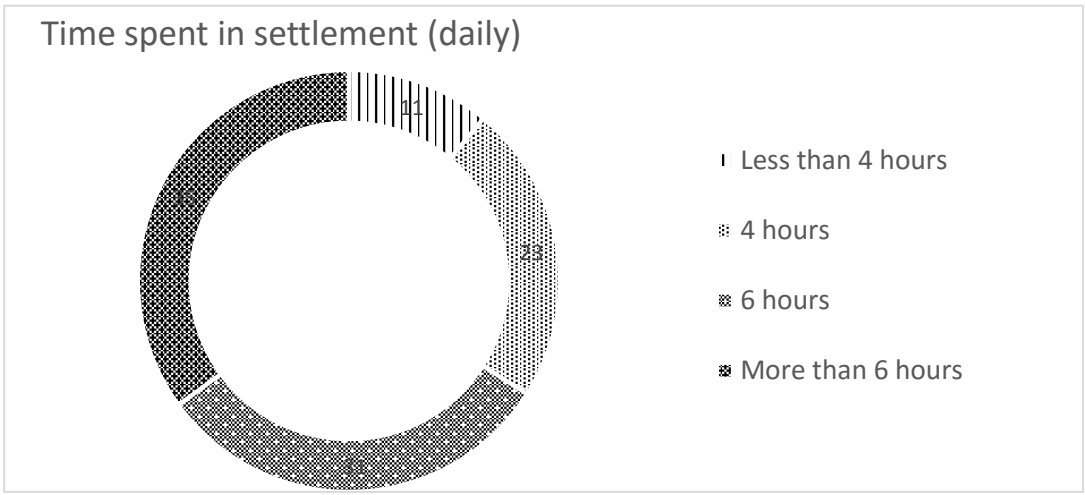


Figure 5.15 Time spent in settlement daily by tenants (on Land)

Figure 5.16 Activity pattern in case B (On land)
(Photograph: Md. Nazmul Hoque Nayeem)

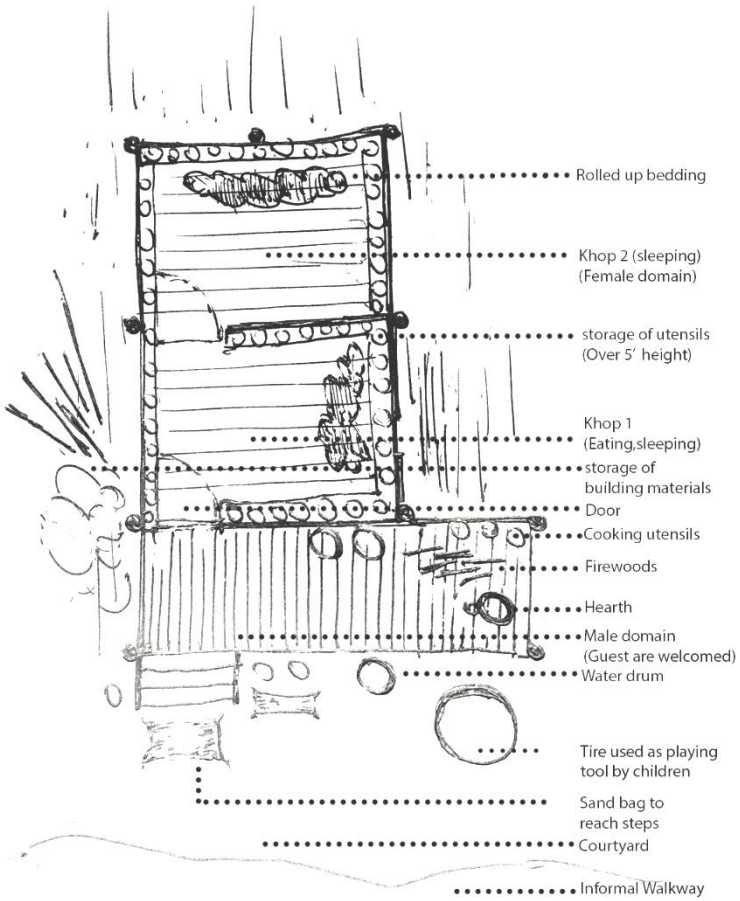


Figure 5.17 Activity and space pattern in case B (Plan of a typical Chiuri)

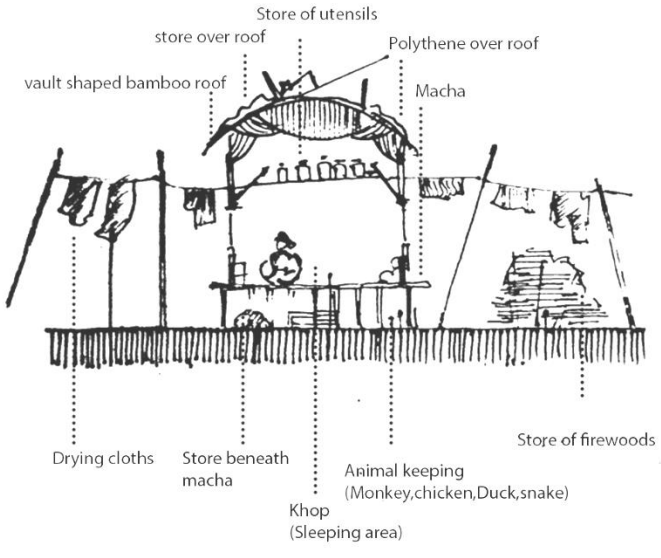


Figure 5.18 Activity and space pattern in case B (Secion of a typical Chiuri)

In Figure 5.17 we can see the Chiuri on land is divided into 4 spaces. Firstly outdoor courtyard, secondly semi-outdoor veranda like entry space (where they welcome guest and which is male domain),thirdly Khop 01 (sleeping and eating zone) and fourthly khop 02 or sleeping zone that is totally female domain.We can see hearth and cooking zone is located at front and along entry veranda which indicates the females of this community has less privacy sense than mainstream sedentary Bengali community.At Entry veranda, they spend their leisure and prepare for business trip. Children are also found playing here. Male and female members are seen gossiping here and as this space is connected to court, more interactions are seen here between community members. In Figure 5.19, we can see the relationship of outdoor and indoor and storage activity is clear from this section. They use their tiny Chiuri for storing different items at different layers. They store and keep domestic animals like monkey, chicken, duck, snake etc beneath the “Macha” or raised platform. Sometimes they keep the snakes inside the khop 01. They store the items that are not sensitive to rain over the roof like “Jhai” (a tool to use during diving in pond for lost items) or fishing items. Roof is covered with polythene to protect from rain. Sometimes firewood is seen beside their chiuri and sometimes beneath the macha. Utensils are seen to be stored inside the Khop 01 and Khop 02 over 4’-5’ height so that activities are not hampered inside.

5.2.3 Syntactic analysis of spaces

This section deals with the comparison and analysis of spatial patterns in two categories of dwelling. The analysis is based on syntactic data generated by space syntax procedures. The Integration value is fundamental criteria taken into account when determining relations among spaces. These two categories of case studies have different kinds of spaces and domain. Some spaces are personal, some are shared spaces. The syntactic analysis of spaces suggests the way space is organized in the sample dwellings. The finding from these two case studies related to spaces and domains are discussed in detail according to activity in this part.

Case-A Pubail, Gazipur

In Pubail, 10 cases were selected randomly to study. Data were collected through interview, questionnaire survey and observation.

Findings from these 10 cases with detail of the users’ profile, space and domain are

discussed below. Along with boats, some dwelling units were also seen in the bank of the river which is just the upper “shed” of the boat placed on land.

The findings show that, there are 3 simple spaces on the boats. Entry, living area and cooking or washing area. Living area is shaded and have control as well as security. Entry and cooking area is open to sky and without privacy. As they spent the day time in outdoor spaces or in business trip, they just need the shaded portion for sleeping, storing and dinning purpose. As they are nomadic, they keep their belongings as minimum as possible as they have to move. They don’t have any furniture except the storing shelves on 2 curved façades. Their activity inside the boat or shed is sitting oriented and that’s why the height of the shed is lower than other sedentary groups. Women dominated domain is cooking and washing area and male members stay outside most of the time. Another kind of hut is seen on land which is extraction of boat on land. They just take away the “choi” or shed of boat and place it on land. This kind of hut is common in other settlements as well. Sometimes they are placed directly on land, sometimes on stilt.

Table 2 Configurational analysis with J-graph (case A)

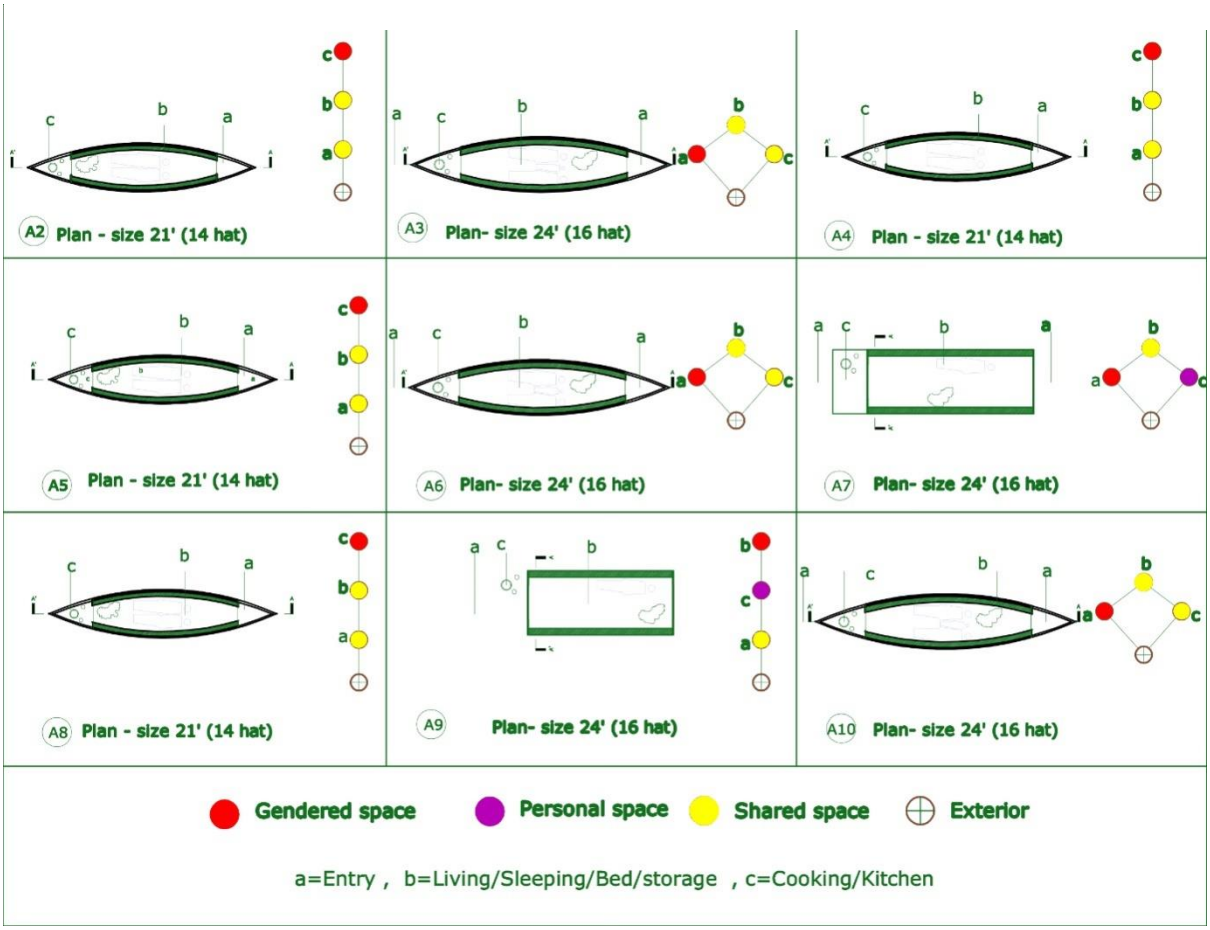


Table 3 : Integration values of activity spaces of case A

Case	Dwelling No.	Exterior/ outdoor	Entry Veranda	Sleeping	Cooking zone	Configuration
Case A Pubail	A1	0.333	1	1	0.333	Linear
	A2	0.333	1	1	0.333	Linear
	A3	1	1	1	1	Linear
	A4	0.333	1	1	0.333	Linear
	A5	0.333	1	1	0.333	Linear
	A6	1	1	1	1	Ringy
	A7	1	1	1	1	Ringy
	A8	0.333	1	1	0.333	Linear
	A9	0.333	1	1	0.333	Linear
	A10	1	1	1	1	Ringy
Average Integration value of activity spaces		0.6	1	1	0.6	

J graph shows 2 different types of spatial organization. One is linear which is mostly seen when entry is from one end. Some of the boats are found with entry from both end. One entry from land, another from water front. In both cases cooking and washing area is placed at water front side. The integration value found for cooking area is 0.333 and for sleeping area is found 1. In these boats, entry and sleeping zone has the highest average integration value (1). On contrary exterior and cooking zone has lower average integration value (0.6) than other spaces.

Entry (1) > Exterior (0.6)

Sleeping zone (1) > Cooking (0.6)

From configurational analysis it is found that, 77% of the studied 10 boats on water (within 14-16 hat or 21 feet-24 feet) have 3 numbers of spaces (Table 5-1) and has shallow linear configuration. Entry to both living and cooking zone from the exterior creates a linear configuration. Rest 33% of the boats and dwellings has shallow ringy type configuration with entry from both ends. The entry and living area are separated by a “parda” or fabric curtain. This helps to preserve the privacy of the internal spaces from the entry. In most of cases, the entry space works as living area to entertain guest. At day time they use the shaded living space as dining or living in some cases but at night it turns to a sleeping zone. The personal or private space cooking zone is located at one end facing the water body.

Case-B Teghoriya, Kodomtoli

In Teghoriya, Kodomtoli, 18 cases were selected randomly to study. Data were collected through interview, questionnaire survey and observation like case A. Findings from these 18 cases with detail information on users' profile, space, domain and activity are discussed in detail below.

From configurational analysis it is found that, 55% of the studied 18 dwellings on land (within 12-16 hat or 18 feet-24 feet) have 5 numbers of spaces (Table 5-3) and has shallow tree like configuration. Entry to both shared veranda space and sleeping space from the exterior creates a linear configuration. This helps to preserve the privacy of the internal spaces from the shared veranda like eating space. In most of cases, the veranda like space just at entry works as shared area to entertain guest. In some cases it was found as eating and preparation space as well (B2, B4,B10,B11,B13).The cell 1 (locally known as "Khop") work as both eating space and child sleeping zone. At day time they use this space for having meal or entertaining guests in some cases but at night it turns to a sleeping zone. This cell 01 acts as the node to the internal personal spaces. B-5, B-7, B-12 has shallow tree-like configuration. In most configurations branching starts from entry or living at depth 1. In B-6, B-7, B-11entry or guest welcoming veranda is absent and entry from exterior is to the cell 01 or eating space. Entry veranda leads to the eating zone and then to sleeping zone. In some cases, cooking area is found adjacent to entry veranda and in some cases cooking zone is located adjacent to cell 01 or eating space. B1 and B14 is exceptional where cooking zone is located adjacent to cell 02 (c).

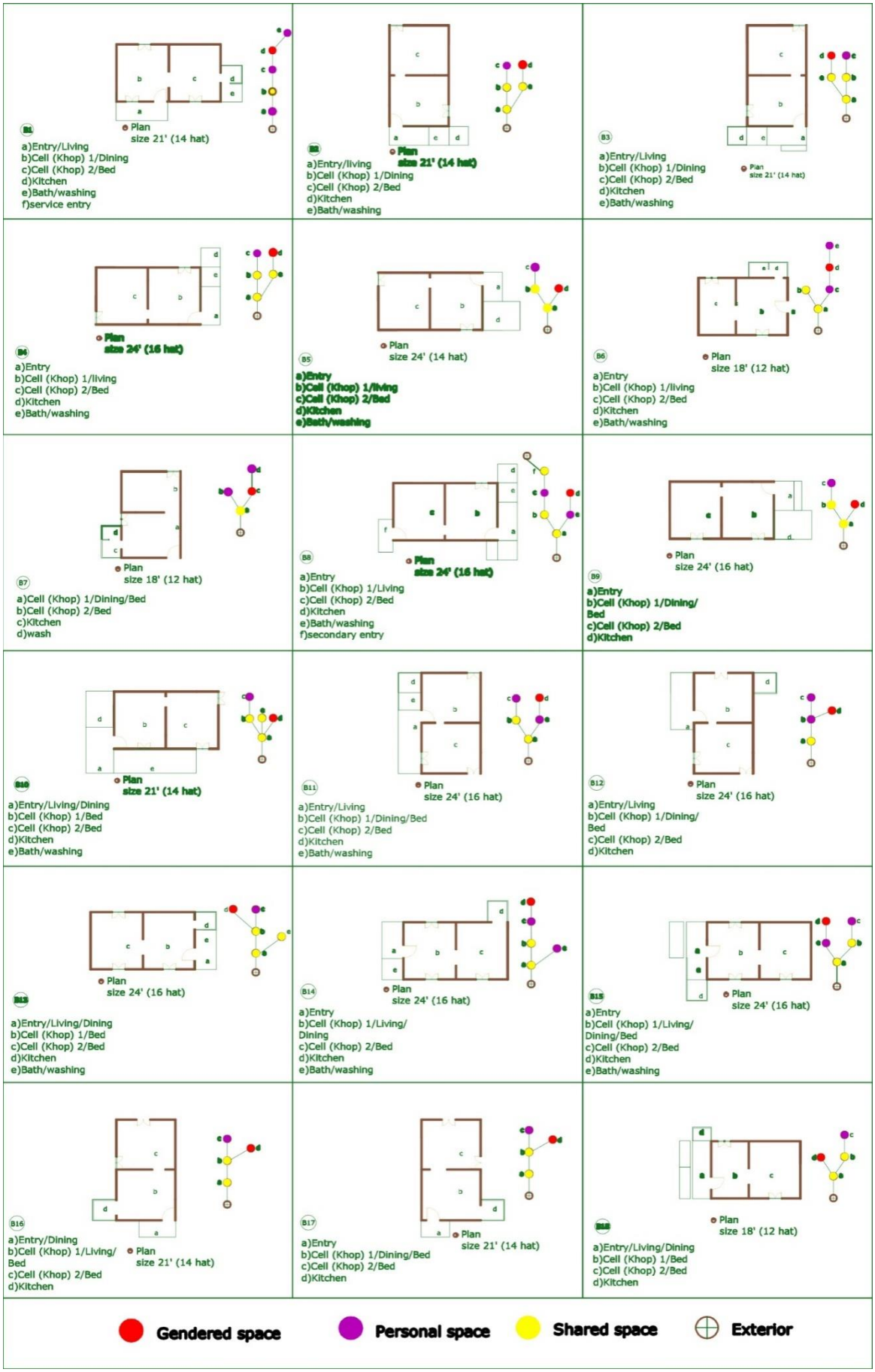
Veranda at the entry in the fourteen dwellings (B-2, B-3, B-4, B-5, B-6, B-7, B-8, B9, B10, B11, B13, B14, B15, B18) create tree like branches with the eating, sleeping and cooking spaces and create choice in access. In most cases this acts as a node with 2-3 connections among the personal spaces and shared space. Eating space (cell 01) is the next node with 1-2 connections that connects the personal or private spaces. Kitchen is the only female gendered personal space adjacent to the male gendered shared spaces. In most cases 2-3 spaces act as shared spaces which are most integrated as well. On the other hand, female gendered kitchen and bedroom (cell 02) are found as most segregated personal space. All the configurations are tree like and no rings are found.

Integration value of Sleeping space (cell 02), washing area and cooking area indicates that they are personal space and segregated. Only in B8 there is a secondary entry and that's why the Bed or cell 02 is a little bit shared here. Entry veranda or living is the male gendered space and shared space with more integration value. Intermediate guest welcoming veranda spaces are connected to exterior as well as other spaces and in most cases, these have maximum choice in movement. These veranda spaces worked as multipurpose spaces and are shared in type. Eating space (cell 01) is a space having more than one connection with more choice of movement and integration.

Table 4 : Integration values of activity spaces of case B

Case	**Dwelling No.**	**EXT**	**Entry Veranda**	**Washing**	**Cooking/ Kitchen**	**cell 1**	**cell 2**	**Vera -nda 2**	**Configur-ation**
Case B Teghoriya Kodomtoli	B1	0.35	0.59	0.35	0.59	0.87	0.87		Tree like
	B2	0.58	1.75	0.87	0.44	0.87	0.44		Tree like
	B3	0.58	1.75	0.87	0.44	0.87	0.44		Tree like
	B4	0.58	1.75	0.87	0.44	0.87	0.44		Tree like
	B5	0.72	2.08		0.52	1.05	0.42		Tree like
	B6	1.49		1.2	3.03	6.02	1.49		Tree like
	B7	1.49		1.2	3.03	6.02	1.49		Tree like
	B8	0.56	1.28	0.72	0.42	1.02	0.63	0.39	Tree like
	B9	0.53	2.12		0.53	1.06	0.42		Tree like
	B10	0.7	3.57	0.7	0.7	1.17	0.5		Tree like
	B11	0.58	1.75	0.88	0.43	0.88	0.43		Tree like
	B12	0.42	1.06		0.52	2.12	0.52		Tree like
	B13	0.58	1.75	0.58	0.58	1.75	0.58		Tree like
	B14	0.51	1.17	0.51	0.38	1.17	0.07		Tree like
	B15	0.46	0.51	0.85	0.46	0.85	0.46	1.72	Tree like
	B16	0.42	1.06		0.52	2.12	0.52		Tree like
	B17	0.42	1.06		0.52	2.12	0.52		Tree like
	B18	0.44	0.87		0.58	0.87	0.44	1.75	Tree like
Average Integration value of activity spaces		**0.58**	**1.507**	**0.8**	**0.798**	**1.43**	**0.59**	**1.28**	

Table 5 : Configurational analysis with J-graph (case B)



The integration value of entry veranda (that is also used as guest welcoming space) varies from 0.51 to 3.57. And in most of the cases the value is more than 1 which indicates this shared zone is most integrated and that's why most of the interactions take place here. And the more interaction takes place, the more possibility of social resilience.

After entry veranda, highest integrated space is cell 1 which is the space adjacent to entry veranda. They use this space as eating space cum sleeping space and it is most active space in day time. They spent most of the time here and at night they use it for sleeping. In some units an extra veranda is found which is also more integrated than other spaces. The integration value varies from 0.39 to 1.75 with average value of 1.28. Here least integrated spaces are cooking and washing areas. These spaces are placed to ensure privacy for women and personal space. But there are 2 exceptions (B6, B7) where these spaces found integrated more compared to others. Average integration values for these 18 cases are arranged from highest to lowest below.

Entry / Entry veranda (1.507) > Cell 1 / eating space (1.43)> Veranda 2 (1.28) > Washing (0.8) > Cooking (0.798) > Cell 2 /Sleeping 2 (0.59)

From above case studies it is clear that most integrated spaces are the threshold spaces- entry veranda spaces. Those spaces are used as guest entertaining or shared space of this dwelling. They receive their guests in these spaces and arrange any meeting with outsiders here. The cooking and washing area are also connected from these public domains in some dwellings. In some cases, the cooking and washing area is placed adjacent to the main entry or veranda. That means unlike mainstream sedentary community they do not consider the kitchen or washing area as private activity. And Kitchen and washing area is female gendered but it is connected closely to male gendered main entry very closely in many cases. That indicates their sense of privacy is different from mainstream community. And as women are strong decision maker and wage earner in this community, they take part in decision making in public arena.

Concluding on the general configurational properties of the 18 dwellings the following points can be claimed from the study:

• In most of the small compact nomadic dwellings on land transition space is absent in between spaces and one enters directly to the entry veranda cum guest zone from the exterior space. This is a shared space and threshold space between indoor and outdoor. Eating or cell 01 which is a shared space act as a node, distributing access from it to the female gendered spaces (sleeping and cooking space) and gives choice in movement which helps to protect the privacy of the female gendered spaces.

• Most of the dwellings have configurations with 4-5 spaces.

• Entry veranda, the male gendered space, is mostly shared space (in 77% cases shown in figure 5.20) and 33% entry veranda can be regarded as segregated in the spatial organization.

• Shared space eating area has maximum choice in movement within the spaces. This space is used by both genders throughout the day. 17% of this type is connecting 3 spaces and 83% is connecting 2 spaces having choice of movement in the shared spaces.

• Female gendered and personal spaces- sleeping space (cell 02) and cooking space, are spaces having one connection. These are terminal spaces with maximum privacy and segregation. Cooking space is a personal space as cooking is found to be performed by the female members in most of the studied dwellings and accessed from eating space.

5.3 Ecological analysis of dwellings: Materials and construction techniques

This section deals with the analysis of construction techniques and material use in dwelling units. Ecological design clues in local examples are explored by drawing attention to natural materials, traditional construction techniques, ingenious design and spatial organization strategies required for comfort, satisfaction, and well-being of occupants. The analysis is based on observation and interviews. These two categories of case studies have different sorts of construction techniques and materials. The ecological analysis examines the way material is used in the sample dwellings. The finding from these case studies related to construction techniques and use of materials are discussed in detail in this part.

Case A- Pubail, Gazipur

5.3.1 Individual unit size (Boat)

The size of a boat is approximately around 21'X6' or 24'x5'. Length vary from 12' to 24'. Small "Dingi" or boats without shed is typically 12' and boat with shed is 21' on average. Height of a boat is around 5'-6'. The Bede community count anything with their hand (Hat in Bangla). So, they measure their boat or shelters in hat. Each large boat cost 20-25,000 BDT to build and small boat cost 7,000-8,000 BDT. The boats are placed on a side of the river. Typically, they choose a less crowded and calm place to settle their fleet. This settlement is situated near a bridge and the village settlement of sedentary community is on the other side of the river. The nearby village settlement is at least 1.5 km from this settlement. The boats that are used solely as transportation has no shed over the head.

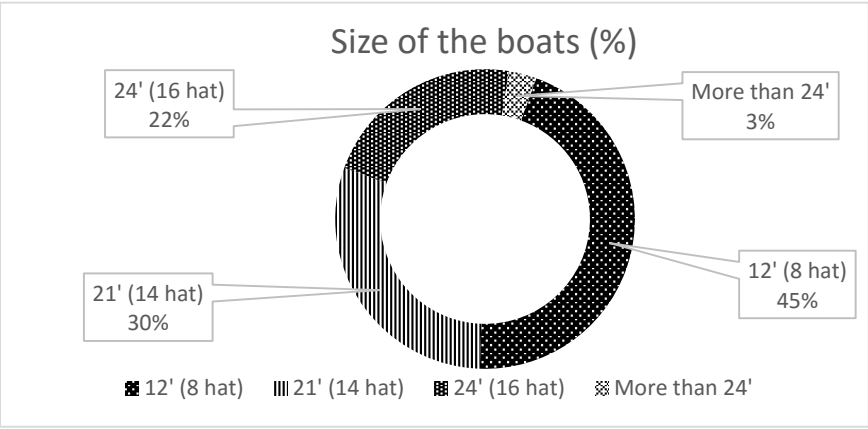


Figure 5.19 Size of the boats of Water Nomads

5.3.2 Material and construction (Boat)

The nomadic people of this settlement used to build their boats with wood and bamboo. The lower portion of the boat was made of wood and upper portion was made of either bamboo or wood. Wood is the most commonly used material. Traditionally, boats are made by carpenters who learned their skill through an apprenticeship. Seasoning of timber is important in boat making. Commonly used timber are from local woods *Jarul* (dipterocarpus turbinatus), *sal* (shorea robusta), *sundari* (heritiera fomes), and *Burma teak* (tectons grandis).

When they used to build bigger boats in the past, they totally used wood. But now a days they have little to invest in their boat and they use bamboo or tin at the upper portion. As bamboo and bamboo made products has become scarce too, they have chosen tin as material for last few years. They sometimes use polythene to cover the boat to protect it from rain. Various parts of the boat include: Khol (lower hollow curved part), Pata (platform or base), Choi (shed), Mast or Dar, Pal (sail) etc.

They first built the lower parts and later construct the “Choi”. They built the parts separately on land and later assemble part by part. Sometimes they buy the ‘Khol’ and ‘Pata’ from boat market or local wood craftsman and they built the upper part ‘Choi’ near their settlement. At both end they add 2 wooden door frames. As door or enclosure, they use a curved thing called “Jhap” at both end for security and safety. When they stay on water, they use one end as washroom or toilet and drop the excreta on water. They ensure privacy as well with this ‘Jhap’ when they need to use one end as washroom or toilet. It is adjustable and typically placed on roof when not in use. They use several bamboo posts or “Khuti” to stabilize the boat when anchored. These posts are places at both end and both side of the boat. Ropes are used to stabilize the boat and bind them with the post. When anchored, they make small bridge or “Saku” with each boat to reach them without getting wet.

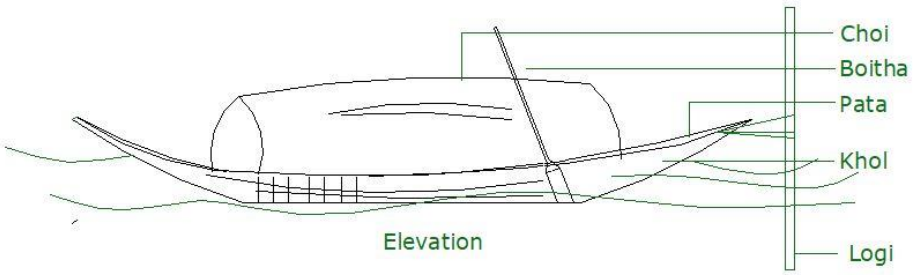


Figure 5.20 Different parts of a boat

Figure 5.21 Construction techniques of boat

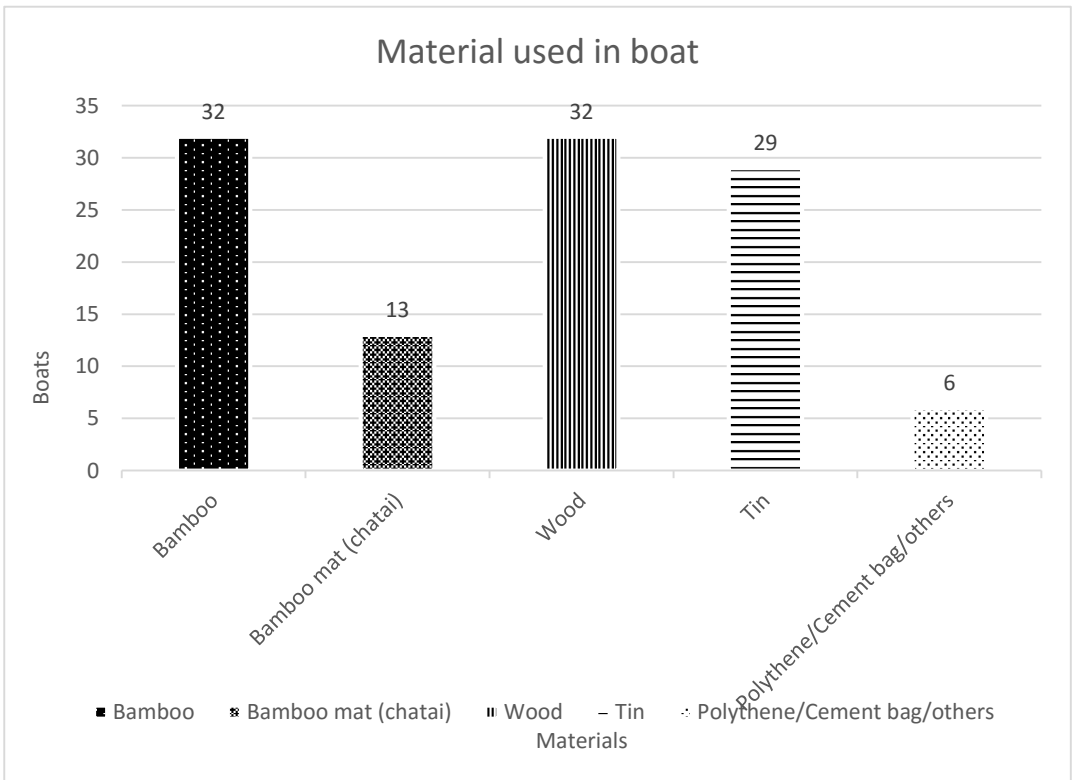


Figure 5.22 Material used in boats of water nomads in case A

Case-B Teghoriya,Kodomtoli

5.3.3 Individual unit size (Hut/Chiuri)

The size of a hut or chiuri is approximately around 18'X12' or 16'x12'. Average height of a chiuri is around 6'-7'. Some of the chiuri are now seen to be around 20' x 14'. As the economic condition improves, they enlarge the chiuri. Each hut or chiuri cost 20-25,000 BDT to build. The chiuri is placed on stilt so that the materials can last longer and they can keep them safe from insects or animals.

In this small space, they perform multiple activities. They cook, sleep, store, wash in this small unit. Sometimes they use the same space for different purpose. This community has defined spaces within their dwelling unit. The entry area is like a verandah and so many activities happen here. They use this as living or dining area in some cases. They gossip and welcome guests in this area. At one corner they have a washing area as well. In some cases, cooking zone is located in one side of this portion.

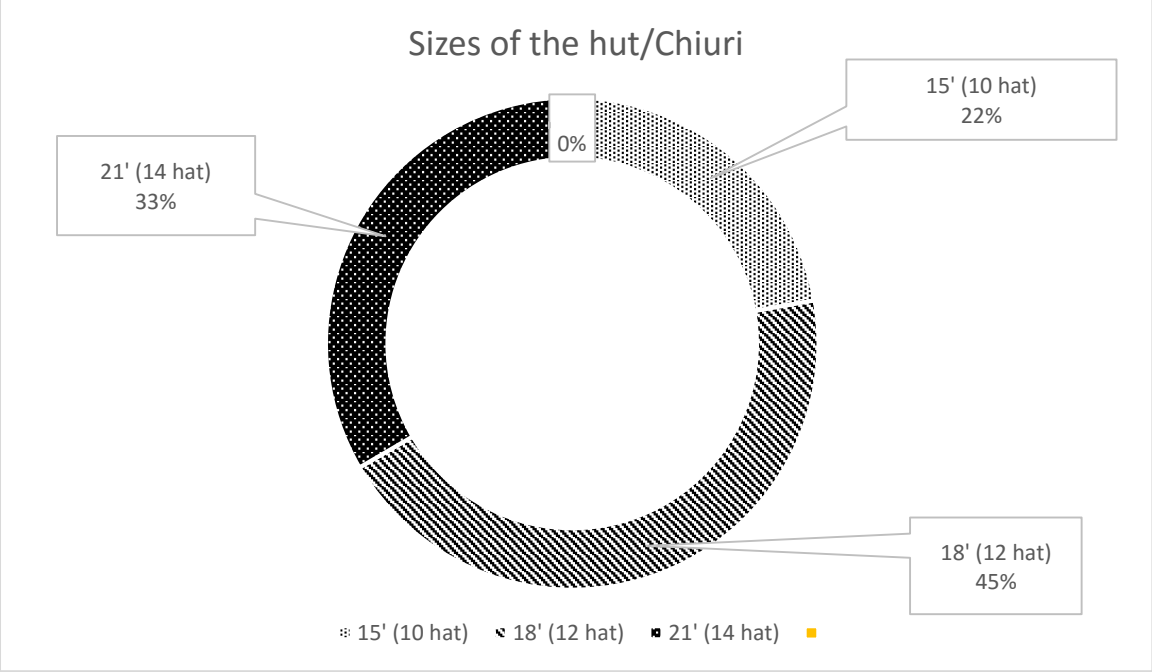


Figure 5.23 Sizes of the Hut/Chiuri

5.3.4 Material and construction (Hut/ Chiuri)

The nomadic people of this settlement used to build their huts or dwellings with wood and bamboo. The lower portion of the dwelling was made of bamboo and upper portion was made of bamboo, wood or combination of both. Bamboo is the most commonly used material in this case. Traditionally, dwellings are made by carpenters. Sometimes the community members made the dwellings by themselves with collaborative effort. The dwellings are erected on some posts or stilts. Then on this a platform is made with bamboo and bamboo made “chatai” or mats. On this platform the roof is erected which is made of bamboo and wood. They use polythene to cover the roof and save the materials from rain and water. Polythene is chosen for 2 reasons. It is cheap and waterproof. Sometimes plastic cement bag is also used for covering the roof. Fabric is used in interior space in ceiling, partition and as floor cover. For selection of materials their first concern is, it should be either of no cost or of lowest cost. They, like other hunter gatherer and nomadic tribe, depend totally on nature and surrounding environment. Instead of buying materials like sedentary community, they collect and gather like birds from surrounding. And they never waste a single material and resource. Each and every material that has minimum lifespan or utility, they store for future use. When they have to move from one site to another, they carry them and reuse the same materials of dismantled dwelling.

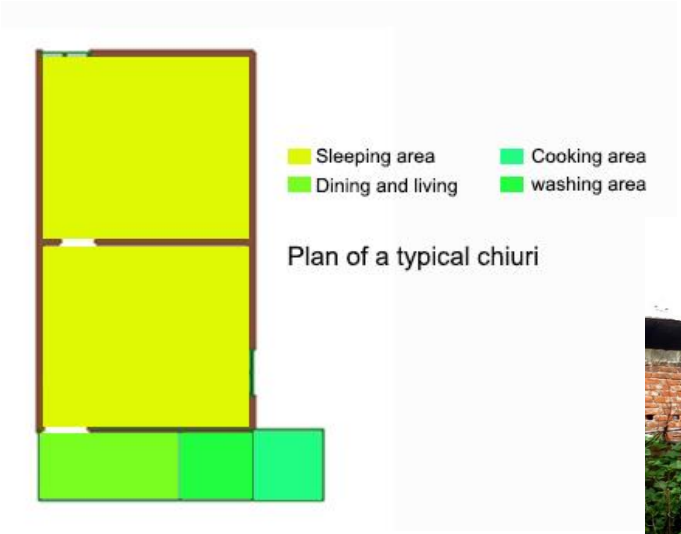


Figure 5.24 Plan of typical Chiuri

Figure 5.25 Children playing in front of a Chiuri

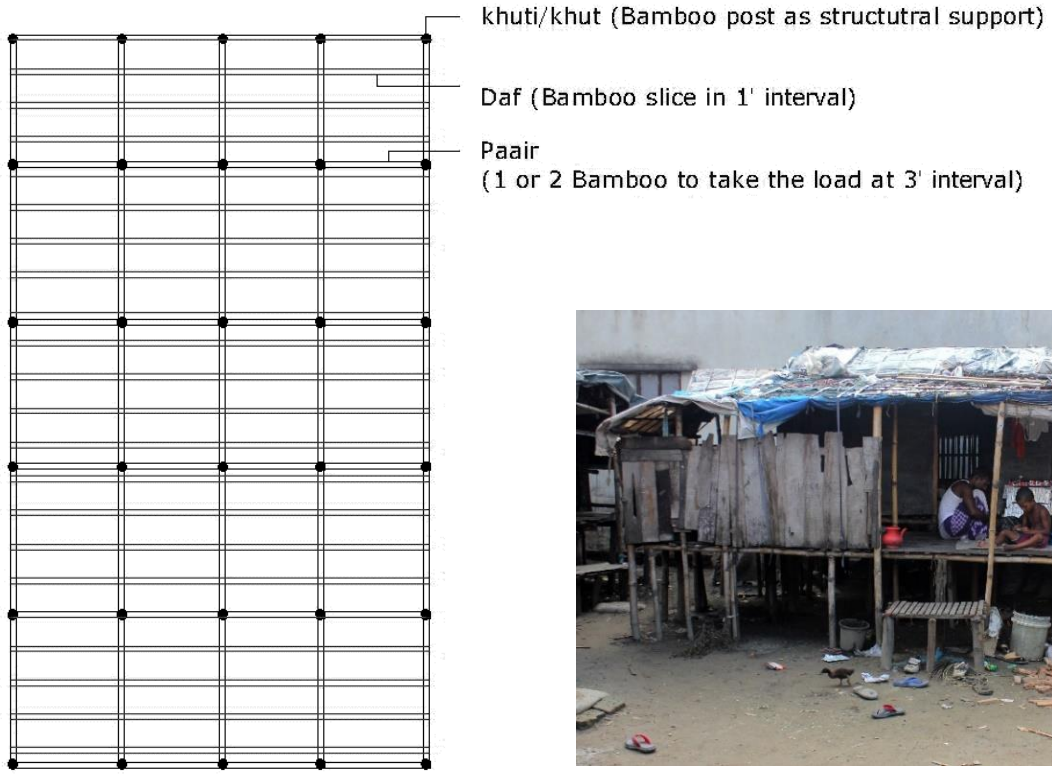
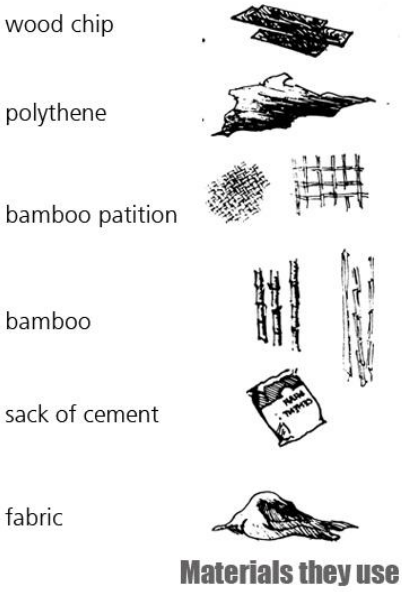
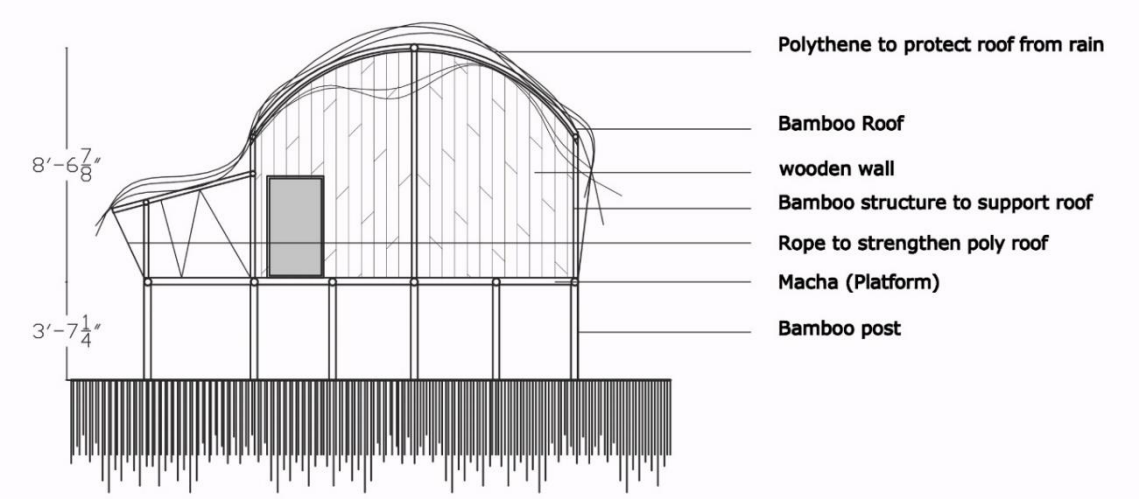


Figure 5.26 Structural element of a Chiuri

Figure 5.27 Activities in veranda of a typical Chiuri





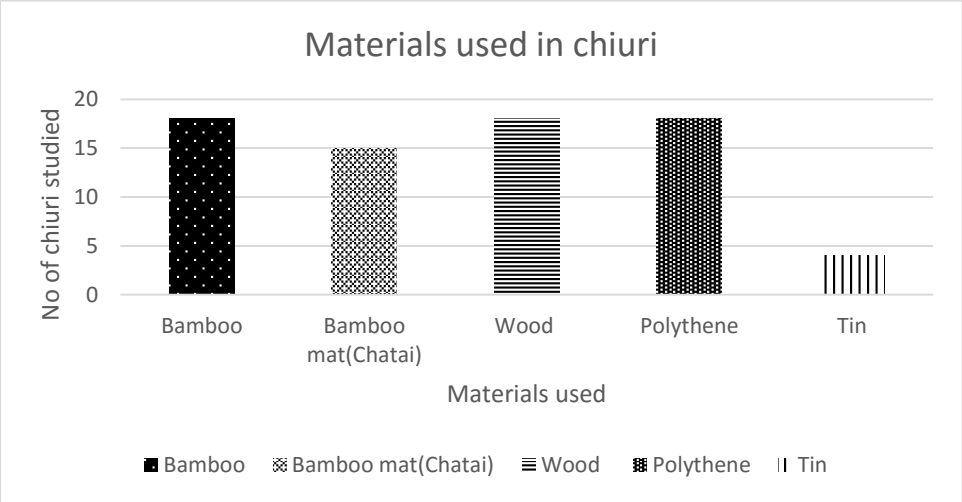


Figure 5.28 Materials used in Chiuri/ Hut

5.4 Discussion

The above discussion of the socio-spatial syntactic and ecological analysis of two category of dwellings (boat and hut/chiuri) on two different site illustrates a pattern of orientation, activity-based space (shared/personal), integration and diversified use of locally available materials.

Space and activity pattern in boat **(case A)** indicates they use a space for multipurpose and activity changes time to time to adapt in changing situation or need. This is an adaptation technique to sustain a living in a tiny and tight spatial organization. Activity inside boat includes gossiping, food preparation, taking meal, sleeping, reading, storing, playing etc while activity outside the boat includes washing clothes/dishes, repairing boat, bathing, playing, roaming around, playing outdoor games etc. Where activities inside the boat are more personal and segregated, activities outside boat are more shared. On water leisure activities includes watching TV/cinema, playing, gossiping, roaming around etc.

In hut/chiuri **(case B)** activity includes gossiping, taking preparation for business trip, cooking, having meal, playing indoor games, storing, sleeping etc. and activity outside includes roaming around bazar, watching TV in tea stall, community gathering, drying cloths,having bath/toilet, playing etc. Orientation of boats and dwelling units indicates they are used to organize their boat/chiuri to maximize integration and interaction among them. In case B the Chiuri/dwelling units are arranged so that each unit can see other neighboring units and members. Courtyard are formed through orientation of units to ensure maximum interaction and collaboration. Their formation of settlement is direct reflection of their social life that indicates orientation or organization of units can reinforce the scope of social resilience through collaboration of community members. And this can construct path for social resilience.

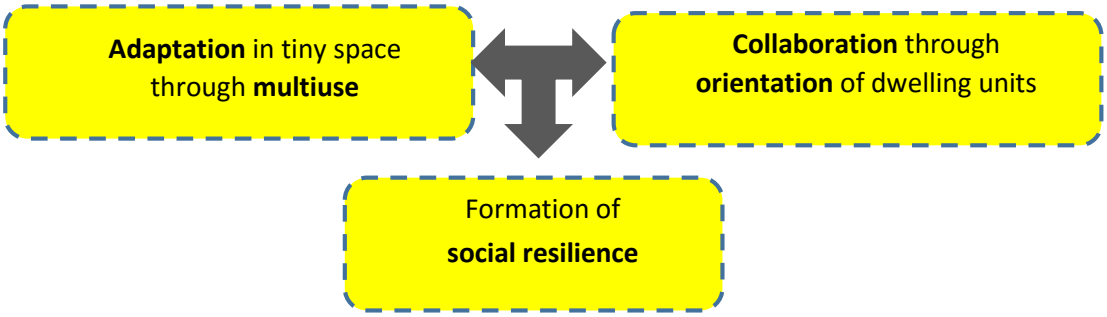


Figure 5.29 Social resilience through adaptation with multiuse,collaboration,orientation

In syntactic analysis section, justified graph shows a variety of integration values of different activity spaces ranging from 1 to 0.33 in case A and 0.35 to 6.02 in case B. Here it is clearly noted that most integrated space is entry veranda in all types of dwellings which is directly connected to outdoor. Another shared space living room (room 1 in case B) is also located at a better integrated zone. And integration value of cooking area and sleeping space is lower than other spaces. It is also noted that integration value in case B is higher than case A between 2 groups of settlement. From the study of the activity space it is found that, integration value of activity spaces is directly proportionate to their frequency of family interaction. Increase of integration of activity space accentuates the opportunity of more community interaction and hence open up scope for social resilience. In both cases, interior organization and in its relation to settlement space, social conventions lack the strong exogenous model which characterizes Bedouin domestic space like organization. Women are not separated from men within the domestic interior, and control of the space outside is neutral with respect to its use by men and women. Visitors are not differentiated according to their different roles and statuses. Sense of privacy is less and gender-based space arrangement is not prominent like sedentary spatial organization. Hence some spaces can be identified as more shared than other and personal spaces are only active at night time.

Analyzing the depth of the studied dwellings on land (case B) it is seen that the male gendered spaces in the nomadic boats or dwellings are located near the entry at depth 01 or depth 02. The shared spaces are located at the beginning or central position of the configuration from where the female gendered spaces are accessed in the domestic space. Cell 01 or eating space act as transition space which is located at depth 02 and it connects the female gendered personal spaces with the

shared spaces. In 28% of the dwellings on land (case B) the cooking area is located at depth 02 adjacent to the entry veranda or male gendered space and in 72% of the dwelling's kitchen is located at depth 03 or 04.

Different spaces in the nomadic dwelling on both cases follow a characteristic: Shared spaces are highly integrated and gendered spaces are segregated.

Figure 5.30 Shared spaces are integrated and gendered spaces are segregated and personal

Shared space creates opportunity for more social interaction that ensure social resilience through sharing and collaboration. Less use of segregated gendered or personal space indicates they don't practice isolation and seclusion. As they have to live a marginal life, they can afford less and that's why their belongings are very selective and minimal. And privacy of space is less affordable for them. Another reason of having less belongings is as their boats are not engine driven, they have to drive that boat for moving to new place to settle. Keeping minimal basic items inside boat help them to move easily with boat. And to lead a mobile life on boat they have to choose basic essential items to carry on. For settlement on land (Case B), it is also applicable as they have to move with all the belongings in van or hand driven cart if the land lord evacuate them from a land. Their mobility

Ecological analysis denotes that they choose more locally available low-cost materials like bamboo, wood and tin to adapt in changing context. In both cases their response is more resilient as well as ecofriendly as they touch the ground softly and flow with the nature. Therefore, this approach creates scope for ecological as well as environmental resilience. Another consideration they keep in mind is cost and availability. Unlike sedentary community they basically collect materials and built their boats or dwellings themselves. And they collect the materials from their visit to nearby locality. The techniques and selection of materials are very ecofriendly and ecologically resilient. Their methods and interventions have very little impact on environment. Their life on boat or on stilt both have very minimal impact on

surroundings. On water they flow with water and on land they touch the ground softly.

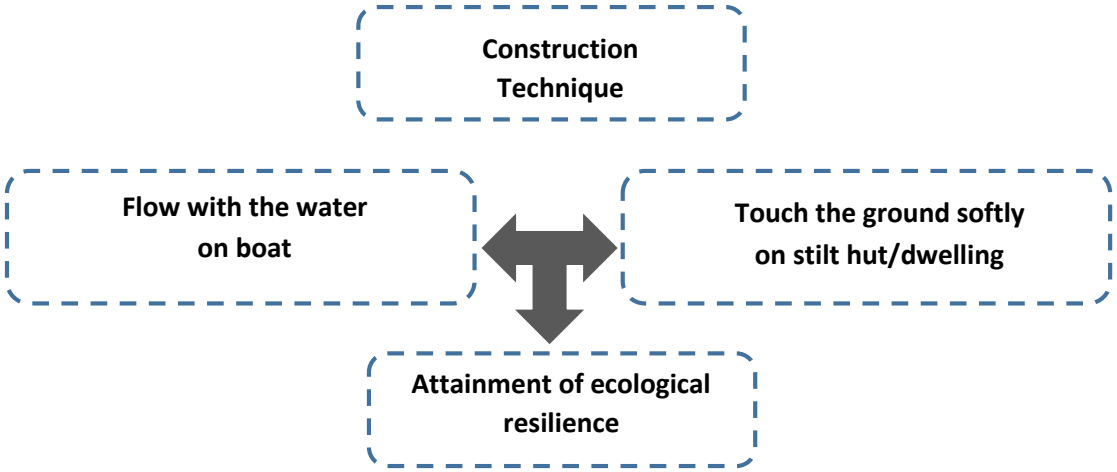


Figure 5.31 Ecological resilience through vernacular construction techniques

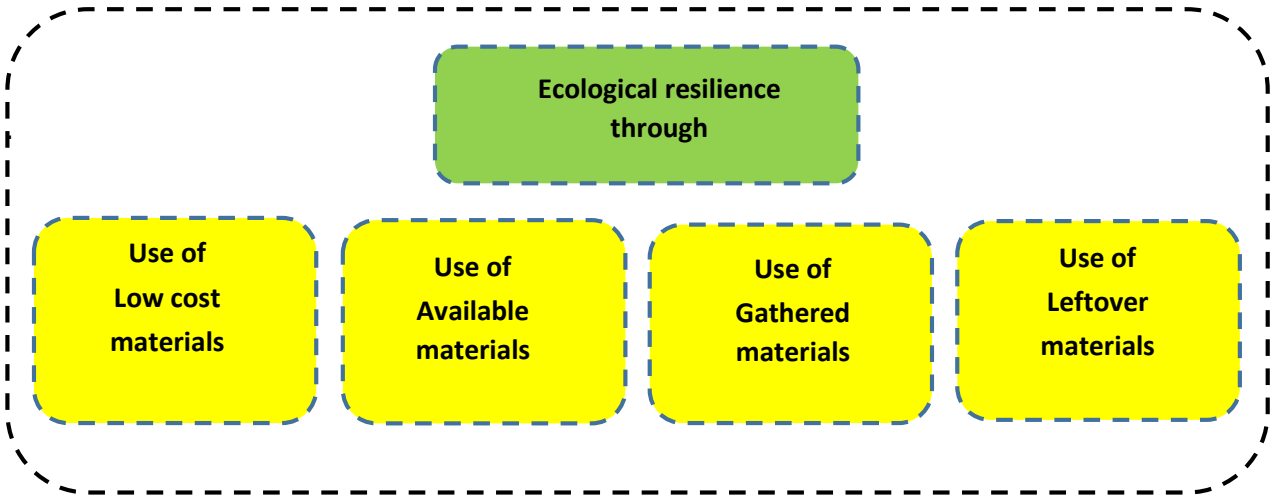
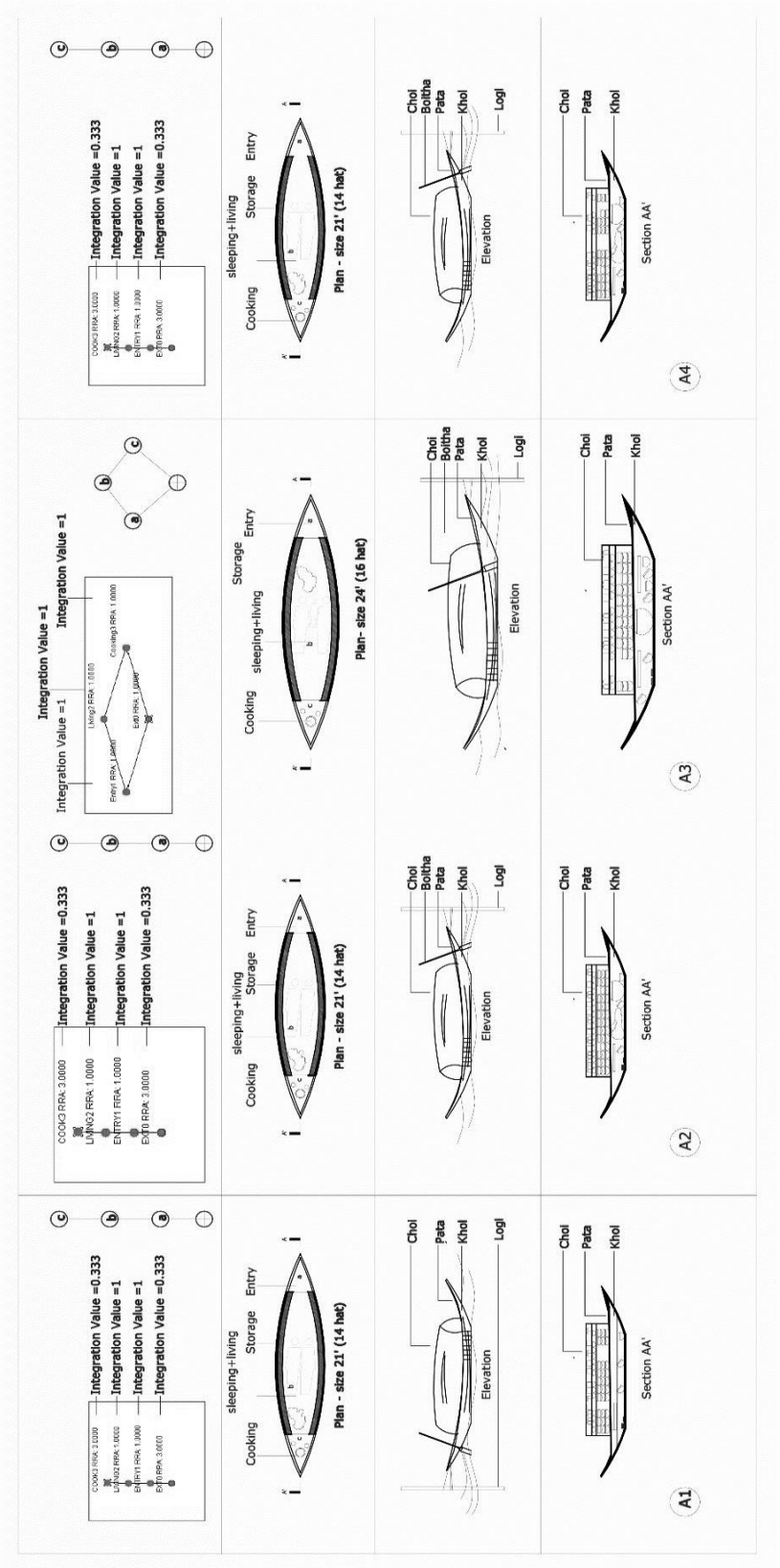
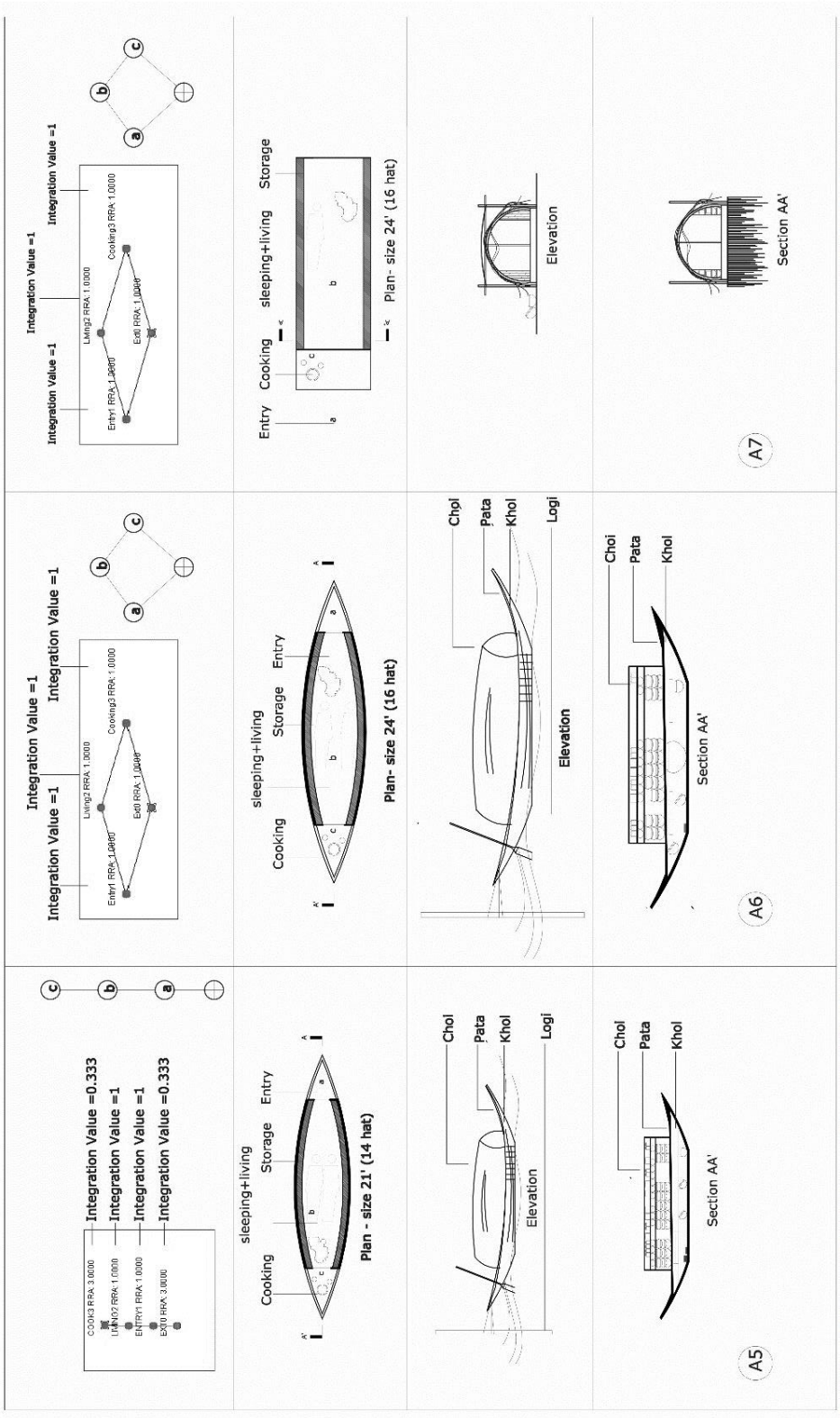


Figure 5.32 Ecological resilience through diverse material use

Table 6: Plan depth of space and integration values of *28* studied dwellings of *2* cases

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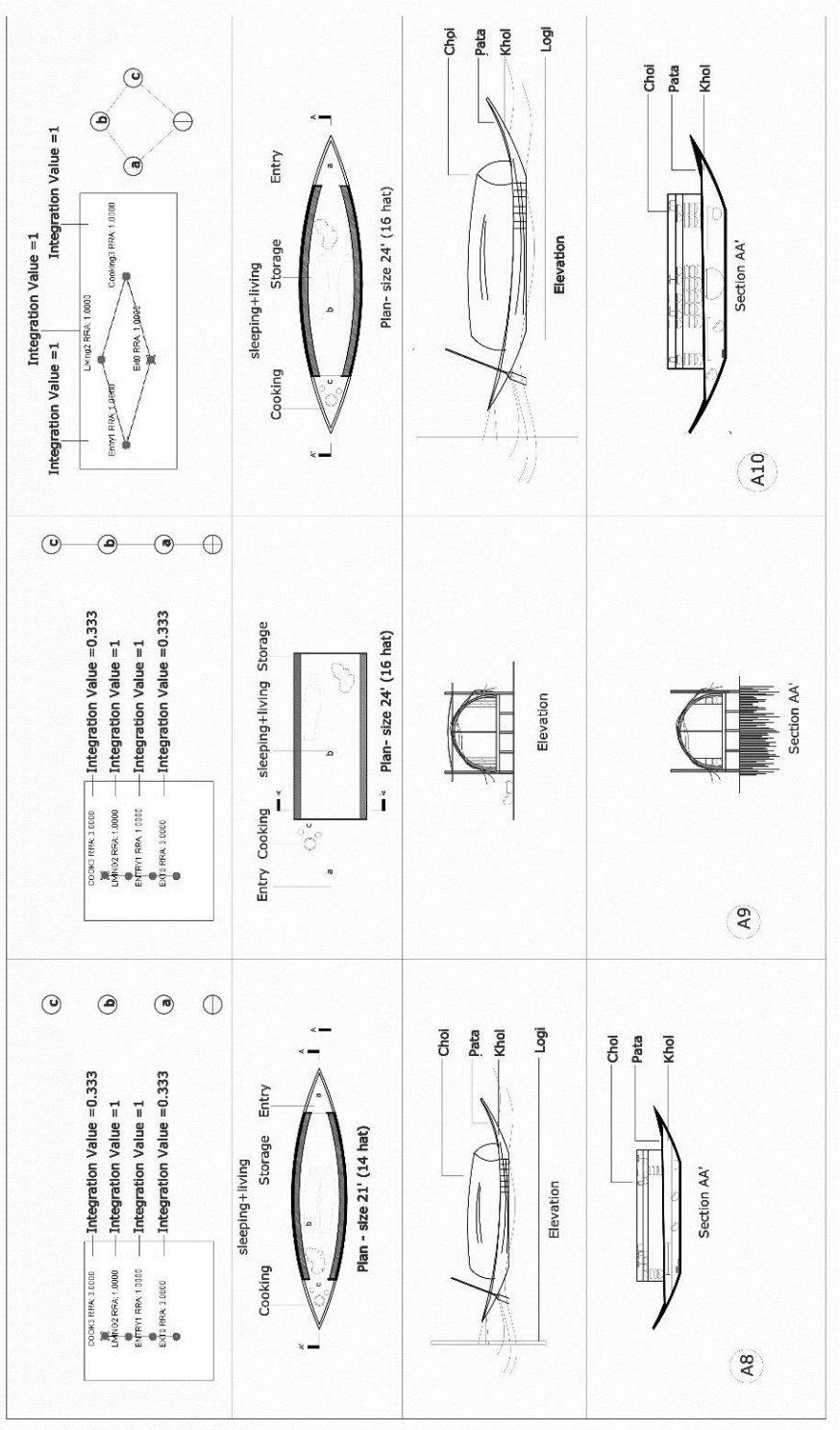
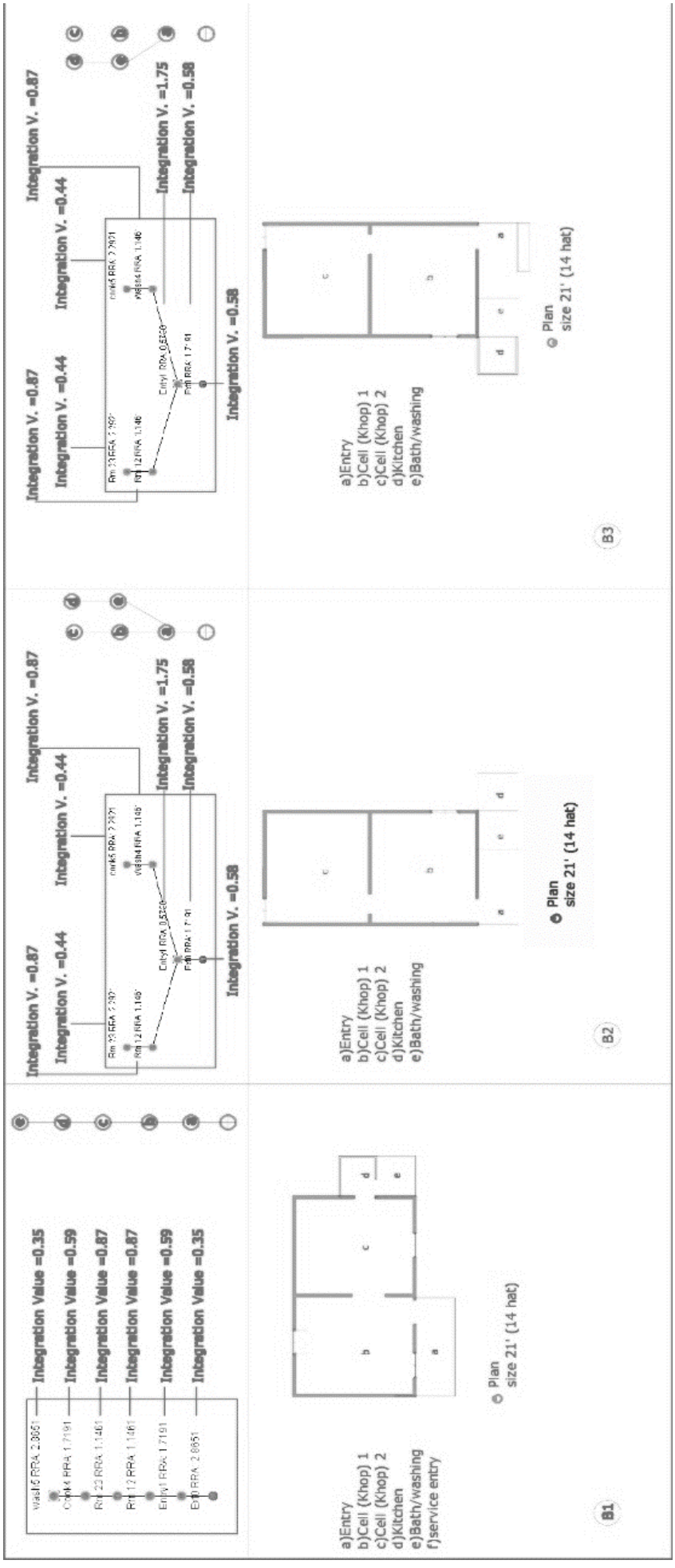
Integration Value =1
Integration Value =1
Integration Value =0.333
Integration Value =1
Integration Value =1
Integration Value =1
Integration Value =1
Entry
Cooking
sleeping+living
Storage
Plan - size 21' (14 hat)
Plan- size 24' (16 hat)
Plan- size 24' (16 hat)
Chol
Pata
Khol
Logi
Elevation
Section AA'
A5
A6
A7


Integration Value =1
Integration Value =1
Integration Value =0.333
Integration Value =1
Integration Value =1
Integration Value =0.333
sleeping+living
Storage
Entry
Cooking
Plan - size 21' (14 hat)
Plan- size 24' (16 hat)
Chol
Pata
Khol
Logi
Elevation
Section AA'
A8
A9
A10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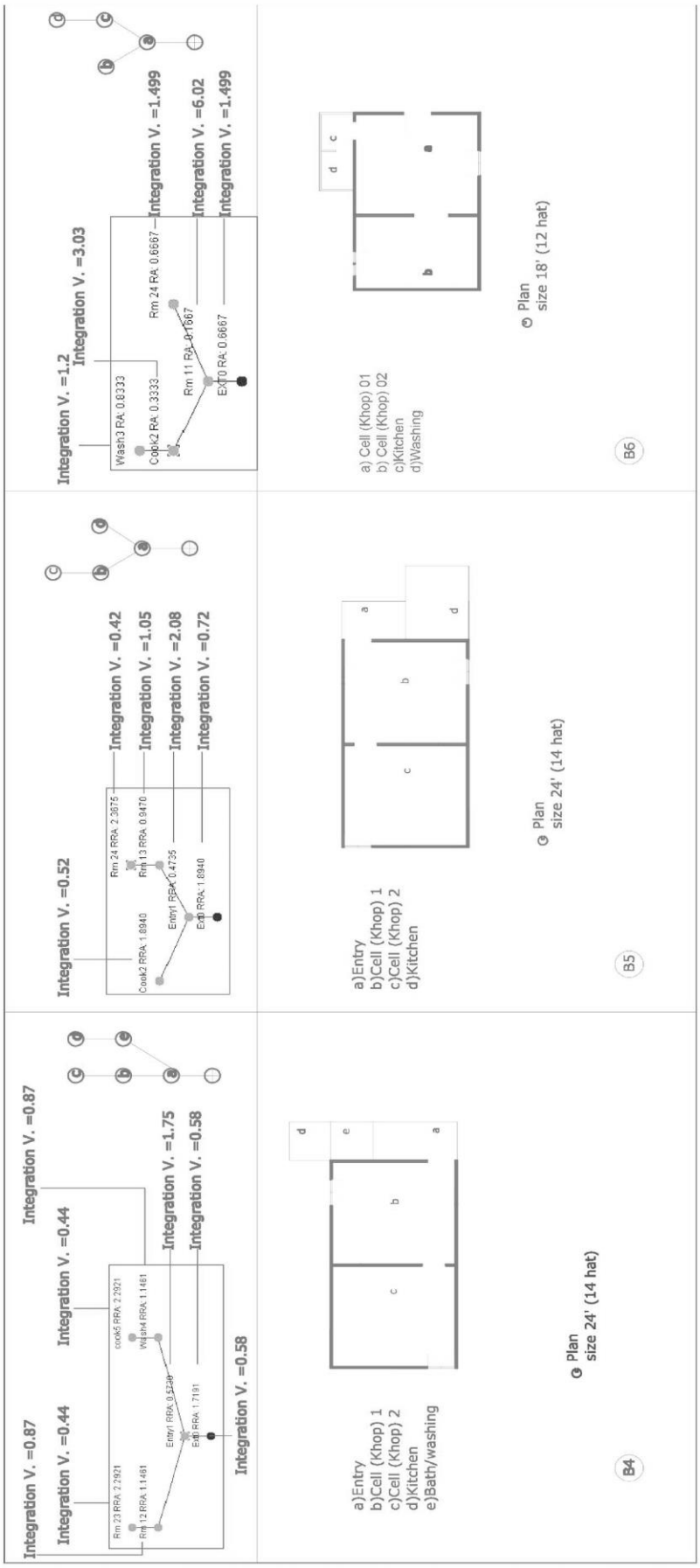
Integration Value =0.87
Integration Value =0.87
Integration Value =0.59
Integration Value =0.35
a)Entry
b)Cell (Khop) 1
c)Cell (Khop) 2
d)Kitchen
e)Bath/washing
f)service entry
Plan
size 21' (14 hat)
B1
Integration V. =0.87
Integration V. =0.44
Integration V. =0.44
Integration V. =1.75
Integration V. =0.58
Integration V. =0.58
a)Entry
b)Cell (Khop) 1
c)Cell (Khop) 2
d)Kitchen
e)Bath/washing
Plan
size 21' (14 hat)
B2
Integration V. =0.87
Integration V. =0.44
Integration V. =0.44
Integration V. =1.75
Integration V. =0.58
Integration V. =0.58
a)Entry
b)Cell (Khop) 1
c)Cell (Khop) 2
d)Kitchen
e)Bath/washing
Plan
size 21' (14 hat)
B3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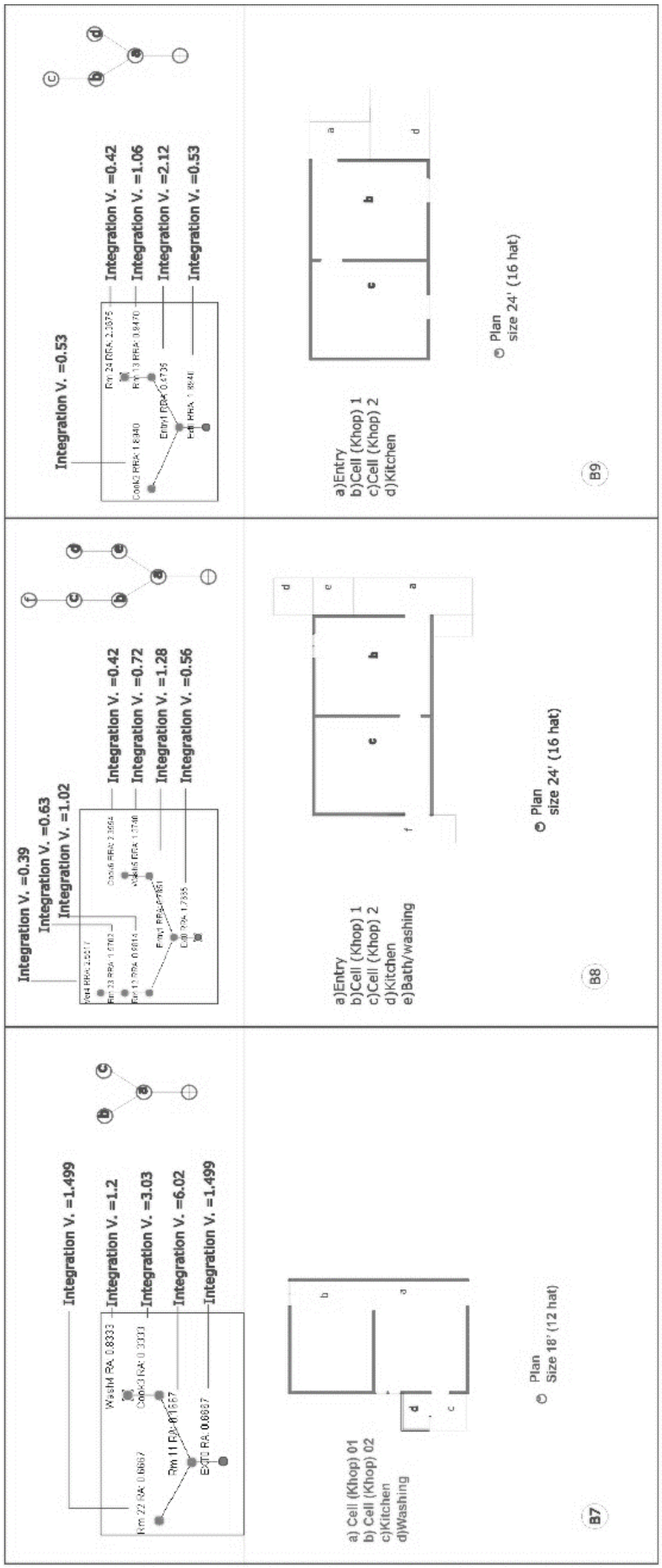
Integration V. =0.44
Integration V. =0.87
Integration V. =0.44
Integration V. =1.75
Integration V. =0.58
Integration V. =0.58
Rm 23 RRA: 2.2921
Rm 12 RRA: 1.1461
cook5 RRA: 2.2921
Wash4 RRA: 1.1461
Entry1 RRA: 0.5730
Ext1 RRA: 1.7191
a)Entry
b)Cell (Khop) 1
c)Cell (Khop) 2
d)Kitchen
e)Bath/washing
Plan
size 24' (14 hat)
B4
Integration V. =0.52
Integration V. =0.42
Integration V. =1.05
Integration V. =2.08
Integration V. =0.72
Rm 24 RRA: 2.3675
Rm 13 RRA: 0.9476
Cook2 RRA: 1.8940
Entry1 RRA: 0.4735
Ext1 RRA: 1.8940
a)Entry
b)Cell (Khop) 1
c)Cell (Khop) 2
d)Kitchen
Plan
size 24' (14 hat)
B5
Integration V. =1.2
Integration V. =3.03
Integration V. =1.499
Integration V. =6.02
Integration V. =1.499
Wash3 RA: 0.8333
Cook2 RA: 0.3333
Rm 24 RA: 0.6667
Rm 11 RA: 0.1667
EXT0 RA: 0.6667
a) Cell (Khop) 01
b) Cell (Khop) 02
c)Kitchen
d)Washing
Plan
size 18' (12 hat)
B6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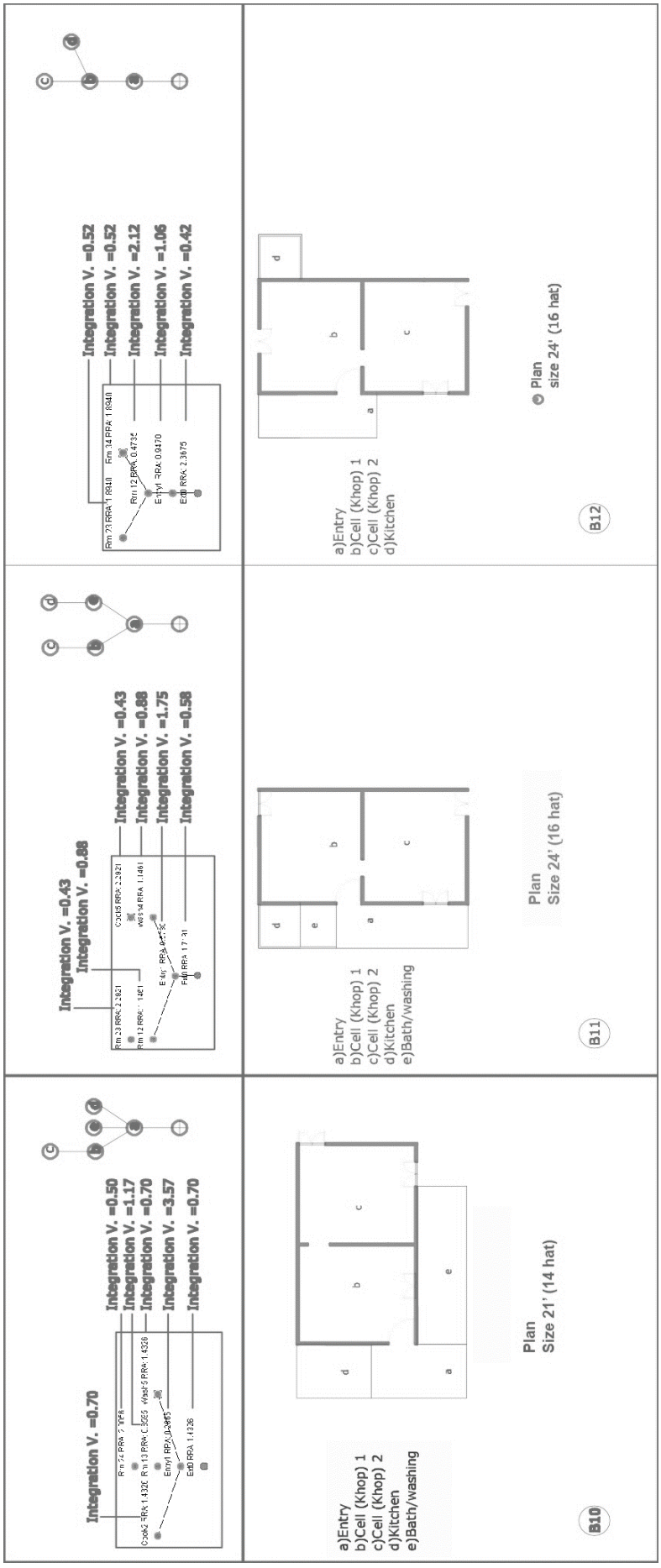
Integration V. =0.42
Integration V. =1.06
Integration V. =2.12
Integration V. =0.53
a)Entry
b)Cell (Khop) 1
c)Cell (Khop) 2
d)Kitchen
Plan
size 24' (16 hat)
B9
Integration V. =0.39
Integration V. =0.63
Integration V. =1.02
Integration V. =0.42
Integration V. =0.72
Integration V. =1.28
Integration V. =0.56
a)Entry
b)Cell (Khop) 1
c)Cell (Khop) 2
d)Kitchen
e)Bath/washing
Plan
size 24' (16 hat)
B8
Integration V. =1.499
Integration V. =1.2
Integration V. =3.03
Integration V. =6.02
Integration V. =1.499
a) Cell (Khop) 01
b) Cell (Khop) 02
c)Kitchen
d)Washing
Plan
Size 18' (12 hat)
B7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Integration V. =0.52
Integration V. =2.12
Integration V. =1.06
Integration V. =0.42
a)Entry
b)Cell (Khop) 1
c)Cell (Khop) 2
d)Kitchen
Plan
size 24' (16 hat)
B12
Integration V. =0.43
Integration V. =0.88
Integration V. =0.43
Integration V. =0.88
Integration V. =1.75
Integration V. =0.58
a)Entry
b)Cell (Khop) 1
c)Cell (Khop) 2
d)Kitchen
e)Bath/washing
Plan
Size 24' (16 hat)
B11
Integration V. =0.70
Integration V. =0.50
Integration V. =1.17
Integration V. =0.70
Integration V. =3.57
Integration V. =0.70
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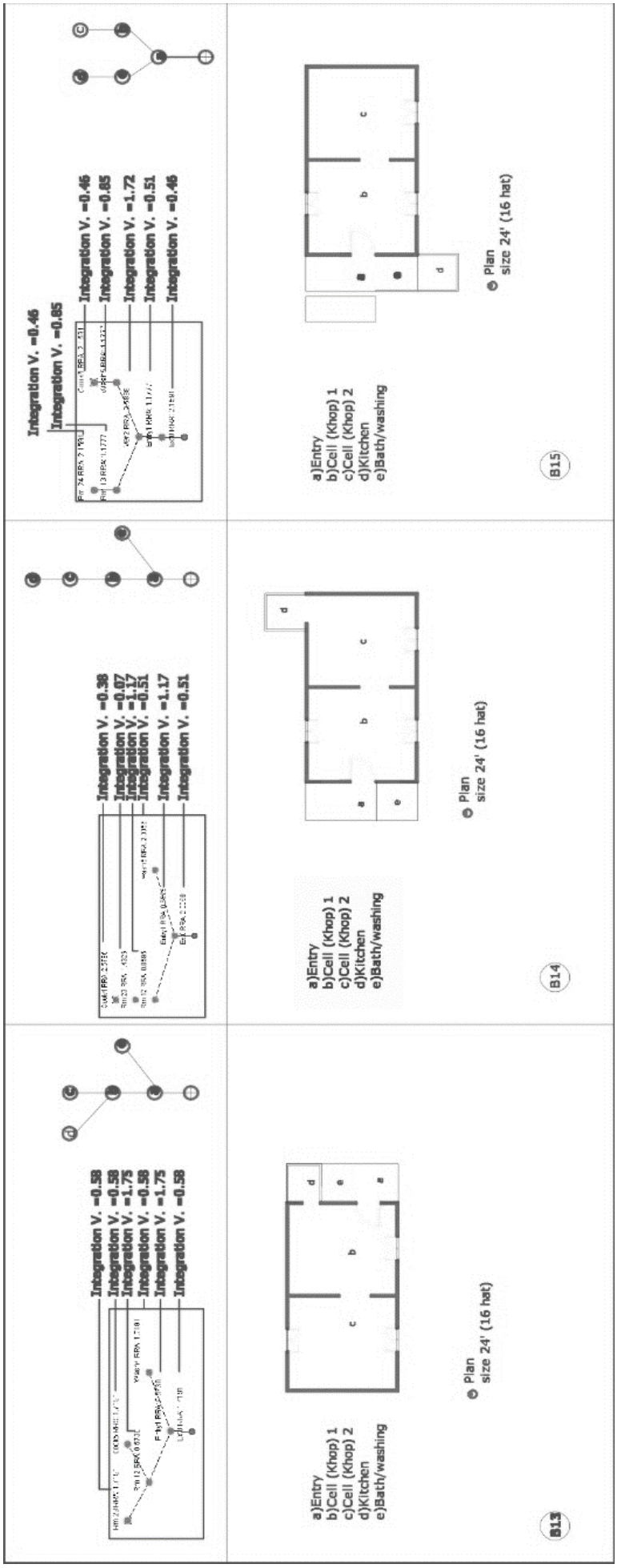
b)Cell (Khop) 1
c)Cell (Khop) 2
d)Kitchen
e)Bath/washing
Plan
Size 21' (14 hat)
B10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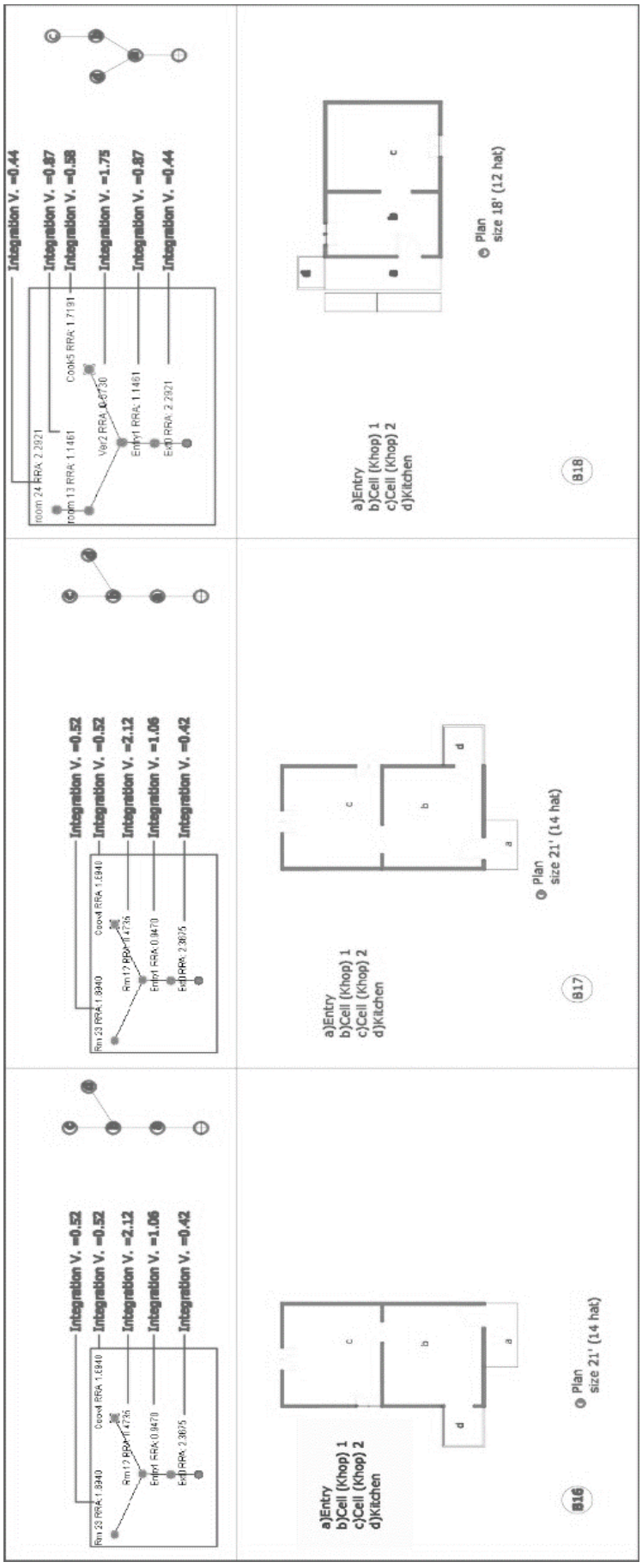
Integration V. =0.85
Integration V. =0.46
Integration V. =0.85
Integration V. =1.72
Integration V. =0.51
Integration V. =0.46
a)Entry
b)Cell (Khop) 1
c)Cell (Khop) 2
d)Kitchen
e)Bath/washing
Plan
size 24' (16 hat)
B15
Integration V. =0.38
Integration V. =0.07
Integration V. =1.17
Integration V. =0.51
Integration V. =1.17
Integration V. =0.51
a)Entry
b)Cell (Khop) 1
c)Cell (Khop) 2
d)Kitchen
e)Bath/washing
Plan
size 24' (16 hat)
B14
Integration V. =0.58
Integration V. =0.58
Integration V. =1.75
Integration V. =0.58
Integration V. =1.75
Integration V. =0.58
a)Entry
b)Cell (Khop) 1
c)Cell (Khop) 2
d)Kitchen
e)Bath/washing
Plan
size 24' (16 hat)
B13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Integration V. =0.58
Integration V. =1.75
Integration V. =0.87
Integration V. =0.44
room 24 RRA: 2.2921
room 13 RRA: 1.1461
Cook5 RRA: 1.7191
Ver2 RRA: 0.6750
Entry1 RRA: 1.1461
Exit1 RRA: 2.2921
a)Entry
b)Cell (Khop) 1
c)Cell (Khop) 2
d)Kitchen
Plan
size 18' (12 hat)
B18
Integration V. =0.52
Integration V. =0.52
Integration V. =2.12
Integration V. =1.06
Integration V. =0.42
Rm 23 RRA: 1.8940
Cook4 RRA: 1.8940
Rm12 RRA: 1.4736
Entry1 RRA: 0.9470
Exit1 RRA: 2.3675
a)Entry
b)Cell (Khop) 1
c)Cell (Khop) 2
d)Kitchen
Plan
size 21' (14 hat)
B17
Integration V. =0.52
Integration V. =0.52
Integration V. =2.12
Integration V. =1.06
Integration V. =0.42
Rm 23 RRA: 1.8940
Cook4 RRA: 1.8940
Rm12 RRA: 1.4736
Entry1 RRA: 0.9470
Exit1 RRA: 2.3675
a)Entry
b)Cell (Khop) 1
c)Cell (Khop) 2
d)Kitchen
Plan
size 21' (14 hat)
B16

6 Discussion and Conclusion

6.1 Introduction

The direct dependence of communities on ecosystems is an influence on their social resilience and ability to cope with shocks, vulnerability, hazards, etc. Resilience, therefore, depends on the diversity of the ecosystem as well as a social structure that governs the living pattern of the community. Social, economic and cultural realities have a major influence on the capability to cope and have varying effects on individuals and communities as well as their build form. The more resilient the community, the less the risk and impact of displacement experienced. Over centuries, Indigenous ethnic peoples have sought through native vernacular techniques and other means to retain traditional characters, including traditional practices, languages, and identities.

There is a clear relationship between social and ecological resilience, particularly for social groups that are reliant on ecological and environmental resources for their livelihoods. Social resilience concerns social groups and their abilities to endure, absorb, cope with and adjust to environmental and social hazards of different kinds. Social Resilience increases the capacity to cope with stress and is hence an antonym for social vulnerability.

There is no specific research on social as well as ecological resilience and its impact on the vernacular dwelling making of water nomads in Bangladesh. Vernacular dwelling or house form is not simply the outcome of physical forces or any single causal factor, but consequence of a whole range of socio-cultural factors seen in their broadest terms. And in the context of water nomads of Bangladesh, the social factors shaping the spatial organization and physical form of their dwelling needed to be studied along with their resilient features.

To investigate resilience in the vernacular architecture of water nomads in Bangladesh, 2 types of settlements were selected as case study around Dhaka. One of the settlements at Gazipur where dwellers live on the boat and another group on land at keranigonj who dwells on hut or Chiuri. The inspection was carried out on 28 dwellings from 2 sites to analyze the vernacular practice of this nomadic tribe in terms of lifestyle, space use, material and technology influencing socio-economic and ecological resilience. Case studies on 2 different contexts are studied thoroughly to understand the settlement profile, individual units, space use, domain, material use and construction techniques. The findings indicate that the spatial organization

influence social interaction and use of local materials as well as construction techniques enhance ecological resilience. The study indicates that vernacular architecture practice of water nomads – is resilient in different situations through spatial organization, adaptation, transformation and collaboration. Socio-cultural factors influenced spatial organization as well as space use and shaped the vernacular architecture of water nomads like other ethnic indigenous communities.

In chapter four 28 dwellings of water, nomads were studied. From the study, the relationship between social interaction and spatial organization is found. The study focused on family members and their activities in the socio-spatial organization of nomads in their dwellings. The components of domestic spaces are thoroughly studied in and around their dwellings. Based on the study of domestic spaces, two types of spaces can be identified in their domestic household. Some spaces are “personal or private space” for individual activities and some spaces are “shared space” which are used by family members as well as outsider guests collectively. From physical field survey and observation of the dwellings of water nomads, it was found that this community has less private space and more shared space. Which indicates, their social life invites more interaction and collaborative way of life. This approach of collaboration enhances social resilience in their community. Another finding is, they practice their own techniques and materials for construction of their dwellings that welcome ecological resilience. Either mobility or building hut on stilt enable them to be ecologically resilient in their vernacular architecture.

6.2 Gender and Bede community

In Bede community women are not separated from men within the domestic interior, and control of the space outside is neutral with respect to its use by men and women. Visitors are not differentiated according to their different roles and statuses. Sense of privacy is less and gender-based space arrangement is not prominent like sedentary spatial organization. In both cases, interior organization and in its relation to settlement space, social conventions lack the strong exogenous model which characterizes Bedouin domestic space like organization. But there is segregation of space based on gender and rule. Privacy of household members is maintained in the introvert courtyard type house forms with the separation of male female zone, placing the male zones near the entrance and female zones at the deepest part. The court acts as the most integrating space that is also the most visually integrated.

Analyzing the depth of the studied dwellings on land it is clear that the male gendered spaces in the nomadic boats or dwellings are located near the entry at depth 01 or depth 02. The shared spaces are located at the beginning or central position of the configuration from where the female gendered spaces are accessed in the domestic space. Eating space act as transition space which is located at depth 02 and it connects the female gendered personal spaces with the shared spaces. In 28% of the dwellings on land the cooking area is located at depth 02 adjacent to the entry veranda or male gendered space and in 72% of the dwelling's kitchen is located at depth 03 or 04. Different spaces in the nomadic dwelling on both cases follow a characteristic: Shared spaces are highly integrated and gendered personal spaces are segregated. And most of the spaces are shared unlike sedentary community and privacy is less respectively. Their shared spaces create opportunity for more social interaction that ensure social resilience through sharing and collaboration. Less use of segregated gendered or personal space indicates they don't practice isolation and seclusion. As they have to live a marginal life, they can afford less and that's why their privacy is very minimal. Privacy needs more partition and materials; privacy of space is less affordable for them. And as a result, they have to share spaces and in return they get scope of more collaboration and adaptation.

6.3 Spaces of family and social interaction

From the analogy of the two types of dwellings discussed in chapter 4, it is clear that the dwelling on water has only one enclosed shaded space which is their sleeping zone. Hence, they have to perform most of the activity outside from cooking to the toilet. On the contrary, the dwelling on land has more defined shaded domestic spaces like eating, cooking, washing and sleeping zone. Exploring the activities performed in different zone in case B, entry veranda works as both eating and guest welcoming zone which is adjacent to the cooking zone and open court where communal gathering take place. Hence this entry veranda can be identified as shared space as they allow shared domestic activities. This entry veranda also works as a threshold between the communal court and indoor domestic spaces. The entry veranda is used as an eating or feeding space and placed near the cooking zone. Usually, this space is used for taking meals by the family members. From the study it is detected that apart from taking a meal, this space is also used for activities like cooking preparation, business trip preparation, children play area, reading area etc.

In most of the cases, this place is most active in day and evening when most of the members are awake. Neighbors and relatives from adjacent dwelling spend more time on this space and adjacent outdoor court. This space acts as the most integrated space in the domestic organization in terms of the daily activities of the inhabitants of this nomadic community.

On the other hand, the syntactic analysis of studied 18 dwelling units on land shows that room 1 and room 2 works as a sleeping zone and considered as personal or private spaces used by individuals and couples. This rooms are used for sleeping by the members. From the studied 18 dwellings on land it is found that in 45% cases, the space in between entry veranda and sleeping zone work as semi private space where children sleep at night.

Previous researchers found that houses tend to be divided into two separate domains, one section is exclusively used by the inhabitants and the other is reserved for receiving male guests. Thus, the configuration appears to modulate the social dynamics of the house's occupants by distancing the hosts from the immediate contact with the male guests (Gomes, 2014). But in this context of water nomads, the use of combined multiuse space is found to make a compact living. And the line between public and private is thinner than the sedentary community as well as gender dominance in space is very subtle. Their women have less sense of privacy and their dominance on space is more profound than male members unlike sedentary community. To ensure the compactness, the entry veranda is used both as a shared space that is used for both guests entertaining and gossiping with neighbours. This compact and integrated domestic life encourages a collaborative social life to make them socially resilient.

In case A on the water they only have one shaded mono-space that is used as multipurpose space. They use this same space for storing, dining, gossiping, sleeping and other uses. For interaction among family members as well as community members, this mono-space act as a catalyst. They have no other choices and hence they have to interact and live compactly in collaboration with others. On contrary in case B on land, they adapted some spatial organization from the mainstream sedentary community and divided the spaces into different zones in larger dwellings. Thus, in some cases, the community lost its identity in terms of space use and collaborative life with sharing. But the formal expression of dwelling

was intact with a vaulted roof like a boat.

The findings from the case A and B can be concluded through following diagram

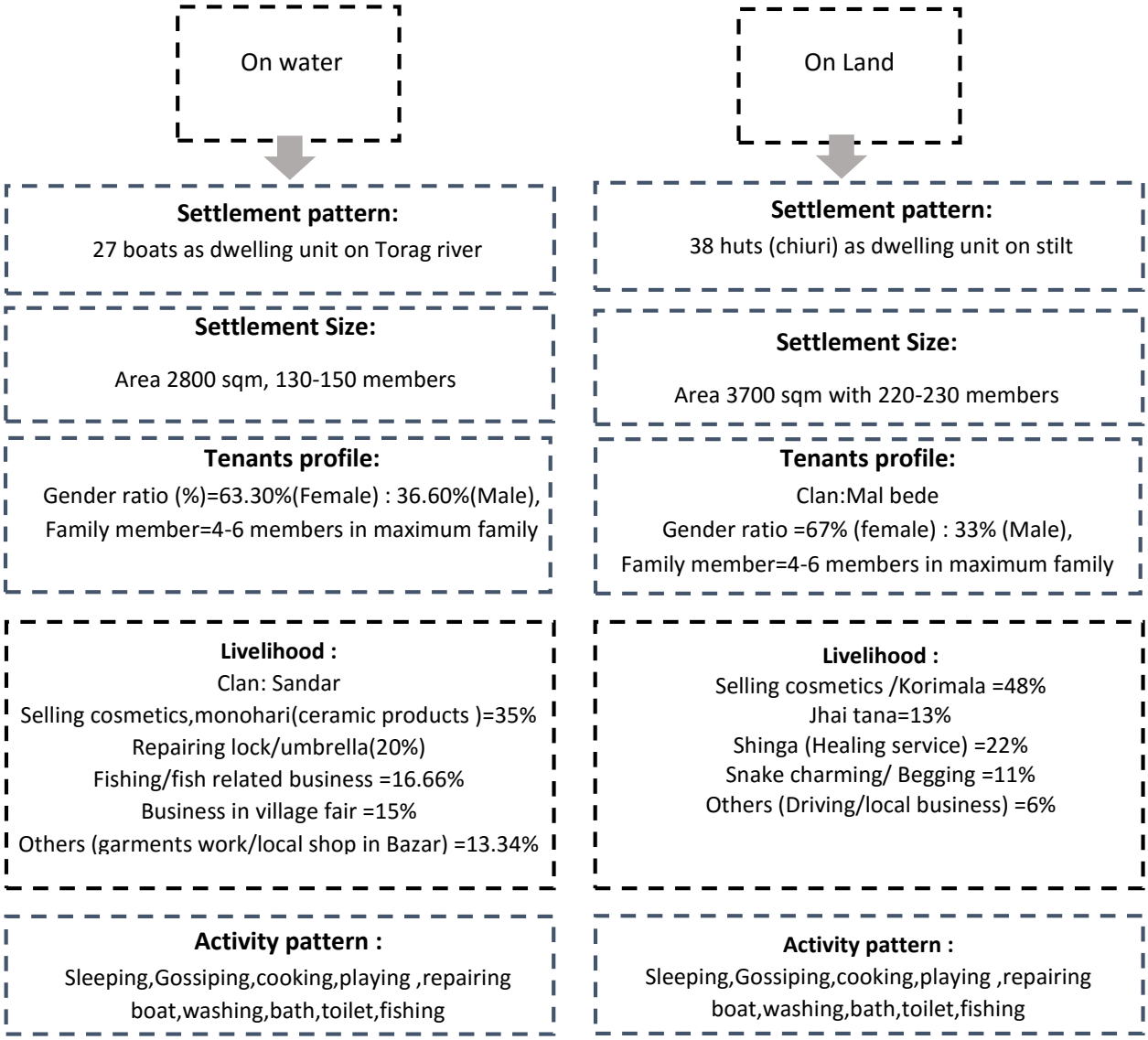


Figure 6.1 Summery of the findings from case A and B

In case A, they ensure maximum use of space by utilizing each space for several uses in that tiny boat. The boat has one mono-space that has 2 curved façades with storing facilities. Beneath the floor they have also storing space. There is no furniture inside and space is sitting oriented. They eat, play, swim on or around water and maintain a nomadic life with mobility. Their settlement and shelter move with their living. Observation shows that activities inside boat consists of sleeping, storing, cooking, playing, gossiping etc. Activities outside the boat includes –bathing,

swimming, repairing boats, gossiping, washing clothes, playing outdoor games etc. Activity inside the hut includes sleeping, storing, cooking, dinning, gossiping, reading etc. while activity outside includes community gathering, washing, toilet, playing, fishing etc. Leisure activity includes roaming around, watching TV/cinema, sleeping, fishing or playing etc. The settlement has specific domain for men, women and children. Women mostly stay in private domain like cooking or living area while men stay in public realm mostly like courtyard, veranda or Bazar area. The dwelling huts looks like upper part of boat (Choi) and placed on stilt to protect it from termites, dampness or insects. The dwelling have 2-3 spaces and they have no furniture inside. They have dedicated sleeping, dining, cooking and washing zone unlike the prior settlement on water.

From the study of dwellings of 2 settlements on water and land, the relationship between social interaction and spatial organization is observed. The study focused on selected community members and their activities in the spatial organization. From physical field study, observation and questionnaire survey of the studied boats and dwellings a new finding can be found which is, family members use a space for multipurpose use and share a space with others that allows them to enhance family interaction. Another thing is as sharing or multiuse allow them to spend more time together unlike users with single use space. They have a tendency to use outdoor space more for activity that also allow them to interact more with other community members through gossiping or interactive conversations. In both cases outdoor as well indoor compact spaces perform as major spaces for holding interactive family activities as well as community activities enhancing collaboration. Less use of cellular type space are increasing family and communal interaction as well as sharing, which help them to achieve social resilience.

6.4 Social resilience in vernacular architecture of Bede community

There is a clear relationship between social resilience and vernacular response, particularly for social groups that are reliant on ecological and environmental resources for their livelihoods. Social resilience concern social groups and their abilities to endure, absorb, cope with and adjust to environmental and social hazards

of different kinds. Social Resilience increases the capacity to cope with stress and is hence an antonym for social vulnerability. The study shows, the architectural form of primitive huts and nomadic tents have their social origin. Pre-urban houses were seen as response to socio-cultural phenomenon. Study of different nomadic tribes reveals that, they live in marginal areas where mobility becomes a logical and efficient strategy for harvesting scarce resources. Nomadic pastoralist, hunter gatherer, and travelling workers of south Asia as well as other parts of the world share some common traits and practices that enables them to cope with vulnerability and becomes resilient in their vernacular architecture practice. And that is their mobility and temporary settlement practice. This practice enables them to deal with natural and other social hazards better than any sedentary community. Local knowledge and wisdom practiced by nomadic tribes in their vernacular architecture show that they have social and ecological resilience. As nomads do not try to dominate the environment and their strategy is rather adaptation through collaboration–they have wide variety of resilient skills to be recorded. And in the context of water nomads (Bede community) of Bangladesh, the social factors are shaping the spatial organization and physical form of their vernacular dwelling as well as their resilient features.

Social and community resilience are result of their livelihood and interaction. Study of both case studies shows that they practice a socio-economic life with strong community interaction. Their spatial organization enhance their community integration as well as interaction. Their practice of sharing, adaptation and collaboration indicates they have strong sense of community. And this shaped the form of the physical environment as well as their vernacular architecture.

6.5 Interaction enacting social resilience

The above discussion of the socio-spatial analysis, syntactic analysis and ecological analysis of two category of dwellings (boat and hut/chiuri) on two different site illustrates a pattern of orientation, activity, integration and diversified use of locally available materials. In syntactic analysis section, justified graph shows a variety of integration values of different activity spaces ranging from 1 to 0.33 in case A and 0.35 to 6.02 in case B. Here it is clearly noted that most integrated space is entry

veranda in all types of dwellings which is directly connected to outdoor. Another shared space eating zone (room 1 in case B) is also located at a good visually integrated zone. And integration value of cooking area and room 2 is lower than other spaces. It is also noted that integration value in case B is higher than case A between 2 groups of settlement. From the study of the activity space it is found that, integration value of activity space is directly proportionate to their frequency of family interaction. Increase of integration value of activity space accentuates the opportunity of more community interaction and hence open up scope for social resilience.

6.6 Vernacular practices for ecological resilience

Environmental analysis of the two case studies denotes that Bede community choose more locally available low-cost materials like bamboo, wood and tin to adapt in changing context. In both cases their response is more resilient as well as ecofriendly as they touch the ground softly and flow with the nature. Therefore, this approach creates scope for ecological as well as environmental resilience.

In case A, they move on water in boat and stay on a site temporarily for few months. It is much less expensive to live on a boat compared to a house, so it's an attractive option for business travelers or folks who can "work anywhere." They don't need to buy land as they don't stay on a place for long. When they want to move, they don't have to sell their home; they simply untie their lines and move their home to a new location. And considering this home can move with the wind, the costal or riverside areas of the whole country are possible future 'homes. From the study it is clear that, most nomadic boat dwellers are very resilient in their architecture practice and taking care of the planet. Most of them work from the boat and are more entrepreneurial in spirit. They value strong friendships and work very hard to make others feel welcomed and wanted. Someone is always cooking too much and invites others over. Boat dwellers generally don't have cable or satellite TV, so they're not inundated with negative news. Stories are shared, jokes are told and food and drink are shared. And due to the lifestyle, the type of people who live on boats are not very interested in material possessions. There's a little amount of space inside the boat.

So, the need for filling the boat with unnecessary items is low. If it floods, their house rides the tide rather than take on water. Cleaning the whole boat takes a fraction of the time needed to clean a house and maintenance is low.

In case B, their choice of building dwelling or huts on stilts 2 feet above the ground is another point that enables them to go ecologically resilient. Stilt houses date to prehistoric times and can be seen in a variety of forms worldwide. New about them are the innovative and diverse ways in which they are being designed and built. Stilt houses are well suited to coastal regions and subtropical climates. They protect against floods, maximize views and allow homeowners to build on rocky, steep or unstable land. They also keep out animals and vermin, provide ventilation under the house and minimize a house's footprint. Elevating the dwelling on stilts made sense to reduce flooding, water damage and weakening of the house's foundation. It allows the nomadic tribes to build on an unstable foundation. While the house follows the slope of the land, bamboo posts elevate it. This allows for a minimal footprint on the ground. To build on uneven ground, stilt hut is best option. The bamboo column stilts are subtle, but in varying heights, they allow for the natural undulations of the land and the local flora to remain untouched. Stilts enables the water nomads to build over water. The living space of the house juts out over the water, supported by 30 structural bamboo columns. This not only makes for an unusual living space, but it also lessens the house's mass and footprint on the fragile shore.

The elevated platform allows them to ventilate underneath the house. This allows for ventilation and cool air to flow under the house, protects the main structure from termites and other pests, and enables the natural flow of water in times of torrential rain. Much of the nomadic hut was built on stilts to minimize its environmental impact before, during and after construction. To protect against floods, these stilts are best option in a riverine region like Bangladesh. To mitigate any flood damage, this house is elevated on 30 bamboo stilts. The raised position also provides space underneath the house to shelter animals and equipment. As they have to move frequently and they don't know what will be their next destination, this stilt house navigates rocky and steep hillside terrain, leaving the land untouched. Moreover, It's wooden facade and bamboo structure blend beautifully with the landscape.

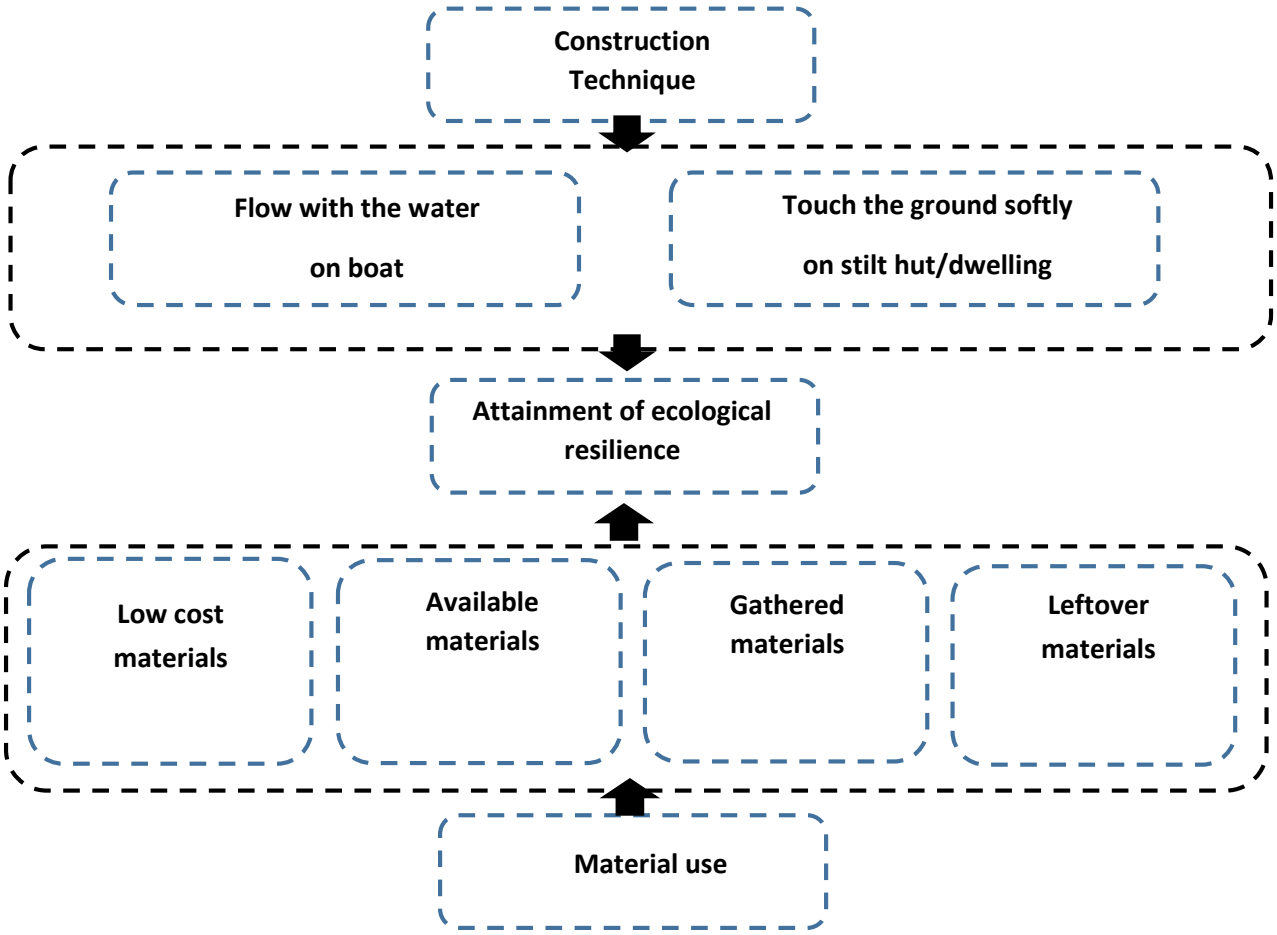


Figure 6.2 Construction technique and material use of dwelling to attain ecological resilience

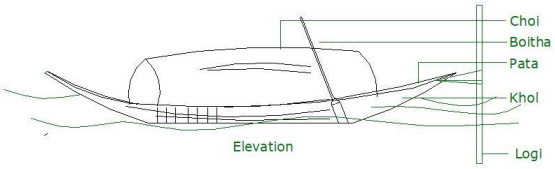


Figure 6.3 Flow with the water on boat (Case A)

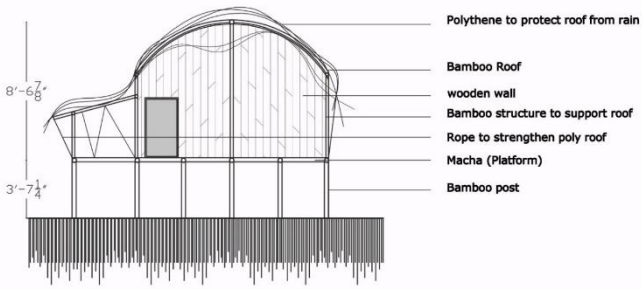


Figure 6.4 Touching the ground softly with stilt on land (Case B)

6.7 Vulnerability experienced by water nomads

In case A, the members of the community live a vulnerable life. They are vulnerable in terms of land, profession, materials of construction and social issues. As their settlement is on the water without any legal papers and documents, they have to

change their location whenever anyone from the adjacent host community raises complaints. Their boat as the dwelling is risky as well. During heavy rainfall or storm, their boat gets overturned. They have to be very prompt and quick decision-maker to cope with nature. Their business is also uncertain most of the time. They don't know whether they can sell their products and service the next day. So, they have to get prepared for the worst scenario and therefore practice multiple livelihoods. If their boat gets damaged, they repair it and use it as a tent to settle on nearby land. Sometimes snakes and insects from the water body come inside the boat. As they use surface water from the river, they suffer from waterborne disease. They are pity traders and the demand for their goods and service decrease if they stay in a place for a long time. So, they must leave a place if they face a challenge to the market.

In case B, the members of the community live a vulnerable life as well. As their settlement located on land which is managed on request or with a small annual rent, they have to change their location whenever the landowner wants to use the land for other purposes. Their 'chiuri' or hut as a dwelling is risky as well. During heavy rainfall or storm, the structure gets damaged or they totally lose their shelter. Rain penetrates through roof and wall and they use temporary solutions like covering the hut with polythene. They have to be very prompt and quick decision-maker to cope with nature. Their business is also uncertain most of the time. They don't know whether they can sell their products and service for the next few days. Their investment is also very little as they don't have enough to invest. As they can't invest more, they have to depend on their hereditary business and can't change their fate. Some of them tried to get a job in a factory but as they are nomads, the factories also don't employ them in works. Two or three of them tried to go out in middle east counties to change their fate, but they also had to return as they don't have a proper education. They are pity traders and the demand for their goods and services is decreasing day by day as well. They have been on this site (case B) for 10-12 years and now they have to move from here. Maybe they will resettle in a different location within a few months and they have to start again. Maybe some of them will change their profession and disguise themselves with the mainstream sedentary. Their livelihood is most vulnerable among all and this vulnerability threatens another segment of their life like social life, space, vernacular architecture etc. But at the same time, this vulnerability helps them to be more resilient in constant changing

context.

6.8 Adaptability and collaboration to attain resilience

A resilient community is one that takes intentional action to enhance the personal and collective capacity of its members and institutions to respond to and influence the course of social and economic change. And adaptation, transformation, and persistence are some measures that are practiced by resilient communities with collaboration. Like other nomadic tribes, this community also practice adaptation transformation and persistence through collaboration as a response to vulnerability.

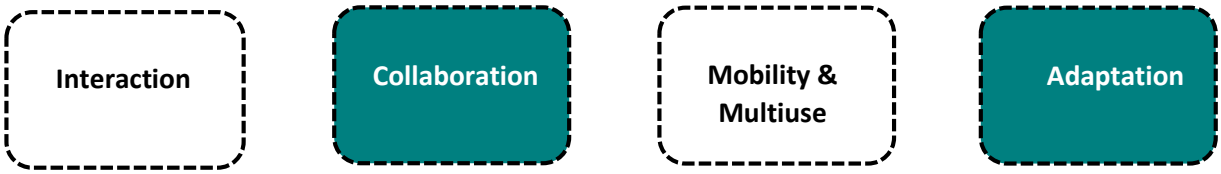
Members of settlement in case A practice adaptive actions and collaboration to continue living in constant vulnerability. They practice ephemerality, movement, and collaboration as ways of reconciling nomadism. Adaptability and collaboration empower them to sustain life on mobility and mobility empowers them to be adaptive and collaborative. This adaptive and collaborative life is possible because their spatial organization allows that and vice versa. Particularly in life on a boat, they face a certain situation that must need collaboration. They need to repair their boat in collaboration with their community members, in return, they help their neighboring boat dwellers with child-caring during a business trip. Sometimes they face scarcity of building materials to repair. They seek collaboration from their neighbors or community members. When a family or a community member faces any trouble or threat from the local sedentary group, the whole community comes forward to help him. They shared many such stories of standing against “Girostho” or sedentary farmer community in the past to establish their right or to establish justice. Most of the time their women faced sexual harassment from local political gangs or leaders of villages. They stand against the sedentary community in such cases and solved the issue in collaboration. As they live on a boat, they used to face trouble during monsoon or any storm in the rainy season. The boat gets drown or affected severely. They adapt with nature in such a situation and never get tired of transforming themselves with climate and nature. They never dictated nature, rather befriended it to. They adjust their need along with the situation, unlike the sedentary community. They change professions, food habits, shelter, building materials to keep the life in pace with changing context. For example, in case A, they changed their building materials from bamboo “chatai” to “tin” to make it waterproof that they used to do by other means in the past. When wood was available, their boat was made of wood.

The time it became scarce, they shifted to another material. In changing socio-economic context nomads of case B are still persistent in their hereditary business. Many of them still struggling to keep the age-old traditional business and profession alive. They change the technology of building their hut or shelter according to the availability of materials and resources that indicates their transformation of spaces and forms. They reinstall their settlement in a new context when abolished or forced to leave a locality and this enables them to adapt in a new situation. Their mobility and nomadic living pattern enable them to be more creative and adaptive. For example, the community members of this settlement are notified recently to shift their settlement within a few months from here and they have to leave the place soon. When this kind of situation arises, they form a team with expert members of the community and they search for a new place. They research and analyze the potential of new places along with travel costs, travel means, business scope, etc. They negotiate with local union Parishad chairman, Govt. authority or landowner to make a deal to settle for a few months. If that works, they shift to the new destination. And new life starts with new adaptive techniques and transformation. During the discussion and community engagement session, some of the members of this community acknowledged if required they change themselves. Their political identity, religious views, social norms, and values- everything is variable and the only transformation is constant. So, their socio-economic life is a result of resilience in response to constant change and mobility.

6.9 Conclusion

Rivers are diminishing and habitats of water nomads are adjusting along with this. In this context, nomads are facing challenges and therefore responding to cope with the situation with resilience. Therefore, their settlements and livelihoods are confronting changes and transformation as well. To examine the resilience in the vernacular architecture of water nomads in Bangladesh, 2 types of settlements were selected around Dhaka with 28 dwellings as a sample case study. Findings from both settlements indicate that the vernacular compact physical features of water nomads have impacts on the socio-cultural as well as environmental aspects of this community. Their social life is also analyzed to trace out its impact on their dwelling pattern. Study shows that their social life, livelihood and economic activity has a

greater impact on their dwellings. Both spatial arrangement and building technology of dwellings derive from their social activity and living pattern. From activity patterns to material selection, all have origin in their socio-economic life. Syntactic analysis reveals their most integrated spaces welcome more interaction and interaction allows them to be more collaborative. Living in an adverse situation enables them to be more creative and adaptive. Adaptation in mobility and multiuse of space allow them to be socially and environmentally resilient.



As the settlements are located near the capital of Bangladesh, they have certain features that can be diagnosed as the impact of rapid urbanization. They are changing rapidly along with the city. More and more families are choosing static life to secure their future as a response to changing socio-cultural context. Concerning contemporary demand, the change of spatial organization directly reflects social and cultural changes. Findings from this study acknowledge the results from previous research that architectural spaces and society are inherently linked to each other. The alteration or transformation in a physical organization occurs to create environments that support a new style of living and acting as well as accommodate socio-economic changes. Spatial organization and sharing of space are much more prominent in this community and personal space as well as women gendered space is less prominent here. The study suggests that the adaptive and collaborative mobile life of nomads through multiuse and sharing of space enables them to be more resilient both socially and ecologically. The syntactic investigation and inquiry on spatial organization and construction techniques of vernacular architecture of water nomads indicate resilience practice in constant adaptation and collaboration. (Gisle´n, 2003)

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Appendices

Appendix A : List of spots where Water Nomads come for yearly gathering

Sl. No.	Name of the Spots	Name of Districts	Type of Bedes
1	Savar (Kanchanpur, Porabari, Amarpur, Boktarpur, Joypara, Jamshi, Aminbazaar, Bank Town villages)	Dhaka	Mal Bede, Toula
2	Demra	Dhaka	Mal Bede, Sandar
3	Signboard, Sayedabad	Dhaka	Mal Bede
4	Merul Badda (Baiddyartek), Rampura	Dhaka	Mal Bede, Sandar
5	Keraniganj (Teghuria)	Dhaka	Mal Bede
6	Louhajong (Khoria, Goalimandra and Kanaksar villages)	Munshiganj	Mal Bede, Bajigar
7	Mymensingh (Munshirhat)	Munshiganj	Sapuria
8	Kucchamura, Nimtoli, Srinagar	Munshiganj	Mal Bede
9	Tongi (Dhaka)	Gazipur	Sandar
10	Pubail	Gazipur	Sandar
11	Kaliganj	Gazipur	Sandar,
12	Sripur	Gazipur	Sandar,Kurindar
13	Bormi Bazar-Moula	Gazipur	Sandar,Kurindar
14	Baburhat	Narshindi	Sandar,Mal
15	Sripur	Gazipur	Mal
16	Srinagar	Munshiganj	Sandar
17	Tangail	Tangail	-

Sl. No.	Name of the Spots	Name of Districts	Type of Bedes
18	Mirjapur (Tangail)	Tangail	-
19	Dapdopia, Madhabpasa, Sayestabad	Barisal	Borial Manta
20	Opposite of Launch Ghat and Shekherhat	Barisal	Borial Manta
21	Sikarpur (Ujirpur-Barisal)	Barisal	Mirshikari
22	Gouranadi (Torki Bazaar)	Barisal	Mirshikari
23	Jhalokati	Jhalokati	Mirshikari
24	Nalchity	Jhalokati	Mirshikari
25	Patuakhali	Patuakhali	Borial Manta
26	Galachipa	Patuakhali	Borial Manta
27	Kalaiya	Patuakhali	Borial Manta
28	Lalmohan	Bhola	
29	Tushkhali and Sonakhali, Motbaria	Pirojpur	-
30	Hularhat	Pirojpur	-
31	Madaripur (Madaripur, Kalkini Bazar, Tekerhat)	Madaripur	Mal Bede
32	Faridpur	Faridpur	-
33	Kaliganj (Kaliganj Bazar and Barobazar)	Jhenaidah	Bazigar
34	Sariatpur (Kotapara village)	Sariatpur	Mal Bede
35	Eliotganj (Harikhola village)	Comilla	Mal Bede
36	Noakhali (Batasia, Maijdi court)	Noakhali	Borial Manta
37	Hatia (Ujkhali, Bibirhat)	Noakhali	Borial Manta
38	Bera (Pabna)	Pabna	-
39	Narshindi	Narshindi	-
40	Ghorashal	Narshindi	-
41	Manikganj	Manikganj	Sandar
42	Saturia (Manikganj)	Manikganj	Sandar
43	Khalishpur (Khulna-near the jute mill)	Khulna	-

Sl. No.	Name of the Spots	Name of Districts	Type of Bedes
44	Pupsha Ferry Ghat	Khulna	-
45	Mongla	Khulna	-
46	Singra	Natore	-
47	Rajshahi	Rajshahi	-
48	Eliotganj (Harikhola village),	Comilla	Gayin,Mal
49	Chandina	Comilla	Gayin
50	Kochua (Comilla)	Comilla	Gayin
51	Comilla	Comilla	Gayin
52	Homna	Comilla	Gayin
53	Companiganj	Chandpur	-
54	Matlab	Chandpur	-
55	Jamalpur (Town, Hajrabari)	Jamalpur	-
56	Melandah	Jamalpur	-
57	Islampur	Jamalpur	Mal
58	Sunamgonj (Sonapur village)	Sunamgonj	-
59	Sylhet (Madhabpur)	Sylhet	-
58	Chatak (Sylhet)	Sylhet	-
59	Hobiganj	Hobiganj	-
60	Jhitka,Pabna	Pabna	-
61	Bera (Pabna)	Pabna	-
62	Bogra	Bogra	-
63	Temok	Natore	-
64	Ullapara (Baralbij)	Sirajganj	-
65	Sribordi (Sherpur-Dudnai)	Sherpur	-
66	Joralganj - Hathajari	Chittagong	-
67	Shekharnagar	Rangpur	-

Sl. No.	Name of the Spots	Name of Districts	Type of Bedes
68	Thakurgaon	Thakurgaon	-
69	Saidpur	Nilphamari	-
70	Kurigram (near the town)	Kurigram	-
71	Satkhira	Satkhira	-
72	Magura	Magura	-
73	Bheramara	Kushtia	-

Appendix B : Survey Questionnaire on Water Nomads

Questionnaire

Name:		**Age+Gender:**	
		Religionclan**:**	

1. How often you stay at home daily?

☐ Less than 4 hours ☐ 4 Hours

☐ 5 Hours ☐ 6 Hours

☐ More than 6 hours

2. How many family members do you have?a)……

☐ Children ☐ Father

☐ Wife ☐ Mother

☐Grand parents

3. What is your profession?

a) Husband/Male:

b) Wife/Female:

c) Child:

4. What was your father's/ Grand father's profession?

a) Father:

b) Grand Father:

5. How many hours a day would you spend for your business/profession?

☐ Less than 2 hour ☐ 3 Hour

☐ 4 Hours ☐ 5 Hours

☐ More than 5 hours

6. How many hours a day do you spend outdoor/out of your boat?

☐ Less than 2 hour ☐ 3 Hour

☐ 4 Hours ☐ 5 Hours

☐ More than 5 hours

7. Did you go to school?

If yes, how much class did you complete?

a)Yes ( ) b)No

8. Does your child go to school?

a)Yes b)No

9. Does your child go for business/income?

a)Yes b)No

10. Do you have Voter ID?

a)Yes b)No

11. Do you have access to hospital?

a)Yes b)No

12. How long have you been in this location?

☐ Less than 1 year ☐ 2 years

☐ 3 years ☐ 4 years

☐ More than 4 years

13. When did you last move with your fleet?

☐ Less than 1 year ☐ 2 years ago

☐ 3 years ago ☐ 4 years ago

☐ More than 4 years ago/others

14. Do you want to settle on land ?

a)Yes b)No

15. What kind of activities do you perform inside the boat/house ?

a) sleeping b)storage c)working d)cooking e)others

16. What kind of activities do you perform outside the boat /House?

a) playing b) bathing c) cooking d)Toilet e)washing/others

17. How many boats/houses do you have ?

a) b) c)

18. What is the mode of your transportation when you go for business/shift?

a) Boat b)bus c)walk d)Rickshaw/van e)others

19. Do you make/repair your own boat/house? If not how do you manage it?

a) Yes b) No c)Others

20. What activities do you perform in your leisure time?

a) sleep b) play c)Roam around d)watch TV/Movie e)others

21. When did you get married? What was your age at that time?

a) b)

22. What is the characteristics of the house/boat?

a) size : b) Material: c)no.of space

23. What do you use as tool for your profession?

a) b) c) d)

24. Where do you celebrate festivals?

a) Eid b) Marriage c)others

25. What are the festivals that your forefathers/you celebrated in the past?

a) b)

26. What kind of animals/domestic pets do you have?

a) b)