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MASTER OF SCIENCE THESIS

Patterns and Changes of Vernacular Architecture in Bangladesh

An application of Amos Rapoport's theory of Defining Vernacular Design

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Table of Content Page no

List of figures III
List of tables IV
Acknowledgement V
Abstract VI

1.0 Introduction 1
1.1 Background 1
1.2 Problem definition 2
1.3 Aims and objectives of the study 3
1.4 Methods 4
1.5 Organization of the research 4
1.6 Limitations 4

2.0 What is Vernacular architecture? 6
2.1 The discovery of "vernacular-ism" in the history of architecture 6
2.2 Defining Vernacular architecture 6
2.3 Variations of vernacular architecture over time and space 9
2.4 The ways of studying vernacular architecture 10

3.0 Method of investigation 13
3.1 The theory 13
3.2 The methodology and analytical process 14

4.0 Vernacular Architecture in Bangladesh 18
4.1 A brief History of Human Settlement in Bangladesh 18
4.1.1 Some ancient human settlements in this region 18
4.2 Form of rural settlements in Bangladesh 20
4.3 Forms of vernacular buildings in rural Bangladesh 23
4.3.1 The "Bengali houses" and its basic characteristics 23
4.3.2 Diversities of rural house forms 25

5.0 Case studies 31
5.1 Justification behind selection of the cases 31
5.2 Organisation of the case study 32
5.3 Rural settings 34
5.4 Semi urban settings 48
5.5 Urban settings 64
5.6 Conclusion 74

6.0 Analysis of vernacular architecture 75
6.1 Assessment of the cases in three different settings 75
6.2 Core and the significant attributes of vernacular architecture in Bangladesh 81
6.3 Changes of vernacular architecture with the changes of lifestyle 82

7.0 Discussion and recommendations 87

References 92

List of figures: Page no

Figure 1.1: Map of Bangladesh and its location in the world context ……..1
Figure 2.1: The ideal types of definitions of architecture ……8
Figure 2.2: The presence of the common features between different architectures…….. ……..8
Figure 2.3: Rapoport's idea about assessing vernacular architecture ……..8
Figure 3.1: Rapoport's view about the built environment ……13
Figure 4.1: Ancient Settlements of Bengal ……19
Figure 4.2: Settlement Patterns of Bangladesh ……21
Figure 4.3: Scattered formation of homesteads in flood plains ……22
Figure 4.4: Basic arrangement of a Bengali house ……24
Figure 4.5: Various types of houses (a) ……26
Figure 4.6: Various types of houses (b) ……27
Figure 4.7: Various types of houses (c) ……28
Figure 4.8: House forms in Hilly areas ……29
Figure 5.1: Spread of different types of settlements in Bangladesh ……31
Figure 5.2: Axonometric view (Rural/1) ……34
Figure 5.3: The agricultural activities in the outer court. ……35
Figure 5.4: The multipurpose activities in the inner court. ……35
Figure 5.5: Stages of developments and changes (Rural/1) ……36
Figure 5.6: Entrance to the outer court ……36
Figure 5.7: Existing plan (Rural/1). ……37
Figure 5.8: Axonometric view (Rural/2) ……38
Figure 5.9: The inner court. ……39
Figure 5.10: View towards the kitchen from the inner court. ……39
Figure 5.11: Stages of developments and changes (Rural/2) ……40
Figure 5.12: Existing plan (Rural/2) ……41
Figure 5.13: Axonometric view (Rural/3) ……42
Figure 5.14: Existing plan (Rural/3) ……43
Figure 5.15: The inner court. ……44
Figure 5.16: The indirect approach to the inner court. ……44
Figure 5.17: Axonometric view (Rural/4) ……45
Figure 5.18: The living room. ……46
Figure 5.19: View from the inner court. ……46
Figure 5.20: The indirect approach to the cooking area. ……46
Figure 5.21: The outdoor cooking area. ……46
Figure 5.22: Stages of developments and changes (Rural/4) ……47
Figure 5.23: View towards the services. ……48
Figure 5.24: View towards to the main living unit from the court. ……48
Figure 5.25: The commercial activities at the outer part of the house. ……49
Figure 5.26: The living room. ……49
Figure 5.27: Details and ornamentations. ……49
Figure 5.28: The details of the buildings. ……49
Figure 5.29: Stages of developments and changes (Semi/1) ……50
Figure 5.30: Existing plan (Semi/1) ……51
Figure 5.31: Axonometric view (Semi/2) ……52
Figure 5.32: View towards the mail living unit form inner court. ……53
Figure 5.33: View to the inner court showing the detached a kitchen. ……53
Figure 5.34: The approach to the inner court. ……53

Figure 5.35: Existing plan (Semi/2) ……...54
Figure 5.36: Stages of developments and changes (a) (Semi/3) ……55
Figure 5.37: The approach towards the detached toilet. ……...56
Figure 5.38: View towards the multi purpose inner court. ……..…….. 56
Figure 5.39: The dining place, looking toward the inner court. ……56
Figure 5.40: Stages of developments and changes (b) (Semi/3) ……57
Figure 5.41: Axonometric view (Semi/4) ……...58
Figure 5. 42: The outhouse. ……59
Figure 5.43: The detached kitchen and the storage. ……..……59
Figure 5.44: The indirect approach to the inner house. ……..……59
Figure 5.45: The inner veranda. ……59
Figure 5.46: Stages of developments and changes (Semi/4) ……60
Figure 5.47: Stages of developments and changes (a) (Semi/5) ……61
Figure 5.48: The main living room. ……62
Figure 5.49: The new dining place. ……..……62
Figure 5.50: Stages of developments and changes (b) (Semi/5) ……63
Figure 5.51: Plan and the stages of development and changes (Urban/1) ……..……64
Figure 5.52: Plan and the stages of development and changes (Urban/2) ……..……..66
Figure 5.53: Stages of developments and changes (Urban/3) ……68
Figure 5.54: Existing Plan (Urban/3) ……69
Figure 5.55: Plan and the stages of development and changes (Urban/4) ……70
Figure 5.56: Stages of developments and changes (Urban/5) ……..……..72
Figure 5.57: Existing Plan (Urban/5) ……73
Figure 6.1: Growth Center by LGED. ……..……82

List of tables:

Table 3.1: Checklist for the position of characteristics (Rural/1) ……..... 16
Table 6.1: Checklist for the position of characteristics (Rural setting) …… 75
Table 6.2: Checklist for the position of characteristics (Semi urban setting) ……...77
Table 6.3: Checklist for the position of characteristics (Urban setting) ……79

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Abstract

Bangladesh possesses a long history of human settlement. The fertile land, vegetations and warm-humid climate inspired people to settle in this region. From the early stage to the present time, this settlements experienced several changes and transformations by human to meet the specific needs of the people. These settlements are often called as vernacular architecture in Bangladesh.

In course of time urban areas are developed for business, education, and administrative purposes. These urban areas are experiencing changes in this time of globalisation. The changes of architecture in urban areas are happening faster than in rural areas of Bangladesh. These changes of architecture in the urban context failed to fulfil some of the sustainability criteria such as economical, social and environmental aspects while the vernacular architecture in Bangladesh showed its sustainability and adaptability. To find out a solution for overcoming this adverse situation for the built environment, a proper study of vernacular architecture is needed.

This study seeks to understand the patterns and the changes of architecture for the assessment of qualities of vernacular architecture in Bangladesh. At present most of the definitions and examinations of vernacular architecture are based on a single or very limited number of attributes / characteristics. But vernacular architecture is not a product of the combination of one or a few attributes. Sometimes it creates confusion in assessing the vernacular architecture. In this research Amos Rapoport's theory of Defining Vernacular Design is applied to analyse the current views about vernacular Architecture and to follow the change patterns over time. Rapoport proposes to separate all the characteristics of built environments into *process* and *product* characteristics. He also mentions some specific criteria attached to these characteristics to assess an environment as vernacular, which he stated as Polythetic approach. The approach has been taken as the basic guideline for this research.

The field studies have been conducted in three stages of human settlements (rural, semi urban and urban) in Bangladesh. All of the cases are assessed under the theory proposed by Amos Rapoport. By analysing all of the cases, the core attributes of domestic environments in different levels of human settlements are found out.

The implication of this study anticipates to have a clear understanding of Vernacular Architecture in broad global context as well as for Bangladesh. This research also aims to provide an overview of the change or transcended patterns of vernacular architecture in Bangladesh. This study also expects to set a framework to study vernacular environments. At the end of this study, discussions and recommendations are made for the future sustainable developments of built environment by taking the essences of vernacular architecture.

Keywords: *Bangladesh, Vernacular architecture, Human settlements, Spatial changes*

1. Introduction

1.1 Background

Figure 1.1: Map of Bangladesh and its location in the world context
(Source: www.graphicmaps.com, December 2002)

Architecture of Bangladesh has eked out of the geo-climate of the region while accommodating the societal norms and traditions of the people. This localized architecture is sometimes referred to as the vernacular architecture of the region (Mowla & Reza, 2000). Bangladesh possesses a rich tradition in the formation and the developments of its human settlements. The built forms of these settlements have their own specific characteristics. For the understanding of this built environment, an analysis of vernacular architecture is needed.

In Bangladesh, like in any other part of the world, traditional architecture showed its sustainability with their harmonic balance within the surrounding society and environment and also with their specific character of forms and spatial relationships. These traditional built forms hold the heritage of the country's long history and traditions. Vernacular architecture also subject to change over places and time. The assessments of vernacular architecture can be varied with the different viewpoints of researchers. Different researchers found not only the positive features but also some negative aspects in vernacular architecture. Sometimes it is claimed that there are some aspects of vernacular architecture, which are not providing a healthy environment[1] with its age-old traditional technology, formal arrangements, functional layout etc (Denel, 1990).

Architecture is a product of a long and complex evolutionary process. In this process architecture has been changing with the influences of different factors like social, economical, technological etc. Architecture in Bangladesh also has been changed and modified in different times with the changes of rulers. Rulers in different times tried to impose and incorporate new elements of architecture in this region. The Hindu, Buddhist, Muslims and finally the European colonists made several changes in architecture specially in the urbanised areas. Nowadays changes are happening by the influences of globalisation, presence of market economy etc. The rural settlements were less effected with these changes of rulers in different times. But in this 21st century, changes in the rural settlements are also taking place but in a slower pace.

[1] Bilgi Denel studied the vernacular architecture of Anatolia where he mentioned, " *Blind acceptance without questioning, steaming from an adherence to traditions, led to no growth and thereby to no potential for development over time. Hence it is possible to say that, as value judgement for rural Anatolian village vernacular architecture, traditions turned out to be bad* ". To be more specific about this statement he made a qualitative judgement of Anatolian vernacular architecture as " *Windows, where they exists, are small, few and often fixed, therefore providing for light without ventilation. Ceilings are low. The overall form contains no visually distinctive characteristics etc* " (Denel, 1990).

After the independence in 1971, thirty years have passed and Bangladesh is trying to find its own regional identity in architecture for its future developments. To find out the regional identity, vernacular built forms are the potential sources of information. The knowledge can be gained by a study of vernacular architecture and its changes over time. This research intends to focus on the pattern and spatial changes of vernacular architecture in Bangladesh.

1.2 Problem definition

With the change in the global context, in terms of technological, climatic, socio-cultural and economic factors; traditional architecture in Bangladesh is also changing. These changes are taking place within both urban and rural contexts.

Bangladesh is a country where the economy is based on agriculture[2] and where the major portions of the people are living in rural areas. But the situation is changing. The mode of economy of Bangladesh is expecting to be oriented away from agriculture to others and the rural people are searching for jobs other than activities related to agriculture. New job opportunities, better scopes for higher education and business in urban areas act as pull factors for the rural peoples to come in urban areas. On the other hand, the lack of income generation activities and the regular devastating floods in rural areas are pushing the rural people to cities.

In this situation there is a high demand of houses in the cities for the increased population. To meet the housing demand, different approaches are taken by different organisations and institutions (both public and private sectors). Houses have been built though it was not sufficient for the demand. At the same time the present developments of architecture failed to ensure some of the sustainability[3] criteria, specially the financial, social and environmental aspects. Prices of the new houses have reached beyond the capacities of people in general. The arrangements of the new urban spaces and individual houses are about to loose their social acceptances with the ignorance about traditional aspects. The environmental qualities in urban areas are degrading with the overuse of natural resources. Contamination of the environment and the destruction of the ecosystems are also happening with different negative activities of building industries, unauthorised settlements etc. The lack of sustainability in the new developments appears as the threat to the built environment.

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[2] The economy of Bangladesh is primarily dependent on agriculture. About 84 % of the total population live in rural areas and are directly or indirectly engaged in a wide range of agricultural activities (GOB, 2002a).

[3] Sustainability in architecture has been identified with some special aspects. Generally sustainable architecture brings together at least five key characteristics: (**a**) *environmental sustainability*- does the approach avoid depleting natural and contaminating the environment? (**b**) *technical sustainability*- can the skills be introduced and passed on to others, and are the tools needed accessible? (**c**) *financial sustainability*- can money or service exchange be accessed to pay for the work that needs to be done? (**d**) *organisational sustainability*- is there a structure of sorts that allows one to bring together the different stakeholders without, for example needing to call on outside expertise on each occasion? (**e**) *social sustainability*- does the overall process and the product fit within and satisfy the need of the society? In practice there is always a compromise between one or the other of these characteristics, in as much as one aspect may only be achieved to the slight detriment of one of the others. Each of these five characteristics is essentially context specific, and relate to the resources that are locally available, or to the customs and needs of the local population. Answering all of the questions it can be said that the characteristics of sustainable architecture should have the following qualities. "Sustainable architecture • makes substantial use of local materials and local means of transport; • uses recourses that are available in sufficient quantity to satisfy a general demand and not damage the environment; • does not depend on equipment that is not easily available; • uses skills that can be realistically developed in the community; • can be afforded within the local socio economic context; • produces a durable result; •responds to and resists the effects of the local climate; • provides flexibility to adopt to local habits and needs; • can be replicated by local community" (Norton, 1999).

In the rural context, the architecture possesses some distinct characteristics to sustain within that particular community. Several generations have been living there for hundreds of years and maintaining their culture and traditions. In this way the traditional rural architecture showed its adaptability and sustainability. In the time of globalisation the architecture in rural areas is changing simultaneously but slowly compared to the urban areas. It is assumed that with the changes of building materials, changes in the use pattern of spaces and the additions of new built forms with the houses like shops etc, the architecture in rural areas may loose some aspects of its sustainability.

The contemporary change pattern, specially in urban areas, are considered as too rapid for easy assimilation (Mowla, 1999b). Therefore it needs to be analysed to see how much this change is capable of responding to the changing context. Nowadays it has become a critical issue to find an approach for orienting the changes of architecture in a sustainable way.

It is necessary to study different levels of human settlements to trace the transcendent pattern of vernacular architecture that is continuing from rural to urban contexts. The researches that are carried out in this field usually focus on rural or urban context separately. These segmental and unintegrated studies fail to explore the vernacular essence.

The less emphasis to analyse the pattern and changes of vernacular architecture and the absence of a proper research framework are considered as some of the major problems in the field of studying built environment as well as for vernacular architecture. Nowadays the studies of vernacular architecture are facing problem with the lack of an appropriate and clearly applicable method. There is also a problem with documenting the results from the practical analysis of vernacular architecture. The documentations of the patterns and the changes of architecture are very important for the research in present and future. At this situation this research is going to deal with some specific problems such as, the lack of an applicable tool for the analysis of vernacular architecture, the problem of following the trace of the changes of vernacular architecture and the problem of identifying the core attributes for a sustainable domestic environment.

Therefore, to overcome these stated problems, a proper study is needed to develop an analytical model, which should have the focus on the pattern and the changes of vernacular architecture in different times and contexts.

1.3 Aims and objectives of the study

This study aims to find out the possible ways to overcome the above research problems for the developments of architecture. The problems of the lack of a suitable analytical tool, the lack of knowledge about the changes and patterns of vernacular architecture, and above all the lack of sustainability within the built environment have become the critical aspects for study. As for the purpose of addressing the problems, this research is conducted to reach the specific objectives i.e.,

- To investigate a suitable tool for the analysis of vernacular architecture.
- To analyse the pattern and the changes of vernacular architecture in Bangladesh.
- To identify the core attributes, essential for sustainable domestic environment.
- To contribute towards an analytical framework for the evaluation of vernacular architecture.

These objectives attempt to be reached by the fieldworks and analysis of the domestic architecture in different stages of human settlements (rural, semiurban and urban) with the help of a suitable method for the assessment of vernacular architecture.

1.4 Methods

The following methods have been used in this research to address the specified problems.

- Literature reviews for a clear understanding of vernacular architecture and for selecting a suitable theory to apply.
- Literature reviews about the pattern of vernacular architecture in Bangladesh.
- Direct observation of the cases for an understanding of aesthetic, functional, and formal qualities of architecture.
- Sketches and photographs. The sketches are used to analyse and for documenting the pattern and the changes, and the functional relationships in a vernacular house. The photographs are used for documenting the use patterns of the spaces, the sequences of functional activities, and different influences those exist in the present vernacular architecture.
- Informal interviews of key persons. For each of the cases the oldest member is considered as the important person. Interviews of the old members are taken to get information about different developments and changes of that particular house and the settlement. Some interviews of the women are taken for the understanding about their preferences for the functional arrangements inside the houses.

The literature reviews served the purpose of making the knowledge base about the pattern of vernacular architecture. The other methods like direct observations, interviews, and photographs are used to trace the present status and the transformations of vernacular architecture compared to the knowledge base.

1.5 Organisation of the report

This report is organised in several chapters. The chapters are arranged in such a sequence that ultimately the objectives can be obtained. In the Introduction chapter; background, problems, methods and the objectives are stated. The next chapter attempts to define '*Vernacular architecture"* and explains the origin and the universal meaning vernacular architecture. The third chapter deals with the methodology of the research. The theory, method and the process of analysis are explained here. The fourth chapter is elaborating what the meaning of vernacular architecture in Bangladesh is, with some illustrations. Chapter five is elaborating the selected cases and the results. The subsequent chapter is the continuation of the results and analyses of the case studies. And the last chapter contains the discussions and recommendations for further development and study of vernacular architecture within the defined context.

1.6 Limitations

The research is conducted to study a society with a special emphasis on aesthetic, functional and social aspects of architecture. As this research has given more priority to the pattern of architecture and its transformations with the changes of lifestyles rather than on technical aspects, so it will not provide the detailed information regarding dimensions or construction techniques of architecture.

Since the study is dealing with the architectural characteristics of domestic environment, so individual households got importance rather than a whole settlement. The research topic contains the phrase "Vernacular architecture of Bangladesh" but as the case studies are not made in a broader scale so it cannot be applied as a source of full information about the whole of Bangladesh. In Bangladesh there are many different types of settlements depending on the different geo-physical, societal characteristics. Among them (for the rural cases) only the flood plain areas are selected for the cases of rural setting as

it is covering more than 80% of the total land[4], which are characterised as scattered settlements. They have been chosen and studied with some considerations[5] so that they can represent some of the typical house forms of Bangladesh. These selected cases have been to get some ideas regarding the salient features that are hidden within them.

[4] Broadly the physiography of Bangladesh can be grouped into three major units: hill soils (12%), old alluvial soils (8%), and recent alluvial soils (80%) (BSoE, 2001).

[5] See the justification behind selection of the cases in the chapter 5

2. What is Vernacular architecture?

2.1 The discovery of "vernacular-ism" in the history of architecture

The historians and theorists of architecture identified architecture generally by the monumental and prestigious buildings. These buildings were built for only the top layer of the society or some special purposes only such as palaces, forts, grand mosques, mausoleums, government buildings etc. These buildings were designed and guided by professional architects or trained designers.

The major part of the buildings of general people was neglected by the historians and researchers in the discussion of architecture. In different publications of architecture like encyclopaedias of architecture from Europe and the United States, these buildings were ignored and mainly concerned with classical and modern architecture of Western, Indian or Oriental traditions. Paul Oliver is one of the prominent researchers in the field of vernacular architecture. He has published several books and research article related to vernacular architecture. Discussing about the interpretations of vernacular architecture in different architectural records Oliver mentioned '*The majority of the buildings are systematically omitted from these publications; in others recognition is made to them only in passing*' *(Oliver, 1997).*

This neglected architecture holds the past culture, lifestyle, building technologies that are suitable for every specific region. The interest to study of these buildings got emphasis with the exhibition called "Architecture without architects" in 1964 by Rudofsky at the prestigious Metropolitan Museum of Modern Art in New York. The book "Architecture without architects" following the exhibition published by Bernard Rudofsky showed some of the undiscovered architecture around the world, those are surviving for thousands of years within a sustainable way.

Sometimes this architecture had been called 'native', 'primitive', 'indigenous', 'traditional' or 'vernacular'. There are some areas of interest, which are common to all of these terms or vocabularies. These common areas of interest are making difficulties for the clear distinctions between the terms. Among those, the term which has gained the widest acceptance is 'vernacular architecture' with its linguistic comparison to the common people (Oliver, 1987p.9). This research is not focusing on the distinctions between those terms but attempts to elaborate and examine the ideas of vernacular architecture.

Several researches have been carried out and some are ongoing to study vernacular architecture, which indicates the growing interests among the architects/researchers in this field. The pioneers in the research of vernacular architecture like Amos Rapoport, Paul Oliver and the people interested in vernacular architecture still engaged themselves in search of the essences of vernacular architecture. Vernacular architecture got a strong standpoint to the researchers with the publication of "*The Encyclopaedia of Vernacular Architecture of the World*" in 1997 edited by Paul Oliver. This encyclopaedia is the collection of researches about vernacular architecture by 250 researchers from 80 countries around the world (Richardson, 2001).

2.2 Defining Vernacular architecture

It's a difficult task to make a common definition of vernacular architecture because there are so many parameters attached to the vernacular. Besides this, there are contradictions among the theorists and researchers to recognise the vernacular architecture as architecture. A conventional definition of architecture usually doesn't accept the 'vernacular architecture' as 'architecture'. Therefore it is needed to discuss the conventional definitions of architecture to recognise 'vernacular architecture' as 'architecture' before going for the definitions of vernacular architecture.

Conventional definition of architecture

There are several definitions made by different architects and theorists, which are applicable for the modern or classical buildings. The houses of general people of every society were ignored or not taken as an example of architecture (Oliver, 1969). The analysis of the words 'architect' and 'architecture' will help us to understand the characteristics and the standpoints of these houses within the domain of architecture.

Literally architecture can be defined as the building, which is designed or erected by architects or designers. In another word, architecture is that product which an architect produces. From the Greek '*arkitecton',* the word architect can be derived from *arki* and *tekton*. *Arki- (or arch)* means chief, superior and *tekton means* builder. So, an architect can be termed as a chief builder or master mason. These chief builder or master masons also existed in the pre-industrial or primitive societies.

The job of an architect is to design and guide a construction work. The architect may get these capabilities by formal institutional trainings or informal learning through working experiences with the local experts. Such as in the vernacular society there was no institutionally trained builders. But each society had some local craftsmen who can guide a group of people for the design and construction. As these skilled people had the capabilities of guiding and training the craftsmen/masons so these skilled people can also be called chief builder or master mason. This definition of architect attempts to establish vernacular architecture as 'architecture' because they (the ancient builders) got their training/capabilities traditionally and their works must be 'architecture'.

Architecture is the art, profession or science of designing and constructing buildings, certainly covers the constructions existed from the time of hunters and food-collectors – if not from the early time of mere gatherers – to the present (Turan, 1990). This definition of architecture attempts to recognise the shelters/and dwellings of general people as architecture. From these understanding one cannot exclude the vernacular houses from the domain of architecture.

Vernacular architecture

The Latin word '*vernaculus'* means native. Architecture is vernacular when it exhibits all of its criteria related to the 'native context' in the sense that it can only be acceptable and recognisable within any particular society by applying some particular technology, materials, social rules and systems.

The term 'vernacular' is referred to as "the mode of expression of a group or class" (Dictionary, 2002). This group/class can be various types such as people, different buildings etc. The mode of expression means how something appears in front of us and this mode of expressions will be different for each of these groups or classes.

Language is one mode of expression of a group of people and 'vernacular' was used for the first time for defining a language in England in 1839. Vernacular refers to the dialect of a region or country rather than a literary, cultured, or foreign language. Vernacular was subsequently employed intermittently and gained a wider application in the 1950s (Oliver, 1997). Later on this idea came in the history of architecture as the mode of expression of a specific category of architecture.

The researchers of vernacular architecture tried to elaborate the idea of vernacular in different ways. Some tried to give a specific definition so that vernacular architecture can be distinguished form the other types of architecture. There are also some definitions, which are basically elaborating the features of features of vernacular architecture. Some of these conventional definitions of vernacular architecture are mentioned in the following texts.

'*Vernacular architecture comprises the dwellings and all other buildings of the people. Related to their environmental contexts and available resources, they are customarily owner or community-built, utilizing traditional technologies. All forms of vernacular architecture are built to meet specific needs, accommodating values, economies and ways of living of the cultures that produces them' (Oliver, 1997).*

'Vernacular architecture is a practical activity pursuing environmental adequacy rather than knowledge; it is a way of acting within the conditions of existence, fulfilling certain environmental needs for a particular group of peoples' (Turan, 1990).

Vernacular architecture generally embodies community values, and less evidently, may symbolize concepts of cosmos, or acts as an analogue for the abstraction of belief. Thus even a simple dwelling may reflect both the material and spiritual worlds of it builders and occupiers' (Oliver, 1997).

Most of these definitions can be mentioned as the descriptions of the essential features or purposes of vernacular architecture. With the help of these descriptions and in combination of the essential features a definition of vernacular architecture can be written as "Vernacular architecture refers to the built forms that are built of local materials using available technology in a functional way that devised to meet the needs of common people in their time and place".

Rapoport says in his book *'House Form and Culture'* that *' A satisfactory definition of vernacular is more difficult. At the moment the successful way of describing it seems to be in terms of process- how it is designed and built'* (Rapoport, 1969). In this definition he only indicated the new factor for defining vernacular as *process. With the continuation of this* idea he developed the way of studying vernacular environments called Polythetic approach, which is taken as the guideline for this particular research and described in the following chapters[6].

Most of the conventional definitions of vernacular architecture are based on ideal types of architecture. These definitions also attempt to set the fixed boundaries between these ideal types of architecture such as primitive, vernacular, popular, high style etc(see fig 2.1). But any architecture cannot be seen as isolated style because they are related and linked to each other in different ways (see fig 2.2). In defining vernacular we can just assess its character as more or less vernacular, not as a specific type of architecture. So a working definition will be that one, which can compare one environment with others to see whether it is more or less 'vernacular' and not only dealing with the ideal types (Rapoport, 1990) (see fig 2.3).

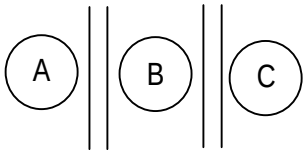

Figure 2.1: The ideal types of definitions try set fixed boundaries between different architectures. Here, A, B and C are different types of architecture such as, primitive vernacular, highstyle etc.

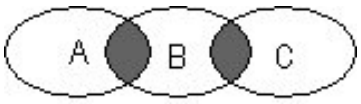

Figure 2.2: The presence of the common features between different architectures.

Figure 2.3: Rapoport's idea about assessing vernacular architecture

[6] See the chapter 3: The method of investigation

2.3 Variations of vernacular architecture over Time and Space

The vernacular traditions may vary from place to place, society to society and it is also the matter of a unique adaptation (and changes) in course of time with the surrounding environment. Such as in the western world like Europe, vernacular architecture is distinguished in relation with industrial movement and sometimes mentioned by pre-industrial or post-industrial vernacular architecture. In the Asian countries societies cannot be classified with the terms pre-industrial or post-industrial society. So vernacular architecture in this region is described in general terms rather to find relation with industrial or with some other movements.

Vernacular tradition is subject to change over place and time and within any single set of characteristics, which is not applicable to every settings. *'It is a particular characteristics of vernacular architecture that each tradition is intimately related to social and economic imperatives; it has developed to meet specific needs within each cultural milieu' (Oliver, 1997).* There may have similarities with in the techniques or typologies between different regions of the world but they have sustained by their own ways of survival qualities.

There is no particular category of vernacular architecture but sometime different special terms are used with vernacular architecture to explain their respective characteristics and settings. Sometimes vernacular architecture is described with 'rural' and 'urban' terms in explaining rural and urban settings respectively when place is considered as a major guiding factor for the distinction. Burnskill (1988) proposes a category of vernacular architecture based on their use types such as:

1. Domestic vernacular architecture: It comprises the buildings designed for living as normally understood such as eating, sitting, sleeping, storage, etc and also ancillary buildings like the brew house, bake house, kitchen, sculleries, wash houses etc. generally it includes all the buildings where the domestic activities are predominated over the commercials.

Domestic vernacular architecture is distinguished in two categories i.e. domestic vernacular architecture in countryside and that of the towns. The former one being related mainly to farming whereas the other related to commerce, and both governed until quite recently by the separate lines of development followed by towns and country.

2. Agricultural vernacular architecture: It comprises all the buildings of the farmstead apart from the farmhouse and its domestic ancillaries. The barn, the cow-house, stable, granary, cart shed, etc would be the examples of agricultural architecture.

3. Industrial vernacular architecture: It intends to include the buildings, which housed the industrial activities related to country sides- wind and water mills, corn and limekilns, smithies and potteries etc. This industrial vernacular architecture also includes the buildings where some of the manufacturing activities are more related to domestic than commercial such as, a workshop attached to a dwelling or incorporated within it.

In this category Burnskill (1988) attempts to segregate the agricultural and industrial activities that are closely related to dwellings and mentions them as different types of vernacular architecture. But specially for the case of Bangladesh, those activities (agricultural and household cottage industrial) seemed as some of the inseparable elements of rural dwellings and they are considered as the part of the houses. So a study of vernacular architecture will be incomplete if some of these activities are considered separately and studied as different types of vernacular architecture.

2.4 The ways of studying vernacular architecture

Nowadays vernacular architecture has got the importance and interests within the area of architectural research. This interests among the researchers initiated to develop several ways to study vernacular architecture.

'*In the first place, studies would largely have been made with educational intentions, either to indicate certain fundamental principles in architecture and building, or to explore a specific characteristics such as climatic modification. Alternatively, the approach might have been from the position of the architectural profession, perhaps with a view to relating contemporary design to a regional tradition, or to solve problems of low- cost housing that may seek to employ skill and meet local needs, or simply to record a tradition as a part of a architectural inquiry' (Oliver, 1997)*. Whatever the purpose is, vernacular architecture is obviously an interesting and significant field for study. Some of the methods of studying vernacular architecture are discussed briefly here.

Method 1

According to '*The Encyclopaedia of Vernacular architecture of the World'* edited by Paul Oliver (1997), the approaches of studying vernacular architecture can be divided into three categories.

1. *Disciplinary:* A body of knowledge; such as an archaeological approach supports this method. The other disciplinary approaches can be Aesthetic, Anthropological, Architectural, Ethnological, Geographical, Historical or Musicological. All of these approaches can be carried out with their special notions.
2. *Interdisciplinary:* It is more conceptual, for instance spatial approach.
3. *Methodological:* In this approach, the methodological ways of recording and documentations are emphasized.

Another category may be ideological; it may be based on Marxist, feminist, or religious. These ideologies may be applicable to any or all of the approaches summarised (Oliver, 1997).

Method 2 *(Study based on typology)*

Typology is used for the understanding of anything more clearly and specifically. For vernacular architecture typologies has been made on the basis of some specific aspects. In '*The Encyclopaedia of Vernacular architecture of the World'* typologies of vernacular architecture are explained by describing all the features of any architecture. Such typologies can be derived from *Elevation, Forms, Plans, Spatial Relationship or structural types (Oliver, 1997)*.

An example of this method can be explained with the study of elevations. A typology based on *Elevations,* will record and analyse the dimensioned and scaled facades, or front plane, sides and rear of the buildings. The other categories can be made in this way on the basis of the above-mentioned formal characteristics and their relations.

Method 3

In the book '*Illustrated Handbook of Vernacular Architecture'* Burnskill (1988) informs that the study of vernacular architecture can be made in five ways. Any of the way can be applied on the basis of the requirements. They are as follows:

1.*General*: The study depends on both fieldwork and library or archive works. A general study of vernacular architecture can be done with the study of a selected area or subject. The actual geographical area should be clearly specified and restricted in size for a general study.

2.*Extensive recording:* This method aims to assist in the speedy collection of survey materials in the field, and by reducing the subjective elements as far as possible, to assist in the comparison of materials between different parts of the country. The system intends to collect basic architectural information as revealed on the exterior buildings and dependent on intensive and documentary investigation to complete the study.

3.*Intensive recording:* During the process of an extensive recording some of the important typical buildings are selected for intensive study through the preparation of measured drawings.

4. Documentary investigation: The careful examination of the documents related to the buildings, their owners, and occupiers are investigated to elucidate some of the mysteries presented in the physical remains.

5.*Destructive recording*: This method intends to record the masonry techniques, timber jointing, detail of plasters, craftsmanship etc.

Method 4

Several researches have been carried out to study vernacular architecture. Amos Rapoport's view of studying vernacular architecture is something different from the others. The conventional approaches cannot provide a clear overview of environments with the partial evaluations (Rapoport, 1990). To overcome this shortcoming, he proposed the Polythetic approach. His idea comes from redefining the vernacular. In his article 'Defining vernacular design' he mentioned that most of the studies of vernacular architecture dealt with Monothetic approaches. But in the study of architecture, no single characteristics could be sufficient for defining the essential features of vernacular architecture. One needs a number of characteristics and a Polythetic approach rather than a Monothetic (Rapoport, 1990*)* in studying vernacular architecture. The Monothetic and the Polythetic approaches are described in his writing, which is presented here briefly.

Monothetic approach: Our built environment is the result of a complex phenomena and a series of adaptations or screening process. These complex phenomena are often defined segmentaly or partially by their attributes (Rapoport, 1990).

Ploythetic approach: The approach, which is considering all of the attributes in a systematic way to address the problem of understanding built environment is called Polythetic approach. In the Polytheitc approach, all of the characteristics of any environment are separated into process and product characteristics. In this approach, all of these characteristics are described with their criteria and existence levels in a given environment to assess them for vernacular.

In the Polythetic approach, Rapoport mentions the 'process' and 'product' characteristics. Each of the characteristics consists a number of attributes. In this regard his opinion is that the environments can be assessed or classified by this approach. Existence and the level of these characteristics together can assess architecture as more or less vernacular. This method has been applied in this research and explained more in the following chapters.

Remarks:
The methods 1,2,and 3 are proposed to study vernacular architecture with some special aspects. Such as in the method 1; architectural, anthropological and some other approaches are mentioned for the study. But the complete information about vernacular architecture is not possible from any of the particular approach. In the method 2; studies are proposed either only on elevations, plans or forms of the buildings. But architecture cannot be studied with only one of these aspects separately. In the method 3; different levels and specific purposive studies are proposed those are making confusion in selecting an appropriate method.

The method 4 proposed by Rapoport aims to overcome these confusions and difficulties in studying vernacular architecture. This method is combining all of the necessary aspects that are related to vernacular architecture. At the same time this method proposes a complete study of vernacular architecture, which is not complicated compared with the other methods. Considering these advantageous features, Rapoport's Polythetic approach seems appropriate and that has been applied in this research.

3. The method of investigation

3.1 The Theory

There are several theories of studying vernacular architecture, which are explained in the previous chapter. Each of the theory has some potentialities and some weaknesses. Among those, the theory (polythetic approach) proposed by Amos Rapoport has more relevance to the present study. *More importantly it can help to study all environments and relationships among them* (Rapoport, 1990). As he has derived his theory from a broader point of view with considering all of the process and product characteristics so the result will not give any partial assessment/evaluation of vernacular environment. Another advantage over the other theories is its simplicity and expedient applicability in the research.

Our built environment is the result of a complex phenomena and a series of adaptations or screening processes. These complex phenomena are often defined by a few numbers of attributes (Rapoport, 1969). Papoport´s theory is to combine all of the attributes in a logical and systematic way to address the problem of defining and assessing vernacular architecture, which is represented in the following steps.

- In his theory Amos Rapoport argues that any single or a few attributes are not enough to clarify the pattern of vernacular environment but most of the researchers used/emphasised a single or a few attributes. He proposed some basic characteristics/attributes and their higher level of presence, which are essential for an environment to be more vernacular.

- All the attributes are divided into two major categories as suggested by Rapoport i.e. Process characteristics and Product characteristics[7]. The former refers to the ways in which the environment is created, how it comes into existence. The later one refers to the characteristics describing what the environment is, its nature, qualities and attributes, including the traditional architectonic, perceptual (aesthetic) aspects of built environment (Rapoport, 1990). Each of these two categories is described in terms of multiple characteristics. These characteristics have their own sets of criteria for the assessment vernacular environments.

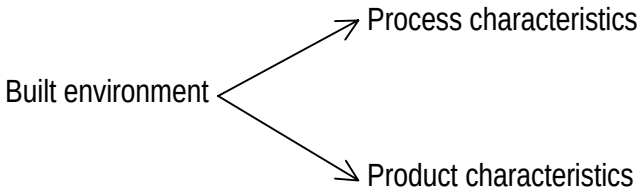

Figure 3.1: Rapoport's view about the built environment

This is Rapoport's basic theory to assess the vernacular environment. In describing the theory he also stated that these attributes can be altered, scaled or weighted. Any of them can be deducted or new attributes can be added within these two broad categories (Rapoport, 1990). These alterations and additions can be done to make the classification more specific for the context and for the research interests.

[7] See the chapter 3.2 (List 1: The characteristics proposed by Amos Rapoport)

3.2 The methodology and analytical process

By using Rapoport's theory this research has carried out in the following steps,

- ***Selection of the domain***[8]*:*
  Firstly, the domain within which the study will be conducted is selected. For this particular study, domain is the built form and its environment. To be more specific the environment is domestic/residential. All of the study, investigation and analysis are done within this environment.

- ***Modification of the characteristics and the reduction in numbers***
  Rapoport proposes 17 process characteristics and 20 product characteristics to assess vernacular environment. According to him the list of characteristics is not to be taken as final (Rapoport, 1990). Some of the proposed characteristics seem very specific and some are dependent on others. There are also some characteristics that are general and difficult to apply in the assessment. An attempt has been made to combine all of theses characteristics to propose a revised version of the list in a new different format for the assessment.

  In the revised version, the characteristics (both process and product) are kept unchanged which are very specific with their assessment criteria. There are some characteristics that have similar attributes to assess vernacular architecture and which are also dependent on each other. These similar and dependent characteristics have been combined and proposed as single character. In the revised list the attributes of the characteristics are reserved in such a way that no attribute can be missed, which are important to get the insight knowledge of the research work. There are also some other characteristics that are mentioned in Rapoport's list but no parameter is proposed to assess vernacular environment. The characteristics with ambiguities are discussed in chapter 7.

  The following lists (List-1 and list-2) are describing the characteristics proposed by Rapoport and the modified characteristics for this research respectively.

  List 1: Characteristics proposed by Rapoport (1990)

  Process characteristics

  1. Identity of designers.
  2. Intention and purpose of designers.
  3. Degree of anonymity of designers.
  4. Reliance on a model with variations.
  5. Presence of a single model or many models.
  6. Extent of sharing models.
  7. Nature of schemata underlying the model.
  8. Consistency of use of a single (same) model for different parts of the house settlement system.
  9. Type of relationships among models used in different types of environments.
  10. Specifics of choice model of design.
  11. Congruence of choice model and its choice criteria with criteria with shared ideals of users.
  12. Degree of congruence and nature of relation between environment and culture/lifestyle.
  13. Use of implicit/unwritten vs. explicit/legalistic design criteria.
  14. Degree of self-consciousness/unselfconsciousness of the design process.
  15. Degree of constancy / invariance vs. change/ originality (and speed of change over time) of the basic model.
  16. Form of temporal change.
  17. Extent of sharing knowledge about design and construction.

[8] The term 'domain' is indicating the area of interest of this study. This domain is not specifying any specific geographic space or some ones individual territory but to categories of the environments. The categories could be residential, industrial, commercial environments or other types of environments. For this research, residential or domestic environment is mentioned as the specific domain.

Product characteristics

1. Degree of cultural and space specificity.
2. Specific model, plan forms, morphology, shapes, transitions (e.g. inside/outside; interface, entrances) etc.
3. Nature of relationship among elements and nature of underlying rules.
4. Presence of formal qualities; complexity, solid-void relationships, massing volumes etc.
5. Use of specific materials, textures, colours etc.
6. Nature of relation to landscape site, geomorphology etc.
7. Effectiveness of response to climate.
8. Efficiency in use of resources.
9. Complexity at largest scale due to place specificity.
10. Complexity at other scales due to other scales due to other use of a single model with variation.
11. Clarity, legibility and comprehensibility of the environment due to the order expressed by the model used.
12. Open-endedness allowing additive, subtractive and other changes.
13. Presence of a 'stable equilibrium' (vs. the unstable equilibrium of high style).
14. Complexity due to variation over time (changes *to* model not *of* model).
15. Open-endedness regarding activities; types, numbers, overlaps, multiple uses, etc.
16. Degree of multi-sensory qualities of environment (large range of non-visual qualities).
17. Degree of differentiation of settings – number, types, specialisation etc.
18. Effectiveness of environment as a setting for life style and activity systems (including their latent aspects) and other aspects of culture.
19. Ability of settings to communicate effectively to users.
20. Relative importance of fixed-feature elements vs. semi fixed-featured elements.

List 2: The modified characteristics for this research.

(The numbers at the end of each characteristic are indicating the relevant characteristics proposed by Rapoport that are combined or modified)

Process characteristics

1.Identity and the degree of anonymity of the designer: *The criteria of identity and the anonymity of the designers are very dependent to each other. For the vernacular design the anonymity of the designers will be high and the designers will be common in nature i.e. part time specialist or the users. (1,3)*

2.Intention and purpose of the designers: *For the case of vernacular design the Tradition, use, pleasure and group identity act as the primary intentions and motivations. (2)*

3. The Reliance, presence, nature and extent of sharing of a model: All of these aspects are dealing with the model. *These aspects of the model are expected with their utmost existence in vernacular design. (4,5,6)*

4.Consistent uses of a single model for different parts of house settlement system: *Consistency is very high in vernacular architecture. (8)*

5.Degree of congruence and nature of the relationship between environment and culture/lifestyle: *Congruence is well neigh perfect in primitive and vernacular environments. This congruence relates to the effectiveness of the environments as a setting for behaviour, lifestyle, etc and its effectiveness in the communication of the meaning. Effectiveness is very high in primitive and vernacular environments. (11,12)*

6.Degree of self-consciousness or un-self consciousness of the design process: *Self-consciousness is very low in vernacular architecture. The design is done by selectionist process. (14)*

7.Degree of constancy/invariance vs. the form of change/originality (and speed of change over time) of the basic model. *Constancy is high and the speed of change over time very slow. (15,16)*

8.Extent of sharing the knowledge about design and construction: *Extent of sharing is very high in vernacular architecture. (17)*

Product characteristics

1.Degree of cultural and place specificity: *It will be very high in vernacular architecture. This specificity is reinforced by different modifying factors (site, response to climate, limited materials etc). The specifics are mentioned by model, plan, forms, morphology, shapes, geometry, transition etc. (1,7)*

2.Presence of specific formal qualities and relation to landscape: *Formal qualities generated by particular environment: solid void relationships, fenestration pattern, massing, volume articulation, level changes, urban spaces etc. For vernacular architecture, the presence of these aspects expected to ensure a closer relation to the natural environment. Vernacular design 'fits' better into the landscape. (4,6)*

3.Use of specific materials, colour, and textures: *In vernacular architecture this vocabulary is richer and very high with the use of specific building materials, textures, colours etc. (5)*

4.Efficiency in the use of resources*: Maximum efficiency is achieved in vernacular architecture through the use of materials, multiple uses of spaces and settings etc. (8)*
5.Complexity at the largest scale due to place specificity: This is the result from the difference between places due to the consistency of cultural landscape. This complexity is high *in vernacular environment and the transitions among places are noticeable. (9)*
6.Clarity, comprehensibility and the effectiveness of the environment due to the order expressed by the model used: *The settings of vernacular environments are culturally supported and the clarity, comprehensibility and the effectiveness of the environment are very high. (11,17,18,19)*
7.Open-endedness, additive and subtractive qualities and the presence of "stable equilibrium": *All of these criteria are expected very high in vernacular environments. (2,3,12,13,15)*
8.Complexity due to the use of a single model with variation over time: *This complexity refers to the changes to the model not of the model. In vernacular this has become highly rich and complex. (10,14)*

- ***Study of the lifestyle and built environment***
  Some selected cases from all over Bangladesh are studied along with the literature reviews, the informal interviews of key persons, observations, taking photographs, sketches, field notes and interviewing the relevant experts. These studies are carried out to get a deep understanding of the environment and to get the answers of the following questions. What do people really want in their domestic environment? What are their preferences? How different factors are effecting in moulding or generating different living environments?

- ***Analysis***
  The information that are collected from field and literature survey are scaled, and compared with each other. This stage tried to find out the similarities and dissimilarities in between the domestic environments at different context. At the end of the analysis an attempt has been made to trace the core attributes i.e. the aspects, those expected to be present in vernacular environment. The analysis has been carried out in the following way

  - A checklist is made to assess the characteristics by plotting them in a table. Rapoport proposes only the characteristics to assess the environments. The table (checklist) is formulated and proposed by the present author for this research to apply Rapoport's theory in assessing vernacular architecture. In this table all of the characteristics are assessed in three categories of high, medium and low. These high, medium and low are the levels of existence of the characteristics in any particular case. Every single case has been studied within this format. The cases of *rural, semi urban* and *urban* are examined and their characteristics are plotted on the basis of process and product characteristics.

Case: (Rural/1)	Charac	Level	1	2	3	4	5	6	7	8
	Process	H	●	●	●	●	●	●	●	●
		M								
		L								
	Product	H	●	●		●	●	●	●	●
		M			●					
		L								

Legend
1-8 are the numbers that are representing the proposed characteristics (see list 2: in the chapter 3)

H=high, M= medium, L= low

Table 3.1: Checklist for the position of characteristics (Rural/1)[9]

[9] Characteristics of every case in three different settings are analysed in the same procedure.

- The results from the checklists of each setting are analysed. The results are also evaluated and compared to observe the similarities and dissimilarities of the characteristics within the settings.

- Finally in the conclusion, some recommendations are proposed for the future developments of domestic architecture. Whatever the area of developments like rural or urban, the recommendations are proposing why, how and to what extent, the potentialities of vernacular architecture can be applied to the architectural developments in the 21st century.

4.0 Vernacular architecture in Bangladesh

To investigate the vernacular architecture in Bangladesh, this research is focusing on the study of domestic architecture in different levels of human settlements such as the rural, semi urban and urban settings. Within these three different settings a special emphasis has been given on the architecture in rural setting. It is necessary to study rural settlement patterns and the formation of homesteads to get a clear understanding about vernacular architecture in Bangladesh.

To understand the characteristics of house forms, it is necessary to have a clear knowledge about the settlement patterns. Houses cannot be seen in isolation from the settlement, but most of them should be viewed as part of a total social and spatial system, which relates the houses, way of life, settlement, and even landscape (Rapoport, 1969). So before going to discuss about the individual house form, the formation of settlements and their patterns have explained in the following texts. The discussion starts with a brief history of human settlements in Bengal region and ends with describing the patterns and forms of the individual houses.

4.1 The Development of Human Settlement in Bangladesh

Bangladesh has a long history of human settlement. The country's location in the deltaic region with fertile land, huge vegetations and plenty sources of water were the main attractions to human for establishing settlements here. The evidences from Palaeolithic civilisation proved the existence of human settlement in Bengal region[10] 10,000 to 15,000 years ago. It is generally accepted that the human settlements started in the west and the north of Bengal regions. The south was either marshy or deeply forested, and it was not suitable for habitation. But later on, due to siltation in the southern region, the marshy areas were raised and the settlements expanded there from the north. Some other ancient settlements were in the Lalmai region and in the south-western Chittagong (Sultana, 1993).

The intention of this research is not to give a detailed description of the ancient settlements of Bengal region. One of the major aims of this study is to find out the characteristics of the settlements and their house forms. As the house forms are carrying, developing and maintaining the traditions from generation to generation for thousands of years, so it is justifiable to describe them to understand the origin and the spread of vernacular architecture in this region.

4.1.1 Some ancient human settlements in this region

Most of the evidences of ancient settlements do not physically exist because of less durable indigenous building materials like bamboo, thatch, soil etc. These building materials are vulnerable to heavy rain, which is one of the main features of the climate in this region. The other reason is the changes of the river courses. As the rivers changed their courses several times, settlements also had changed their

[10] Geological evidence indicates that much of Bangladesh was formed 1 to 6.5 million years ago during the tertiary era. Human habitation in this region is, therefore, likely to be very old. The implements discovered in Deolpota village in the neighbouring state of West Bengal suggest that paleolithic civilization in the region existed about one hundred thousand years ago. The evidence of paleolithic civilization in Bangladesh region is limited to a stone implement in Rangamati and a hand axe in the hilly tip of Feni district. They are likely to be 10,000 to 15,000 years old. New stone age in the region lasted from 3,000 B C to 1,500 B C. Neolithic tools comparable to Assam group were found at Sitakunda in Chittagong. Hand axes and chisels showing close affinity to neolithic industries in West Bengal, Bihar and Orissa have been discovered at Mainamati near Comilla. The thinly forested laterite hills in eastern Bengal dotted with fertile valleys provided a congenial environment for neolithic settlements. However, the archaeological evidence on transition from Stone Age to Metal Age in this region is still missing (GOB, 2002b).

locations following those courses. Often the physical evidences of those settlements have been destroyed by rivers. A few of the records of these settlements are present in some theory and documents only. The traces of some major ancient settlements in the Bengal region from different published documents are discussed very briefly here.

Historians indicate *Pundrabardhans* as the oldest place where civilization started in this region. It includes the present Bogra district, the northern region of Bangladesh. Pundranagar was the capital of Pundrabardhans, which was one of the sixteen *Mahajanapadas*[11] *in the* 6th to 4th centuries B.C (Sultana, 1993). Later on, the name *Pundra* was spreaded all over the Bangladesh region with the name Pundradesh (Baqee, 1994).

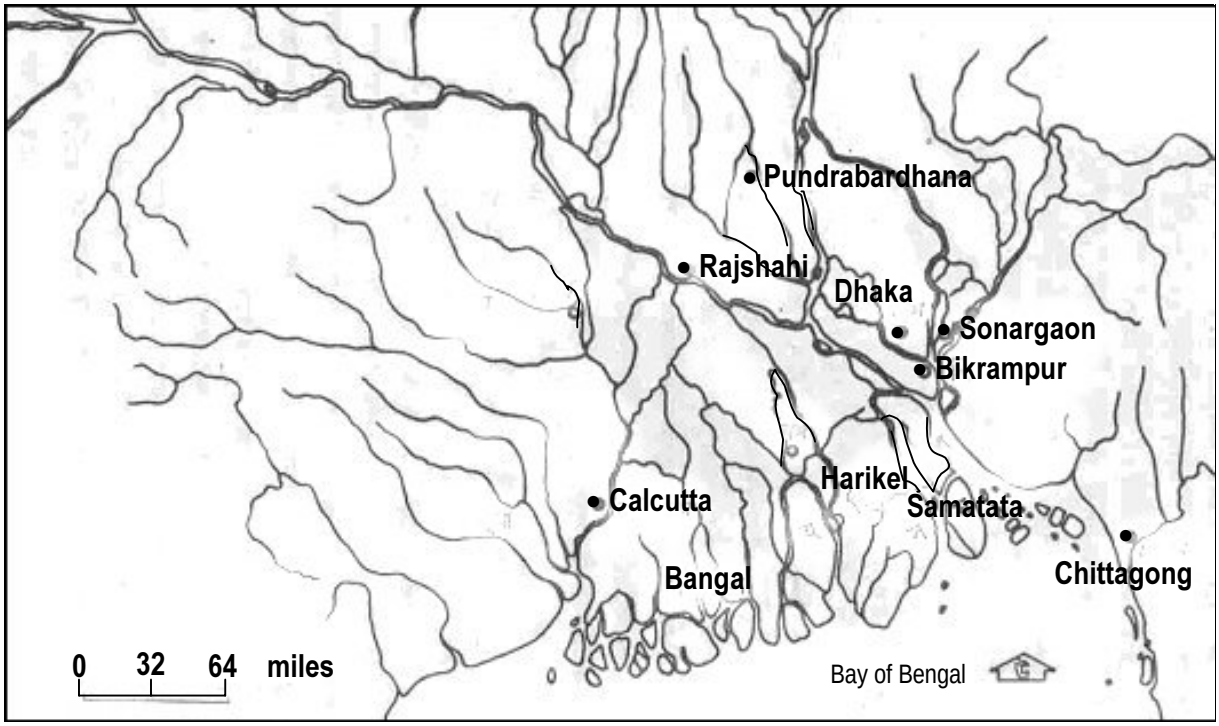

Figure 4.1: Ancient Settlements of Bengal

(Source: Baqee, 1994)

Barendri was the most important area in the Pundrabardhana settlement, which flourished during the period of 2nd century B.C to the 12th century A.D. It includes the greater Rajshahi region.

An ancient populated area of Bengal plain was called *Gangaridai*. It is thought to be located somewhere in the present district of Jessore and adjoining areas (Sultana, 1993). The area is also called by the name Banga or Vanga in *Jaina* books and *Vedas*[12]. The river Bhagirathi generally bounds Banga on the west, on the east by the Brahamaputra, on the north by the Padma-Ganges and on the south by the sea Bay of Bengal.

11 The mega human settlements.

12 "*Veda*" means knowledge, vedic culture means the spiritually aware society. In Hindu religion there are four great holy books called Veda's named as *Rg-Veda, Sama-Veda, Yajur-Veda, and Atharva-Veda*. Each Veda includes one or two Brahmanas, ceremonial handbooks, and Aranyakas, ritual interpretations, plus many inestimable Upanishads, metaphysical dialogs (*Vedas,2002).*

Samatata was situated within the regions of Commilla, Noakhali and Tripura (*currently in India*). Though there are some evidences of the spreading of *Harikel* settlements in Commilla and Noakhali but its origin must be in the southeast part of Chittagong (Baqee, 1994). *Bikrampur and Nabba* were the two settlements of ancient Banga. Bikrampur is still known by its name and Nabba was most probably the watery lower section of Barisal and Faridpur.

Sonargaon was spread within 12-13 miles[13] to the southeast of present Dhaka but now thought as ruined by the rivers. These examples are considered as the origins of human settlements in this region. Though most of the settlements are disappeared now but it is still believed that they inspired the further spreading of settlements in Bengal region.

4.2 The Forms of rural settlements in Bangladesh

A network of rivers, with their tributaries and distributaries crisscross the country. These rivers made the major parts of the country flat and fertile with their sedimentations. Besides these flood plains, there are hilly regions also but in some limited areas only.

Distinct cultural and social factors along with differences in geophysical characteristics, materials, climate and technology guided the spreading of human settlements in this region. This research intends to focus on cultural and social factors to study vernacular architecture, while the other aspects are considered as the modifying factors.

In this 21st century, the number of houses is now increasing rapidly with the increase of the population. In the past, settlements took places by the riversides, where alluvial soil was ready for the cultivation. Another reason for following the rivers was the transportation facility. But in course of time this attitude of building the houses following the river courses has changed. Humans have started building their houses not only following the river courses but also in different places with scattered forms to meet the need of scarcity of houses for the increased population in different regions. This spreading of settlements ultimately resulted in the developments of different types of settlement patterns like linear, scattered, nucleated etc.

According to Choudhury and Zaman the forms (see fig:4.2) of rural settlement in Bangladesh can be categorised into six types (Choudhury & Zaman, 1976). Those are presented briefly in the following discussions.

1. *Nucleated and clustered* settlements can be found along the main thoroughfares in the high flat land of the northern Piedmont and the Barind regions.
2. *Scattered* settlements are seen in the central delta region where the homesteads are built on artificially raised mounds.
3. *Linear* settlements are formed along the levees of the dead and dying river in the moribund delta of the southwest region.
4. *Dispersed and isolated* settlements can be found in the coastal areas and offshore islands.
5. *Very sparsed and also linear* settlements are seen along the spring line in the Chittagong of the Eastern hilly region.
6. *Clustered and highly densed* homesteads are built on very high artificially raised mounds.

[13] One mile = 1.63 kilometres

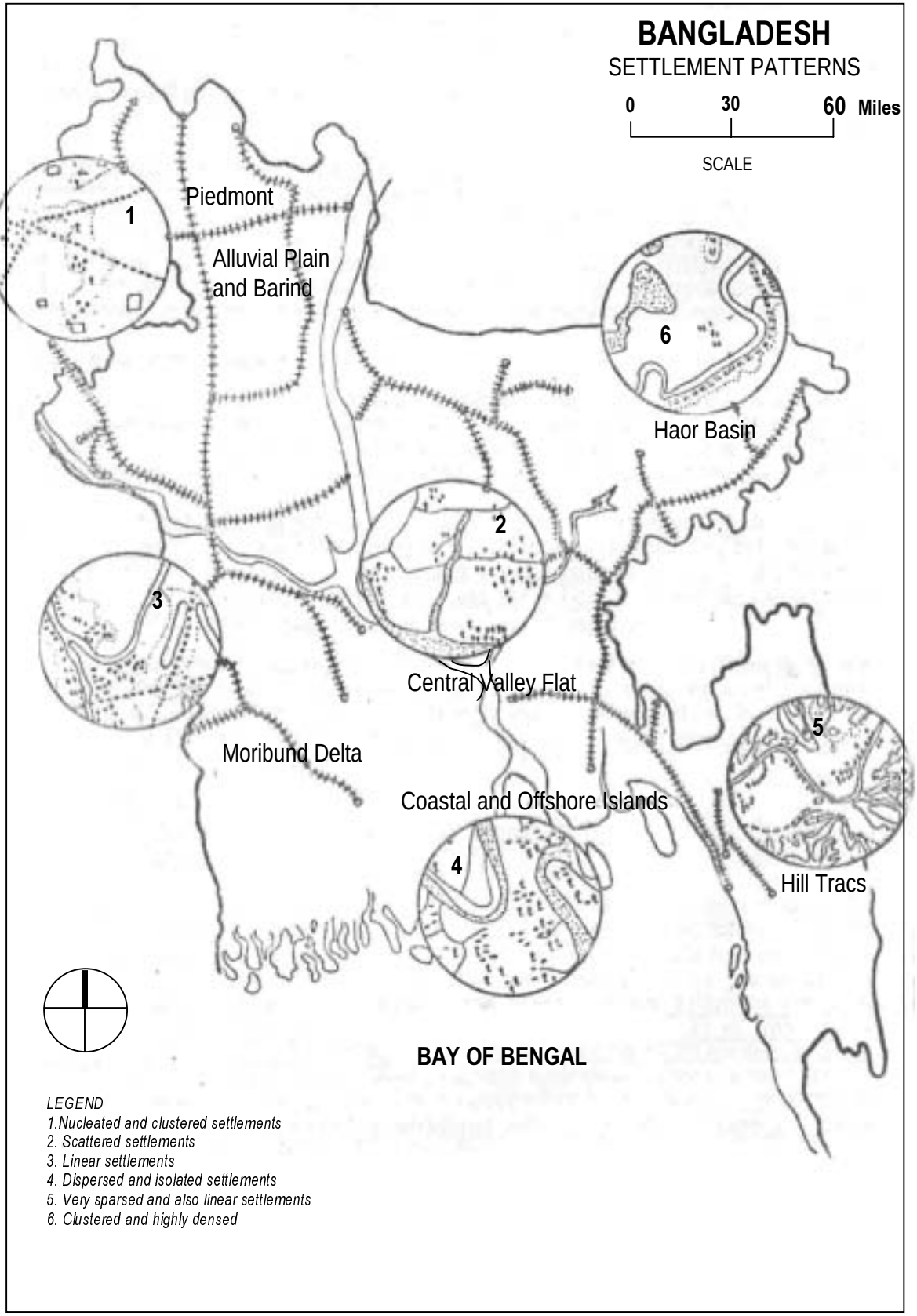

Figure 4.2: Settlement Patterns of Bangladesh

(Source: Choudhury & Zaman, 1976)

In some aspects, these types of settlements are making ambiguity by their names. The types like scattered and dispersed and isolated settlements have the similar meanings though they are indicating the settlements of different regions. Generally the types are providing an overview of the forms of human settlements in Bangladesh that are described in the following texts.

Nucleated settlement
These settlements are built on high flat lands, which are safe from the danger of floods. Irrigation for the cultivation is done here with the surface water or shallow tube-well. For these factors homesteads tend to organise themselves to form clusters. This type of village is comparatively compact, regular and larger in size with 200-400 families. This compactness and regularity gave the characters of the settlements as nucleated pattern.

Scattered settlement
Most of the deltaic plains of the country and the river valleys are extremely fertile. Each and every year these plains are becoming more and more fertile with the sedimentations by floods. This fertile land acted as the basic attracting factor for living. People hold up their lands, make raised earthen platforms and build their houses. As a result there is less regularity among these houses and the settlement appeared like the scattered form.

The scattered arrangement of houses has the disadvantages for transportations and communication. Boat is the only mean of communication during the flood time. But in present days, new road networks are expanding to connect these houses and settlements.

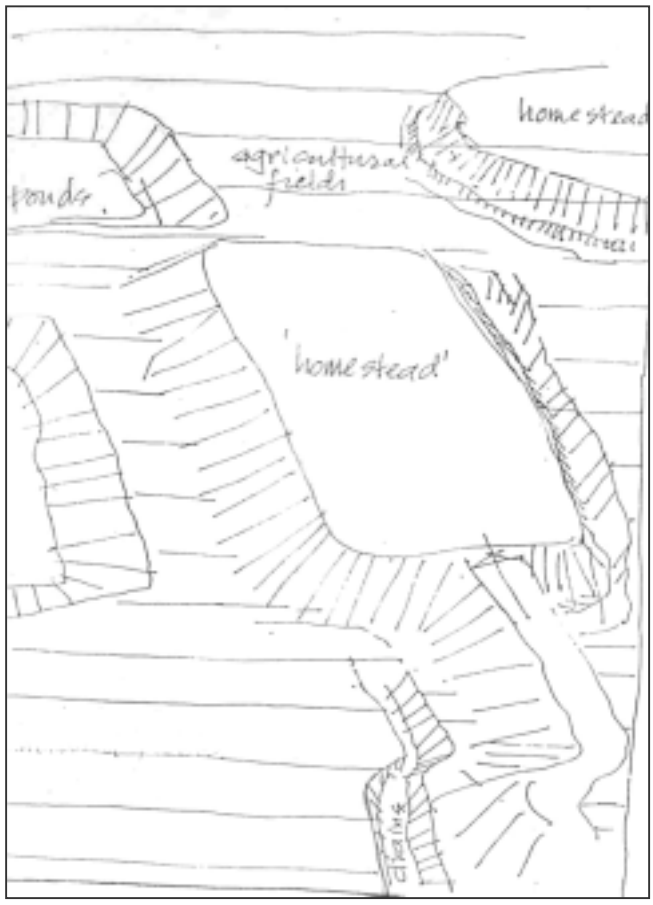

Figure 4.3: Scattered formation of homesteads in flood plains. (Right)

(Source: Hasan, 1985)

Linear settlement
This pattern originated from the shape of the river. Settlements followed the river courses to get the facilities of fertile land along them, good opportunities for communications and water available for cultivation. Though the rivers change their directions, the settlements, which once grew along the river, continue to remain there. The linear forms of settlements can also be traced by the shore of marshy lands.

Dispersed and isolated settlements
Isolated settlements can be seen in the islands of the Bay of Bengal that formed at the mouth of the Ganges-Brahmaputra delta. The Islands are extremely fertile as they are formed by the sedimentations of the rivers. These fertile offshore islands are not only potential for agriculture but also for fishing. Those opportunities of cultivation and fishing inspired people to start living in the offshore islands. Homesteads are also built here an isolated, which gradually resulted in a dispersed and isolated settlement pattern.

Sparsely built homesteads in the hilly areas
In the eastern hilly regions, homesteads are built sparsely on the sloping areas. Limited cultivation is done after only the preparation of the slopes by making terraces. Sometimes homesteads follow the contour lines of the hills and became linear but all of them are keeping a minimum distance between themselves.

Clustered and highly densed homesteads
In the Haor (*larger marshy area*) areas of the North-eastern micro region and the part of the south-central zone, houses are found built on artificially mounds that resulted in the formation of highly densed clusters.

4.3 Forms of vernacular buildings in rural Bangladesh

'Bengali' is the most widely prevalent culture in Bangladesh. This culture is also shared by the neighbouring West Bengal in India. While there are many regional dialects, customs and religions, the basic common language Bengali plays the prime role in maintaining the cultural homogeneity throughout the region (Ahmed, 1997). Though the country has some differences in the settlement patterns but there are also some common characteristics that can be traced out and represented here.

4.3.1 The "Bengali house" and its basic characteristics

A typical Bengali house can be understood properly through a study of the social structure and its position in the settlement system. The nuclei of rural social structures are the households (*ghar*) and Homesteads (*bari*) (Mowla, 1999a). A Bengali house can generally be described as the grouping of some isolated rectangular huts (rooms) around a court (*Uthan*). Physical manifestation of different family level outdoor activities like gathering of family members, festivals etc basically gave rise to *uthan* or courtyard house (Mowla, 1999a). This rectangular built forms and courts made the typical pattern as 'oblong' throughout the region.

A Bengali house starts with a main living unit associated with other ancillary functions like rooms for granary, cattle, cooking, husking (*Dekhi ghar*[14]) etc around a court. The periphery of a homestead is surrounded either by vegetations or screens by jute sticks and bamboo. These vegetations are used not only for maintaining the property demarcation but also for maintaining the privacy of the houses.

Generally, the shelters (*rooms*, *huts or ghar*) are constructed as single roomed with single storied. In some areas partitions within the rooms and two storied buildings can also be seen. Two storied shelters can be found in very limited areas only where timber is available. Another reason for building two storied houses is to maintain a higher status in the society. In the shelters having partitions within, one portion is used for living and other for storage of crops and granaries.

The houses in rural Bengal are generally made of indigenous building materials like bamboo, straw, grass, jute sticks, leaves (*Golpata)*, mud and C.I. sheets[15]. Approximately for the last forty years brick has been using in the rural areas as the building material. The use of bricks in the rural houses can be assumed as the influences from the urban areas as the durable and prestigious building material for shelters. C.I. sheets, bamboo, straw, jute sticks or *golpata* with the combination of mud are basically used for the construction of the enclosures. For the roofing, C.I. sheets and thatch are the most

[14] 'Ghar' means room in Bengali language.

[15] Corrugated Iron Sheet. The iron sheets have been introduced in the colonial period during 1757 to 1945 A.D by the British colonists.

common in the rural areas. In some areas of the northern dry regions, clay tile roofing can be seen. In most of the areas of rural Bangladesh plinths of the rooms are constructed with rammed soil.

The basic layout of a traditional Bengali house has basically two zones without considering the changes of locations, materials, climates etc and their impact on the house forms (Khan, 1982). All the activities of a house are arranged by following these zones. The zones are specified as,

a. Formal zone (male, outer part of the house)
b. Informal zone (female, inner part of the house)

These zones have been organised on the basis of social, cultural, religious and climatic considerations, which are representing a 'Bengali' society. These aspects and their relations with the houses are explained in the following texts.

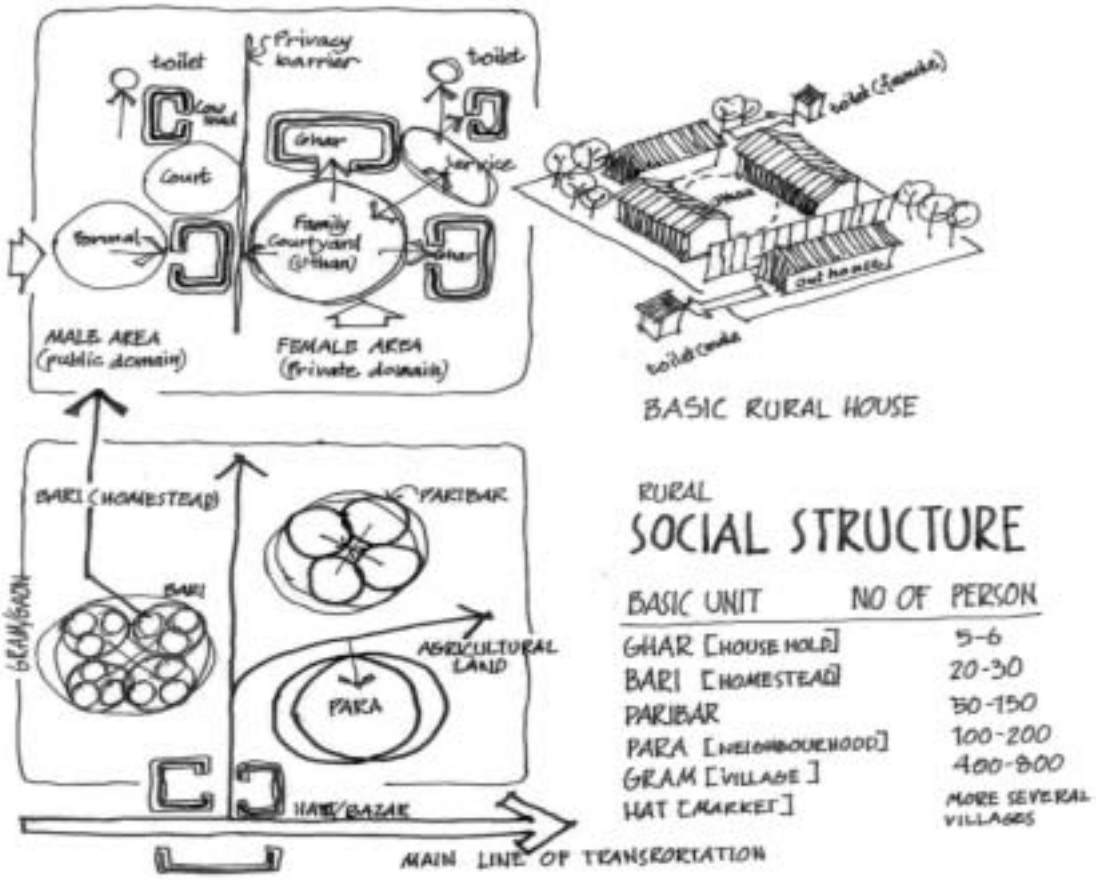

Figure 4.4: Basic arrangement of a Bengali house
(Source: Mowla, 1997)

a. Formal zone

The formal zone is the outer most part of the house. All the activities related to agriculture like crop preparation for cultivation and selling are done here. The built forms like an outer house (*baithak ghar*), cowsheds, toilets, general storage and food storage for cattle are organised in this zone to support those agricultural activities. Male persons occupy this portion of the house generally. Women also use this space for different household works during the time of absence of the outsiders.

The outer house is used for the entertainment of male persons from out sides (*generally not relatives*) and for the persons (*kamla*) who are employed for the cultivation. Sometimes this room is used for taking rest and sleeping for them also. The outer house is also used as a buffer between formal and informal zones. An additional toilet is arranged in this zone for the use of male persons of the family, workers and visitors.

b. Informal zone

All of the functions like sleeping, cooking, washing, taking care of children and rice/crop preparations (*steaming*) are included in this zone. Female members usually occupy this zone. Generally the rice husking function is associated with the kitchen and done by women of the family. The kitchen and toilets (for woman and children) are arranged at the corners of the court and sometimes they are approached indirectly to ensure more privacy (see the cases of rural settings in the chapter 5).

This zone can be approached from the outside generally by two ways. One indirect entrance at the corners and sometimes the other entrance is arranged through the *baithak ghar*. All of the rooms with the shaded verandas are oriented towards the courtyard, which is the most common in a rural house. A central and introvert courtyard plays a vital role in keeping the family bondage more strong so it also has some special symbolic values rather than functional aspects.

The inner court is not used only for the activities of drying the crops or preparing the foods but also for different family activities like family gatherings, children playing, drying clothes etc. The *uthan* is the basic module for the organisation of living spaces in a rural house (Mowla, 1999a). Special ceremonies of the family generally organised here, like *Gaye Halud*[16]*, Mukhe vat*[17] etc. Considering all of these aspects, this organisation has been accepted as the essential and inseparable element of a rural Bengali house. There are some transformations and changes of these basic elements of a Bengali house are also taking place, which are elaborated and discussed in the chapter 6.

4.3.2 Diversities of rural house forms

There are not only different types of settlement patterns but also diversities in the house forms. The patterns house forms are subject to vary, which depends on different factors. It is justifiable to discuss about their variety and changes to understand properly the pattern of a Bengali house. The house forms can be changed or transformed by different modifying factors like climate, building materials, construction technology, land features etc. Researchers in this field tried to classify the house form based on these factors. The classification of house form can be made like:

- Diversities of house forms with the differences of land characteristics, climate and available construction material
- Diversities of house forms with the differences of cultural factors
- Diversities of house forms with the differences of religious factors

The diversities of house forms are described in the following discussions.

[16] It is a part of marriage ceremony in Bengali culture. The day before marriage, the bride and groom are rubbed with turmeric.

[17] It is that festival, when a child starts his/her eating rice for the first time.

- **Diversities of house forms with the differences of land characteristics, climate and available construction material**

The geophysical characteristics of Bangladesh can be classified into three categories (Sultana, 1993). Such as,

a. The plain land, which is characterised by flood plains
b. The terrace land of the *Barind, Madhupur*, and *Lalmai*
c. The hilly and upland areas of the east and northeast

The differences in the landforms, land levels, and the soil characteristics are guiding the varieties within the house froms. These features are also associated with some cultural and climatic factors.

a. House forms in plain land

The characteristics of houses can be recognised by its roofs and walls. These are subjects to change with the variations of locations, climate and availability of materials and technologies. Here the house forms are assessed on two aspects.

- Roofing materials
- Enclosing materials

Roofing materials

In general bamboo, thatch and C.I. sheets are the common for roofing materials all over the Bangladesh (Baqee, 1994). Among these roofing materials, bamboo and thatch are the most common. The use of C.I. sheet is increasing rapidly for its availability and durability against the warm-humid weather and the heavy rain. Clay tiles are used in the areas of dry climate where the soil with lateritic quality is available.

Enclosing materials

The houses of rural Bengal can be categorised into different types (Sultana, 1993) on the basis of enclosing materials. Such as,

- *Bamboo walled houses*:

In the piedmont alluvial plains, specially in Rangpur, Moribund delta area in Jessore and Haor Basins, flood plains of the Ganges, the Jamuna – Brhamaputra, the Meghna, the Tista and in some areas in eastern and northern regions (Sultana, 1993). The walls are generally made of bamboo and rooms are configured in rectangular shape. Bamboo is used for making posts (*and frames*) and enclosing elements, which is called *Bera*. Sometimes timber is used for the post and making an upper horizontal floor in the room. This horizontal floor is used for storage purposes. It also acts as a thermal buffer in hot and cold seasons.

Sometimes the bamboo enclosures are plastered with mud to protect it from rain and for aesthetics purposes. The bamboo walls with C.I. sheet roofs are the common practice in the rural areas and around Dhaka, Pabna, Narayangange, and Chandpur districts (Sultana, 1993), but they can also be found scattered in all of the flood plain regions.

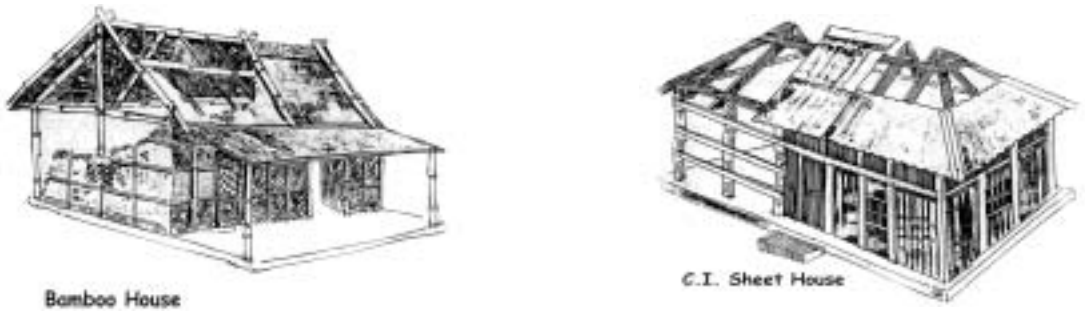

Figure 4.5: Various types of houses (a)
(Source: Hasan, D.M., 1985)

- *Mud walled house*:

The countryside of *Dinajpur, Pabna, Kustia, Chapai Nawabganj, Bogra, Jessore*, and some parts of Khulna are characterised by mud walled houses. Sometimes walls are made of sun dried earthen blocks of one to two feet thickness. These mud walled houses are generally oblong in shape and covered with the roofs made with clay tiles, thatch or C.I. sheets. The application of these construction materials depends on their availability and the ability of the house owners.

In these specific regions the lands are normally above flood level. Besides this, relatively less rainfall, dry climate and lateritic soil (which get very hard when dry) are the main reasons behind the mud constructions. Relatively taller (15´) mud walled houses are found in the southwest of *Darsana* and *Poradaha* districts (Sultana, 1993). The houses with two or three levels are common in Chittagong region.

Figure 4.6: Various types of houses (b)
Source: (Hasan , 1985)

- *Timber houses:*

Relatively smaller groups of populations in Cox's Bazar, Teknaf, and Moheskhali are using the house forms having walls constructed with timber. Generally, the houses are built on raised wooden platforms to get safety from snakes and other animals. The lower parts of the houses are also used for various purposes like storage, keeping domestic animals, different family activities etc. Another motivation behind this wooden construction is the availability of wood in the forest areas. Some of these buildings are also finished with different wood curving for aesthetics purposes. With these distinctive features, the houses are representing the special identity of those regions.

- *Timber and brick built houses*

The timber and brick built houses are common in the east of Sylhet district. The floors, plinths and the lower parts of the walls are constructed with brick while the rest portions of the walls are constructed with bamboo reeds covered with cement or mud on the both sides. Posts are made with timber logs and roofing with C.I. sheet or thatch.

- *C.I. sheet built houses*

C.I. sheet was not being used as the indigenous building material in this region. Later on, for the durability it became one of the major building materials in local tradition. In the northern part of Sylhet, it is very common to build houses (walls and roofs) with C.I. sheets. Heavy rainfall in that particular region is one the major reasons behind choosing the C.I. sheets. C.I. sheets are providing protection against rain and dampness of the weather. Another reason of choosing the C.I. sheets is the influences from the buildings of tea gardens constructed in British colonial period. The economic ability of the peoples of that particular area is considered as an additional reason behind the selection of comparatively expensive building materials.

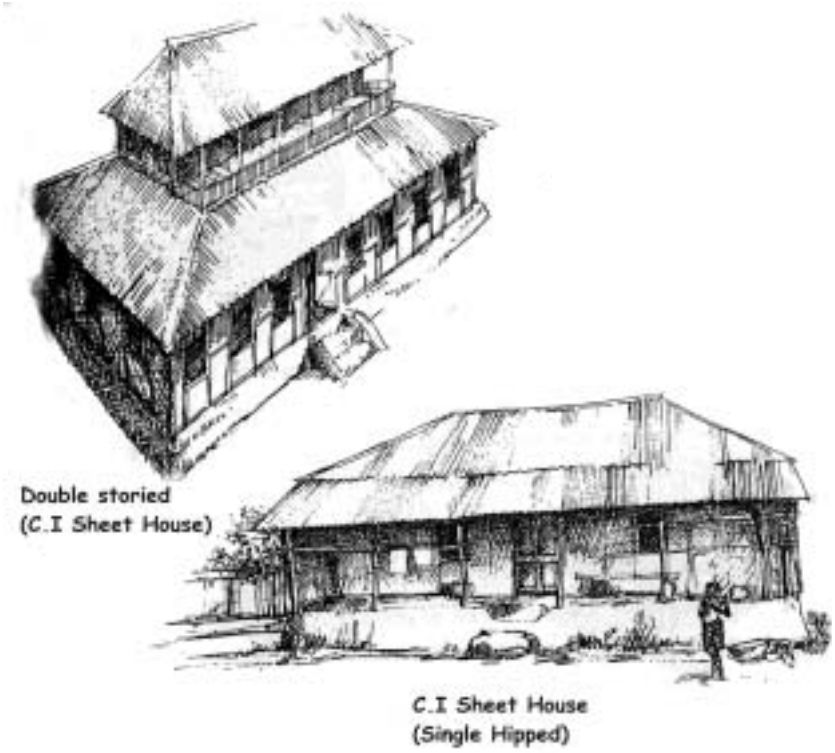

Figure 4.7: Various types of houses (c)
(Source: Hasan, 1985)

- *Thatched/straw walled houses*

In the *Haor* basins and *Chalanbil* areas houses are characterised by thatch walls, where straw, long grass, jute sticks and thatch are available and cheap. Those materials are also used for roofing purposes except jute sticks. The main reasons of selecting these materials are the cheaper price and the dismantle capability in the natural hazards like floods.

b. House forms in Terrace land

It includes the terraced land of Barind, Madhupur and Comilla. These areas are characterised by dry climate with low rainfall. Latertic content of the soil and the land placed above flood levels altogether influenced house forms to build with mud walls. Dry climate also insisted to form the compact house forms and densed settlements to get benefits from shadows by each other.

c. House forms in Hilly areas

The form and design of houses in the hilly regions are different from the other areas and they are representing some special characteristics. The "tribe"[18] occupied hilly regions of Chitagong, Sylhet and Maymanshingh possesses these special characteristics.

[18] Tribes are the close communities of distinct ethnic group different from main population. They have their own headman and socio-cultural customs even they have their own language or dialect. Their agricultural system and food habits and also the dress are different from mainland people. In Bangladesh, the tribal people trace their roots (mostly) from Myanmar (Chittagong), Tibet (Sylhet and Mymensing), and South India (Sylhet and North Bengal). Tribal people of south Indian origin are mostly of Dravidian race while other are predominantly of Mongoloid race. There are other immigrants in the main populations but they have mixed with the local population. In fact main Bengali population is a hybrid race of Dravidian, Mongoloid, Arian (north Indian and Central Asian), Semitic and Austroloyed blood. They have homogenous socio-cultural traits, habits and language. Rakahin or Mogh village in Kuakata or Bengali village in Chittagong Hill Tracts will explain that it is not only the geo-climate of a place but also their respective traditions that influence their living and building habits. (Information provided by Professor Qazi Azizul Mowla, Architecture Department,BUET, Dhaka in November 2002)

The hilly areas of Chittagong are characterised by the houses built on raised platforms built with bamboo or timber. Among the tribal people, the richer ones build wooden platform and bamboo platform by poorer ones (Baqee, 1994). About half a portion of the platform is used for living room and the rest of the portion as veranda for multipurpose family outdoor activities. A ladder made with bamboo approaches this platform or veranda.

The lower part of the platform is used for keeping the domestic animals though its introduction was for the protection from ferocious animals from the hilly forest areas. The hilly areas of Sylhet, Habiganj, Moulovibazar and in the flat areas those tribal usually build their houses like other areas with oblong mud wall and covered with thatch (Sultana, 1993).

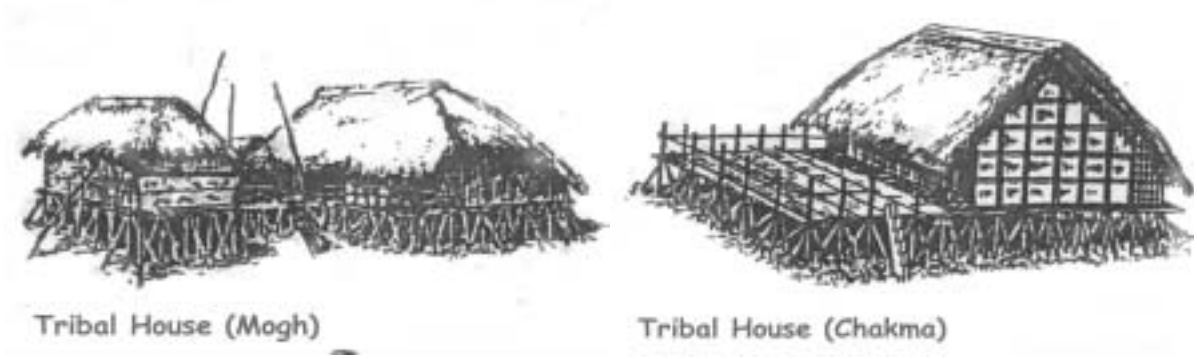

Figure 4.8: House forms in Hilly areas
(Source: Khan& Islam, 1985)

- **Diversities of house forms with different cultural factors**

Culture is the most powerful factor, which is guiding the evolutionary pattern of households in this area. Studying at the micro level of human settlements, the impacts of culture in the formations of house forms can be understood. The traditional Bengali house shows the efficient use of building materials and evolutions of a house form having relationship with the limit and the possibilities set by various physical and socio-cultural factors (Islam, 1998).

An attempt is made by Professor Sirajul Islam Chowdhury, a cultural geographer, for making a classification of rural houses on the basis of cultural and social aspects. The proposed classification (Chowdhuri, 1988) is as follows,

1. "*Choushala Griha*" or a house with four units on four sides (*vita*) of a courtyard.
2. "*Briti Griha*" a house completely surrounded by wall made of bamboo, combinations of thatch and bamboo or jute sticks.
3. "*Atchala Griha*", an eight roofed house. Sometimes there are several divisions are made within the room.[19]
4. "*Posta Griha*" a house with raised embankment all around. Sometimes, for rich families the embankments can be pucca (constructed with permanent building materials).
5. "*Dishala Nanda Griha*" with two houses on the either sides of the courtyard.
6. "*Shusthita Griha*" where the rooms have verandas on all sides.
7. *Tribal house* houses can be mentioned as the houses used by the peoples in the hilly areas like, Chittagong, sylhet, Maymanshingh.

[19] See figure 3.7: Various types of houses (c) (Double storied C.I. sheet houses)

8. "*Adibasi*" house of primitive tribes. The *Saontals* are mentioned as the primitive tribe in Bangladesh. Most of the houses are built with ornamented mud walls and thatched roofs. Usually a family has only one room and a number of families are organized around a court (Baqee, 1994).

Among the categories mentioned above, the *Choushala Griha* is the most common, where the others are seen very infrequently. *Briti* houses are seen only in the northern Dinajpur, *Atchala* in Satkhira, *Dishala* in Sylhet, *Shusthita* in Sitakundu and *Posta* in Mirsharai (Islam, 1998).

- **Diversities of house forms with different religious factors**

Religion is one of the major factors, which guided the formations of rural houses in Bangladesh. Among the total population, 90% are Muslim, 7-8 % are Hindu and 2-3% are Christians, Buddhists and others. The Muslim and the Hindu religious impacts are seen most prominently in the layout and the arrangement of the built forms. Such as,

- The houses of the Muslim families are more introvert in nature, because of some religious regulations. Usually the Muslims houses have some kind of special walls or partitions around the entrances for privacy (Islam, 1998). In a Muslim family, female members are more restricted within their inner areas. The situation is now changing. The Muslims women are taking parts in different types of activities outside their houses.

- In the Hindu religion, cow has a special status. For this reason a special attention has been given to the cows for the take care in a Hindu house. As the result the cowshed in a Hindu family looks more neat and clean than that of a Muslim house.

- The Hindu women are allowed to the outer court for taking care of the cows, which is uncommon in a Muslim family.

- The arrangement of the rooms in the Muslim houses follows strongly the cardinal directions for the easy recognition of the Kaba[20] direction. The orientations of the sleeping mats, beds and toilets also follow this direction. But in the case of a Hindu family it is not necessary.

- In a Hindu family it is common that a place is reserved for planting holy tree '*Tulsi*'. There is also a specific place/room for the worship and for placing the images of gods, which is unfamiliar in a Muslim family.

- An outhouse is an essential part of Muslim house whereas it is not so common in a Hindu family (Baqee, 1994). Generally the purposes of the outhouse are solved at the *puja mondop*[21] in a Hindu family.

- Some wealthy Muslim families in the rural society have two ponds (Islam, 1998). One for male and the other for female. If it is a single pond then there are two *ghats*[22] *are* prepared for male and female separately. The female ghat is surrounded by some kind of screenings for privacy.

[20] Kaba is the direction towards Macca. The Muslims use this direction for their prayers.

[21] Puja mandop is the place for placing the statues of god and its worships.

[22] Ghat is the bank of a pond or a river.

5.0 Case Studies

5.1 Justifications behind the selection of the cases

The developments of human settlements in Bangladesh can be considered as three different levels like 'rural', 'semi-urban' and 'urban' settings. Case studies have been carried out from each level of these sequential developments of human settlements. To study the patterns of vernacular architecture and its changes over places, it is important to investigate and study different stages of settlements. The justifications for selecting the cases in different settings are presented below.

Selection of the cases in rural settings

For the rural setting, a particular village (Krordulia) is selected. It is located about 20 miles away from the district town Pabna. Scattered forms of rural settlements can be seen as the dominant pattern in Bangladesh (see fig 5.1). Within this category of settlement, this village is selected as a typical case of scattered settlement (village). Selections of the cases within the village are based on the following criteria. The following criteria *a* & *b* are applicable to semi-urban settings also.

a. The houses that are old and have sustained within the rural environment for hundreds of years. These houses experienced several stages of development(s) through generations and possess the traditions and culture. It is expected that the selected cases will provide necessary information to study the house forms and its transformation patterns.

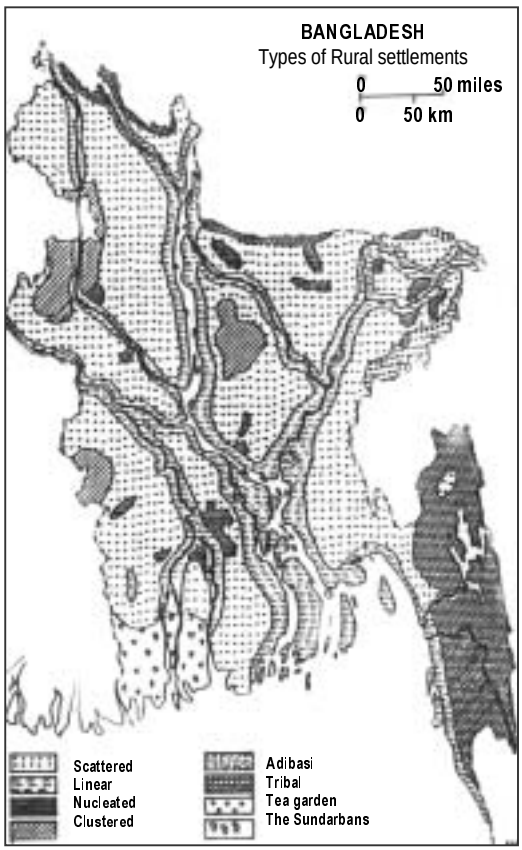

Figure 5.1: Spread of different types of settlements in Bangladesh
(Source: Baqee, 1994)

b. The present author has previous experiences from the particular village. The author got the opportunities to observe the lifestyle of the people, their customs and beliefs for more than twenty years. By this time, the author experienced different developments and transformations within the particular village. He is also familiar with the characteristics of house forms in the village. Based on his experiences, the cases are selected among the typical families[23]. Theses selection criteria provide the scopes for in-depth analysis and information of vernacular architecture.

[23] A typical family in the rural areas of Bangladesh can be characterised by joint family (see the cases in rural settings). But there are also single-family houses. Peoples are living together to support each other for different activities that are related to agriculture such as crop preparation, cultivation, marketing of the crops etc.

Selection of the cases in semi-urban settings

A small district town Pabna is selected for the study of the houses in semi-urban settings. Pabna is one of the oldest cities in Rajshahi division, which developed in the British colonial period. The study area is also one of the oldest settlements within Pabna district, which developed in the beginning of the 1900s. The name of the area is *Moktar para*[24] came from the judiciary related job types of the inhabitants. The construction period and the job types of the house owners influenced to add the colonial architectural features in the houses. At the same time it is expected that the influences from the rural houses will exist in the physical manifestations of the houses in the semi urban settings. It is also expected that most of the house owners who migrated from the rural areas would try to implement some of the traditional rural features to their new urban houses.

Most of the houses have passed different stages of transformations and developments during the last one hundred years. A long history of human settlement with different influences in the formation of households in this particular area provides enough information for the study.

Selection of the cases in urban settings

The urban settings are characterised by mixtures of functions like trade and commerce, industries, administrative centres, public housing etc. High density of population, class differences in the people, compactness of built forms and the provisions of public spaces are also considered as urban characteristics. In Bangladesh, the capital Dhaka is considered as the most developed urban area, which is selected as the study area for urban setting.

Dhaka has a long history of urban settlement for about 500 years (Mowla, 1997a). Common knowledge states that the contemporary trend of architecture in new Dhaka is not based on traditional style. The persistence of indigenous urban morphology of old Dhaka provides supports for the argument that the settlement pattern holds some innate cultural demands, which are equally contemporary and transcend the transitory pressure and demands of life (Mowla, 1997b). As the houses of the settlements in old Dhaka contain the traces of culture and traditions so they became potential cases for the present study.

The cases of urban settings are selected form the study conducted by Professor Iftekhar Mazhar Khan (Khan, 1982). In that study, Khan observed some of the typical houses in old Dhaka for making a redevelopment proposal. Khan's study is sufficient for providing the necessary information about the present research. From his study five cases are selected as a part this study with a different orientation for the analysis. The investigation aims to study the vernacular characteristics in the urban houses and their transformation patterns.

5.2 Organisation of the case study

All of the cases are studied along the informal interviews with the key persons[25] and the family members, taking photographs and observations. In all of the cases, real names of the respondents are not given for the integrity of the research.

[24] Moktarpara: The lawyers and Stamp writer's neighbourhood. Stamp writers are the people who write the judicial documents for different purposes.

[25] The key persons informal interviews. For each of the cases, the oldest member is considered as the key person. Interviews of the old people are taken for the information about different developments and changes of that particular house and the settlement.

The cases are organised and presented with a common format for the easy understanding and analysis. This common format expects to cover the aspects that are considered relevant for the research, which is presented below.

a. *The family, land and locality*
   Brief information of the family, the ownership pattern and the position of the family within the society are discussed here.

b. *The dwelling and its construction materials*
   The building materials and construction techniques applied in different parts of the houses.

c. *The stages of development and changes*
   The houses are passed through different stage of changes for several times to meet different demands of the family. The changes, transformations and their reasons are discussed under this subtitle.

d. *The formal relationship and spatial organisation*
   Organisation and linking of spaces in a house are analysed and discussed here.

e. *Checklist for the assessment of vernacular characteristics*[26]
   The characteristics are assessed in three categories of high, medium and low.

.

[26] See the detail about checklist in the chapter 3

5.3 Rural settings

Case no: (Rural/1)
Name of the respondent: Md. Abdul Karim
Occupation: Farmer
House type: Multi family house
Village: Krordulia
District: Pabna

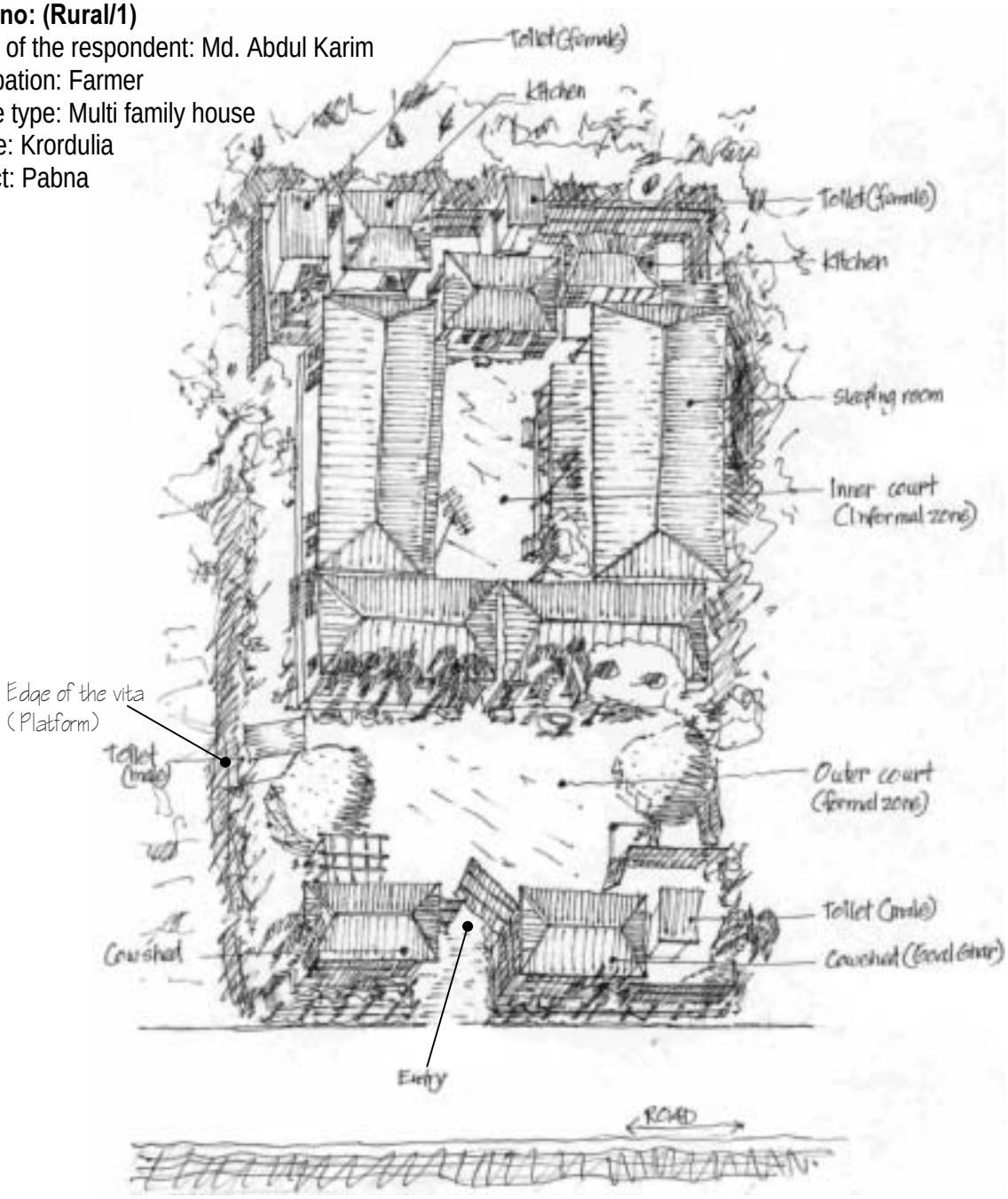

Figure 5.2: Axonometric view (Rural/1)

a. The family, land and locality

The vita[27] is well known in the village as "Hazi bari". Jaid Uddin who was the owner of the house started living here after his marriage in the 1920s. He got four sons from his second wife. The elder son moved to urban area after his matriculation for higher education and settled there. The other three sons continued living there with their families. After the death of Mr. Uddin the three families lived together for seven years. Mrs. Uddin is still staying with her sons in her primary position in the compound.

[27] The artificially raised earthen mound on which houses are built in a rural area.

In the year of 1987 the younger son moved to the new vita and started living there while the two sons and their families are still living in this old house. The elder son, who is living in the near district city Pabna, also owns this new vita. The family members of the elder son occasionally come to the village to see their grandmother.

After the expansion of families, two brothers decided to divide the whole plot among themselves though they are sharing the same courtyards and other facilities. Now most of their children have moved to the capital Dhaka or to other cities for job and education. Their daughters have moved away with their husbands after marriage. These events of changes can be considered as the common phenomena for the whole society also.

b. The dwelling and its construction materials

C.I. sheets are used as major building materials for walls and roofs. The cowsheds and kitchens are built with bamboo wall and C.I. sheets for roof. The plinths of the two major living units are constructed with brick and cement finish. All the other rooms, kitchens, cowsheds, storages have mud plinths. Fences around the compound are constructed with jute sticks for the privacy of the inner house.

Figure 5.3: The agricultural activities in the outer court.

Figure 5.4: The multipurpose activities in the inner court.

c. The stages of development and changes

At the primary stage the house owner took the south facing room and three of his sons took rooms to the other three sides of the court. The younger son was a physician and he used to look after patients at the outer house. This outer house was used as a resting and sleeping place for employees, and for entertaining the visitors. Sometimes this outhouse was also used for storage of crops and the plough.

Up to 1985, no major changes were done except the construction of a new room for the younger children who were studying in the high schools at that time. Daughters were used to sleep with their parents up to their marriage.

The current compound consists of two families though visually it can't be recognised easily. The Introduction of a formal dining place and living room for guests are considered as an influence from urban lifestyle. Living room associated with a dining table for the guests are placed for the first time in this house in the1990s. The dining table is being used to entertain guests. Otherwise family members usually take their meals in the kitchen or at veranda sitting on the floor.

Electricity is one of the major factors for changing the environment within the house. These changes are the clear reflections of urban lifestyle that reached to the rural people by watching drama, cinema through television and other media.

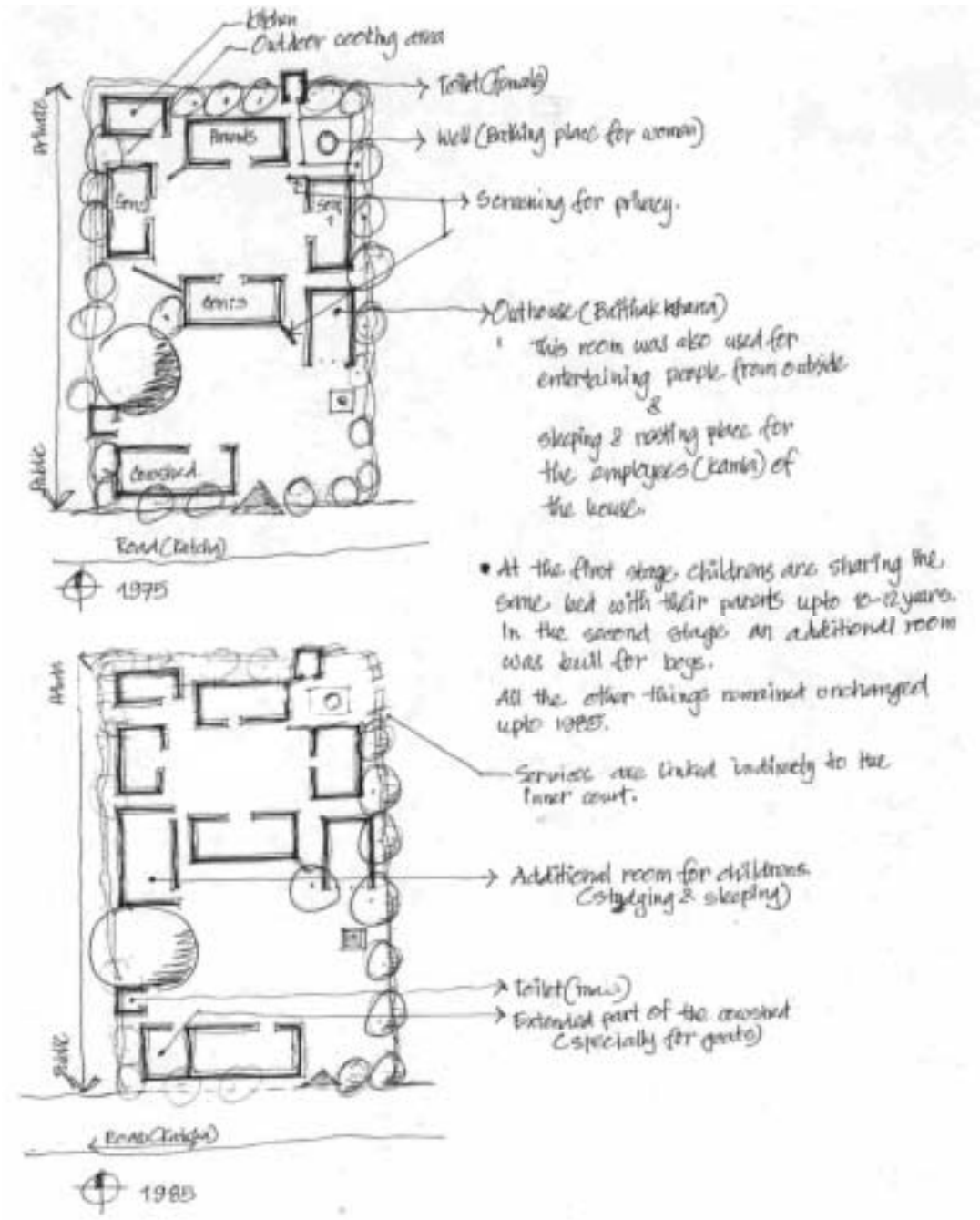

Figure 5.5: Stages of developments and changes (Rural/1)

d. Formal relationship and spatial organisation

It is common in a vernacular house that rooms are arranged isolated around a court but now rooms are coming closer to each other and became compact. As a result the building units are becoming linear and sometimes L- shaped to maintain the traditional spirit of spaces.

Figure 5.6: Entrance to the outer court. The uses of two different types materials are making the discontinuity.

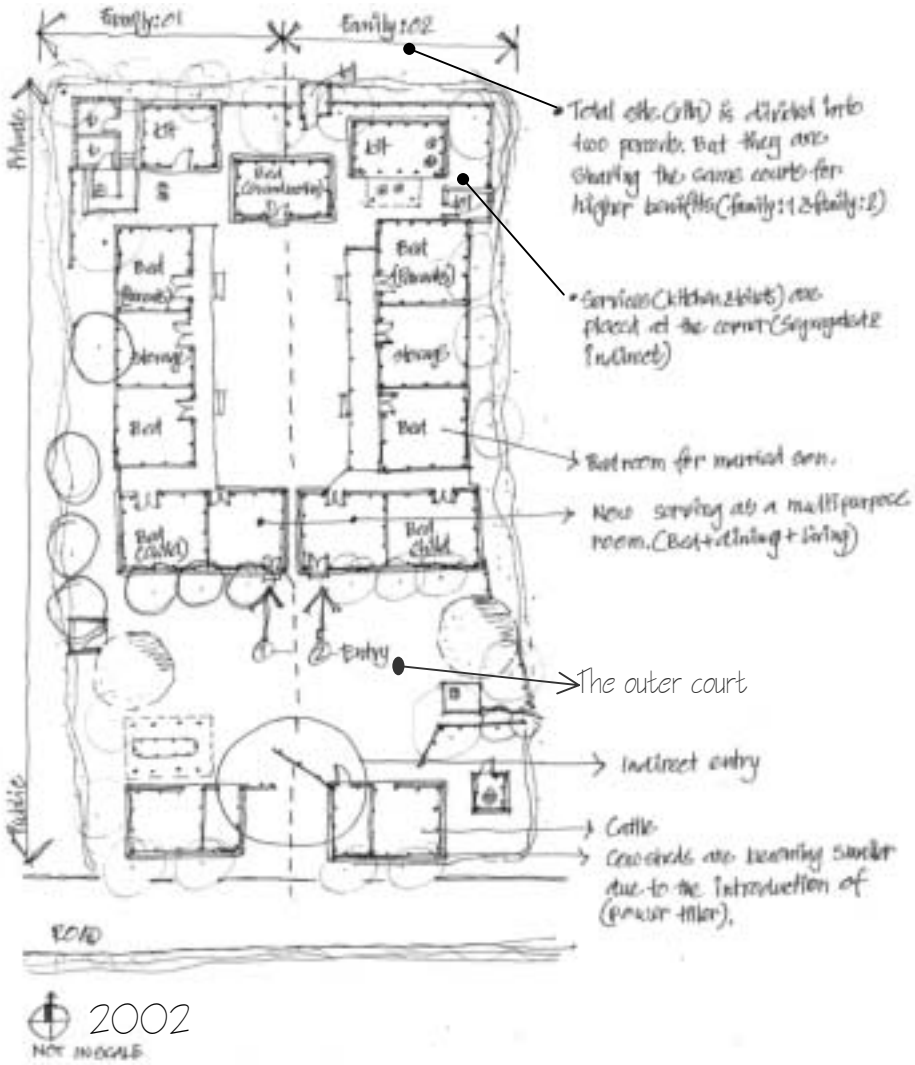

Figure 5.7: Existing plan (Rural/1)

This compact arrangement of rooms has become more convenient for the dwellers to use. Not only the living rooms but also the services like kitchen and toilets are becoming closer to the living rooms. Each room is connected with a shaded veranda, which is ensuring safe movement to the kitchen and the other rooms in rainy seasons. Storage is placed in between two living rooms, which has the accesses both from veranda and bedrooms internally. The sizes and the numbers of the cowsheds are decreasing now as because the animal based ploughing and crop collections have been replaced by mechanical mean of cultivation (power tiller).

e. Checklist for the assessment of vernacular characteristics

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Case: (Rural/1)	Charac	Level	1	2	3	4	5	6	7	8
	Process	H	•	•	•	•	•	•	•	•
		M								
		L								
	Product	H	•	•		•	•	•	•	•
		M			•					
		L								

Legend
1-8 are the numbers that are representing the proposed characteristics (see list 2: in the chapter 3)

H=high, M= medium, L= low

Case no: (Rural/2)
Name of the respondent: Abdul Hamid
Occupation: Farmer
House type: Multi family house
Village: Krordulia
District: Pabna

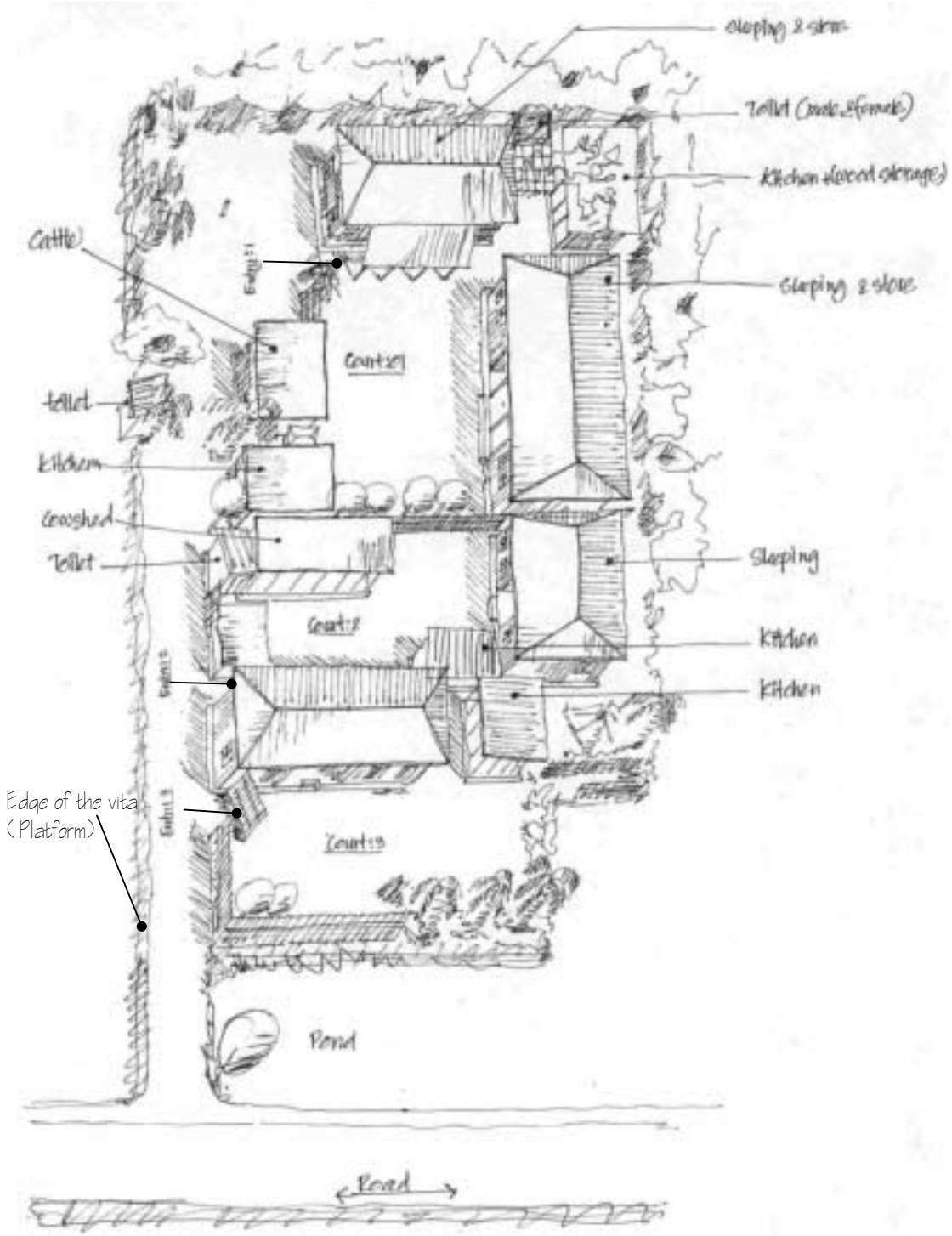

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Figure 5.8: Axonometric view (Rural/2)

a. The family, land and locality

The family started the construction of a small house at the rear side of the plot. It is known from the respondent that a Hindu family had been living here up to 1940s. The family moved to India in 1947. After that time the father of Mr. Hamid built a new house and started living here.

This plot was the only land piece of the house owner when the house was being constructed. By profession they used to cultivate lands of other villagers and share crops. The respondent has two brothers and one sister, presently who are living on the same plot except their sister, who has moved to her husband's place.

b. The dwelling and its construction materials

After the death of their father, the plot was divided between three brothers. They made their own houses individually on the same plot but separately. With the separation, three courts are generated instead of one. The elder son got the primary location of the house (the south facing room). This is one of the traditional rules that the chief or the elder son of the house will get this primary position.

Thatch, bamboo and jute sticks are used for making enclosures while roofs are made with C.I. sheets. The economic inability of the owners guided in choosing these low cost building materials, otherwise they would use C.I. sheets for all constructions. All of the rooms are built on mud plinths.

c. The stages of development and changes

Primarily the house was built as a typical rural house with its arrangements of forms and functions. But the formation of an active outer court was not possible due to the absence of functions like the outhouse, cowshed, storage etc. As the owner did not have any land to cultivate so the needs for cowshed, rooms for employees were unnecessary. Up to the1980s the house remained in the same situation.

Later on the inner court was expanded to meet the demand for space with the increase of family members. Up to this level the changes and its adaptation was in quite similar to a vernacular house. Now the total plot is divided longitudinally into three parts, which is uncommon in a rural setting. The common practice in extending a house is done by making different courts linked internally, in this case that is not taken place.

Figure 5.9: The inner court. The court became slippery in the rainy season, which can cause accident.

Figure 5.10: View towards the kitchen from the inner court. The shaded place in front of the main living room. From the kitchen there is visual linkage to the court.

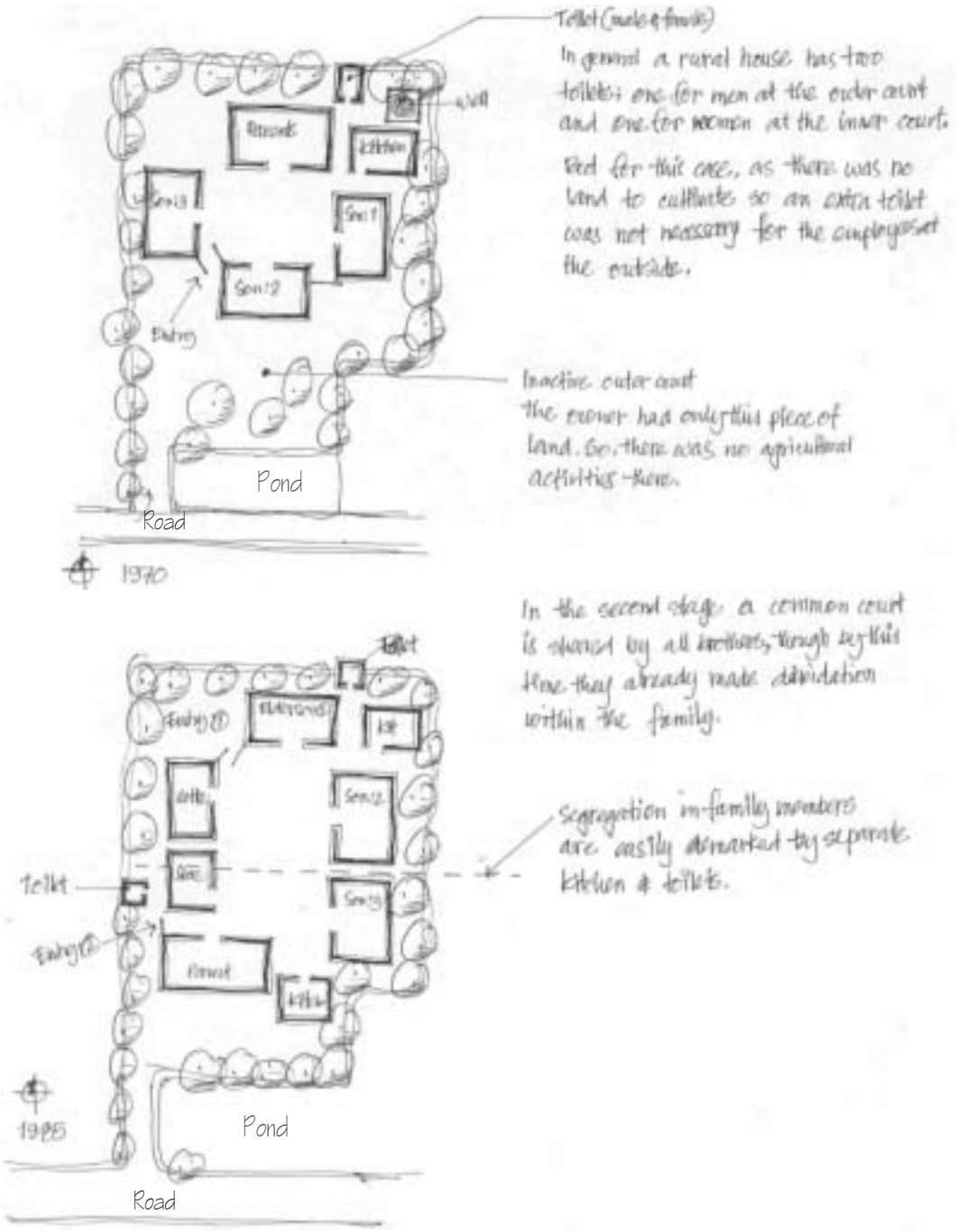


Figure 5.11: Stages of developments and changes (Rural/2)

d. Formal relationship and spatial organisation

The formal relationships are the same as any typical rural house. Isolated built forms are making two distinct zones for male and females. Except the court 1,all the main living rooms are not oriented towards south as there is not enough space to do so after the segregation.

Some of the linkages of the functions are not working properly especially for the courts 2 and 3.Toilet is placed totally out of the compound for court 2, which is not common in the tradition. Traditionally toilets and kitchens are arranged in such ways that approaches to those services can be made without interruptions from courts, which is absent here.

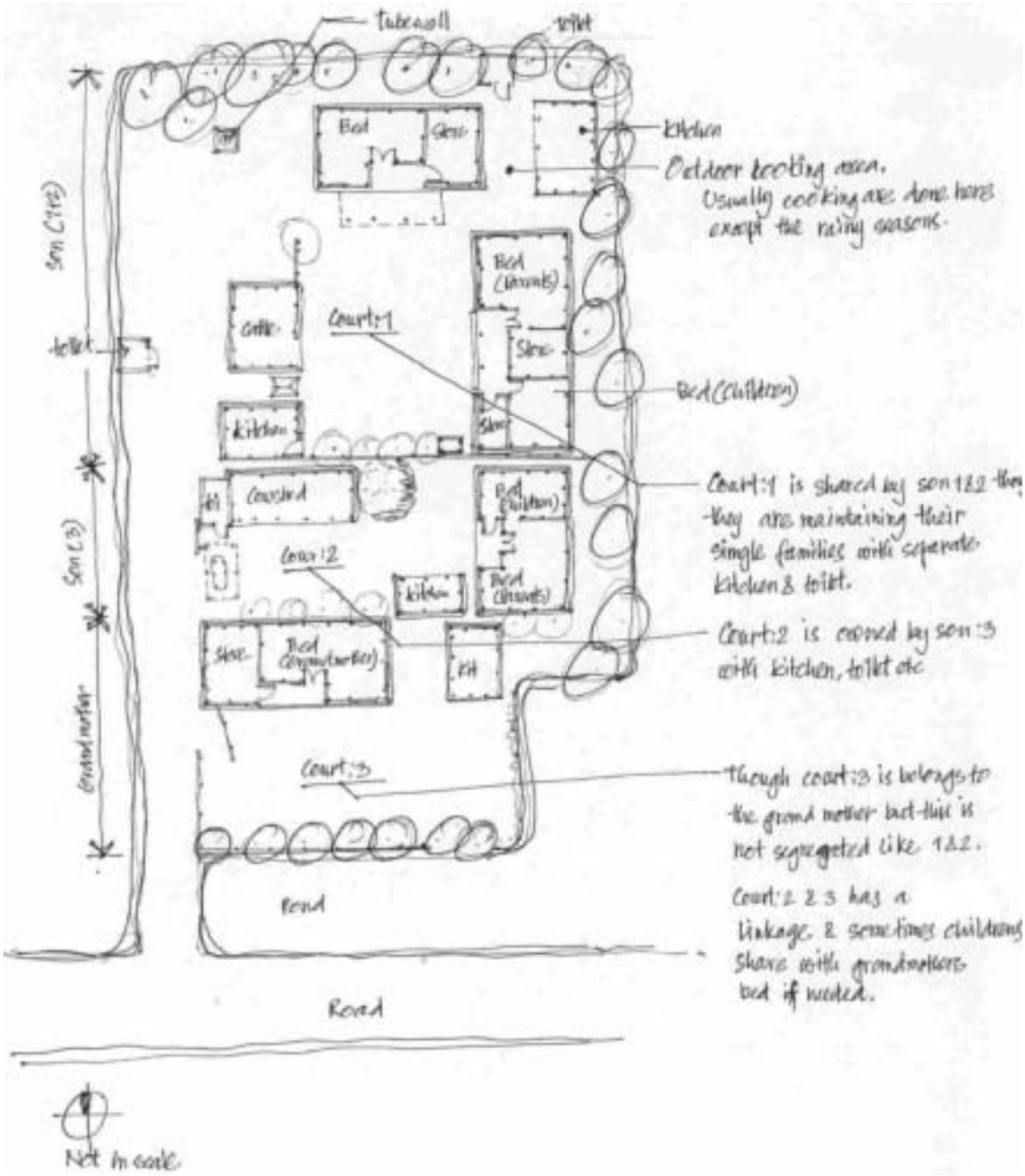


Figure 5.12: Existing plan (Rural/2)

e. Checklist for the assessment of vernacular characteristics

Case: (Rural/2)	Charac	Level	1	2	3	4	5	6	7	8
	Process	H	•			•	•	•		
		M		•	•				•	•
		L								
	Product	H	•		•	•	•	•		
		M		•					•	•
		L								

Legend
1-8 are the numbers that are representing the proposed characteristics (see list 2: in the chapter 3)

H=high, M= medium, L= low

Case no: (Rural/3)
Name of the Respondent: Mohammad Rahimuddin
Occupation: Farmer/ village doctor
House type: Single-family house
Village: Krordulia
District: Pabna

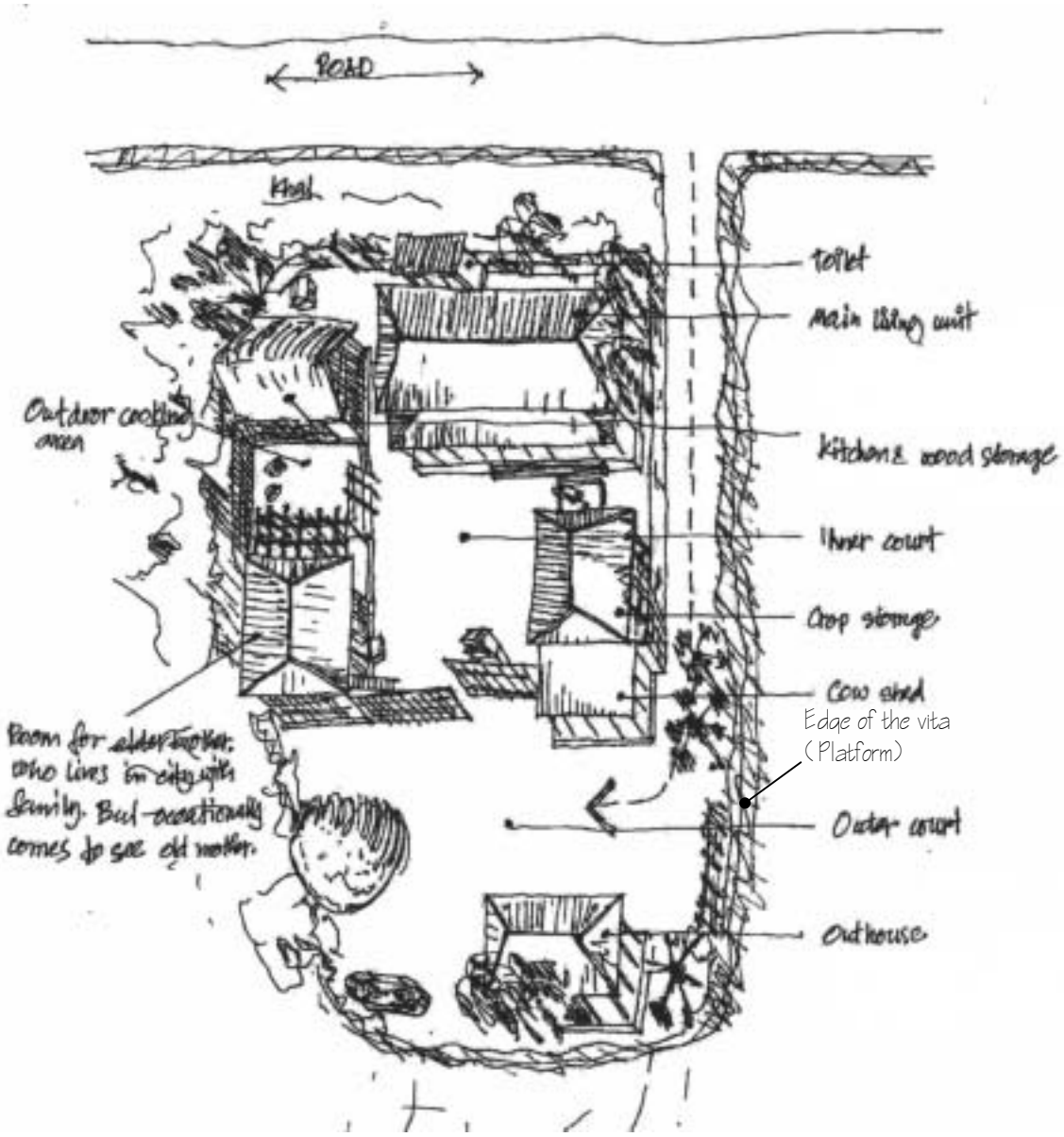


Figure 5.13: Axonometric view (Rural/3)

a. Family land and locality

Md. Rahim started living here since 1987 after he had moved from his previous house in the same village. He raised this platform to build a house. This smaller sized family with one son had the impacts on shaping the house form. That's why this house is still remaining unchanged from the beginning and it is expected that in near future there is less possibility to expand. The owner of this house is a rural physician trained for the treatments of very general diseases. Simultaneously, he spends most of his time for agricultural activities.

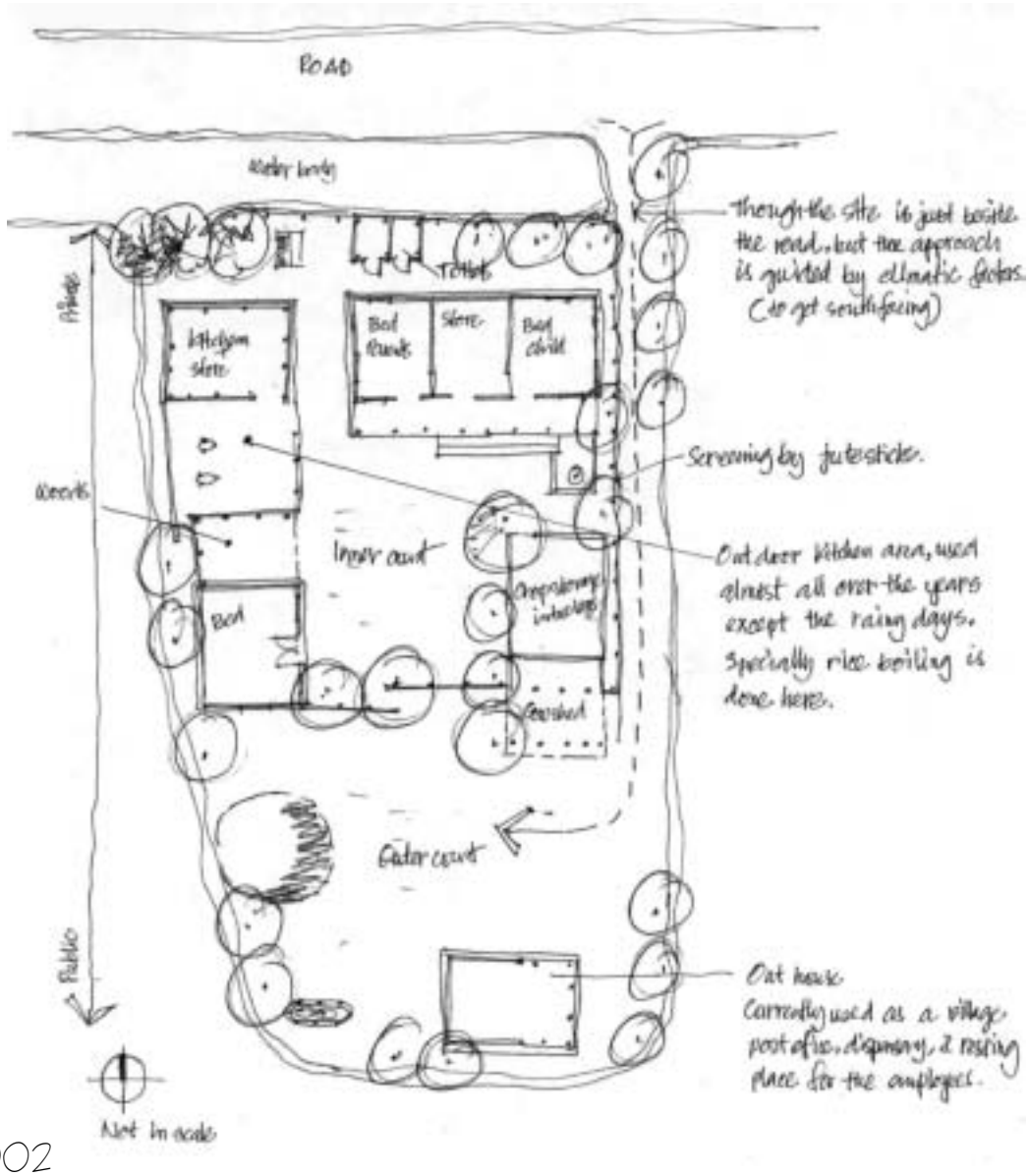


Figure 5.14: Existing plan (Rural/3)

b. The stages of development and changes

As because of the small sized family and the short time duration there is no remarkable change can be recognised in this house. Primarily the major living unit was built with bamboo for the enclosure and C.I sheet as roofing. This unit had two compartments; one for himself and the other for his son. Afterward this living unit has been expanded into three compartments, which is totally constructed with C.I. sheets.

c. The dwelling and its construction materials

This house is a typical rural dwelling in terms of arrangement of forms and the use of materials and spaces. C.I. sheets are used for making the walls and roofs of the main living unit while the frames are made with timbers. The walls of the other rooms like outer house, cowsheds and kitchen are constructed by either bamboo or thatch with mud plaster in some portions. The main living room is standing on a plinth made with brick while mud plinth is common for all the other rooms. This pucca (brick constructed) plinth is ensuring the convenient movement and durability in rainy seasons.

Figure 5.15: The inner court. Trees, built forms are making the environment cool and private.

Figure 5.16: The indirect approach to the inner court. Fences are made with jute sticks.

d. Formal relationships and spatial organisation

Generally houses in rural areas are approached from the south. As the road is to the north of the plot so a long connection is made to have an access from south. As a result the house giving it's back to the road.

This house is also following the same spatial organisations as a typical rural house form like clear segregation of formal and informal zones, indirect approach to the inner court, segregated arrangement of service functions. The long approach is terminated to the outhouse, which is also used by the respondent for looking after his patients. Fences made with jute sticks are guiding the indirect approach and ensuring the privacy of the house. The major living room is oriented towards the south. All the other services are linked with the inner court, as it should be in a vernacular house.

e. Checklist for the assessment of vernacular characteristics

	Charac	Level	1	2	3	4	5	6	7	8
Case: (Rural/3)	Process	H	•	•	•	•	•	•	•	•
		M								
		L								
	Product	H	•	•	•	•	•	•	•	
		M								•
		L								

Legend
1-8 are the numbers that are representing the proposed characteristics (see list 2: in the chapter 3)

H=high, M= medium, L= low

Case no: (Rural/4)
Name of the Respondent: Md. Abu Taleb
Occupation: Farmer
House type: Multi family house
Village: Krordulia
District: Pabna

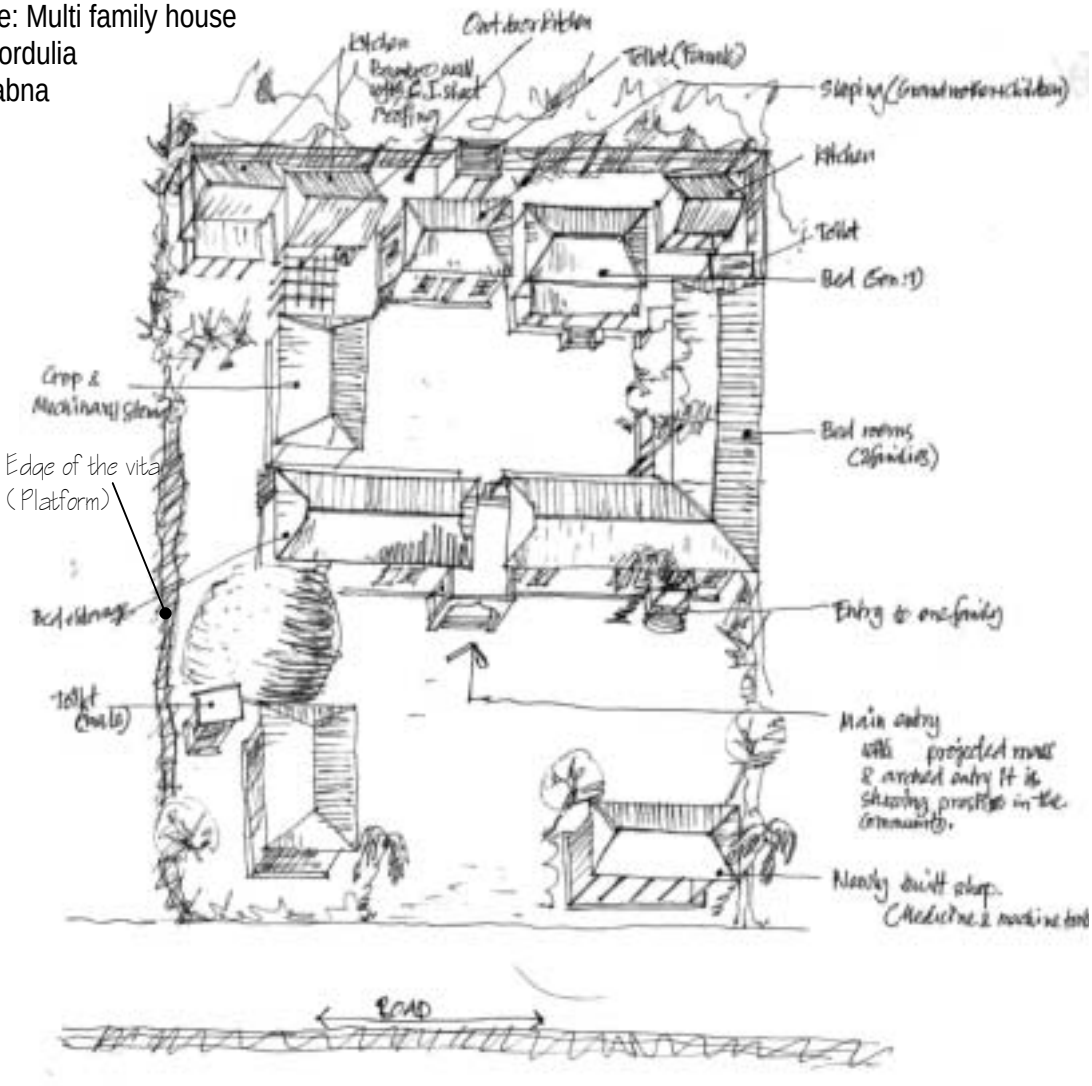


Figure 5.17: Axonometric view (Rural/4)

a. Family land and locality

This house is known as the 'chairman bari[28]' in the village as once Mr.Taleb was the chairman of the local Union Parishad (a smaller unit of local government). His father bought this land near about 1900s and started living here. At the beginning, the plot (vita) was made with a large area that resulted in the possibilities and provisions for expansion of the house later. Currently the respondent with his three brothers jointly own the land.

b. The dwelling and its construction materials

Currently, Mr. Taleb and his other three brothers are living there with their families. A few years ago they are divided into four families but still living in a single plot. Mr. Talebs's mother is holding the primary position of the house and elder son Mr. Taleb got his place just beside his mother's room because he will be next chief of this house. The four brothers are maintaining their separate kitchens, but at the same time utilising the courtyard and other common facilities.

[28] 'Bari' means house in Bangla language.

Primarily the house was built with bamboo wall with C.I. sheets roofing on mud plinths. Now major parts of the house are built with C.I. sheets where the plinth is made with brick construction.

Figure 5.18: The living room. Sometimes these rooms are used as temporary storage.

Figure 5.19: View from the inner court. Rooms are connected by a veranda. The toilet is placed at the corner and very close to the living units.

c. The stages of development and changes

At the primary level, all the spaces and built forms were arranged in the traditional way. Such as the internal court was created by three isolated rooms on three sides except the west, where enclosure was made with shrubs and jute sticks.

Later on, all of the built forms are constructed with brick up to the plinth level while C.I. sheets are used for roofing. New rooms are constructed for the power tiller and crop storage. Some changes are done also in the division of the existing rooms. At this stage the house has become compact and rooms are becoming interconnected and linear (L-shaped) in shape. Very recent a shop has been added in front of the plot, which is owned and run by one of the brothers.

Figure 5.20: The indirect approach to the cooking area.

Figure 5.21: The outdoor cooking area, adjacent to the main kitchen.

d. Formal relationships and spatial organisation

The formal relationships and the spatial linkages are fulfilling all the criteria of vernacular architecture in the particular region. Though in the later stages the isolated rectangular forms became linear but it is ensuring conveniences for different activities of the dwellers like safe movement in between rooms and to the other places.

In spatial organisation this house is maintaining the basic sequence of a rural house i.e. degree of privacy, connections to the services, and the linking with the formal and informal zone. The house has a common entry but at the same time the brothers kept the separate entries to their living units also.

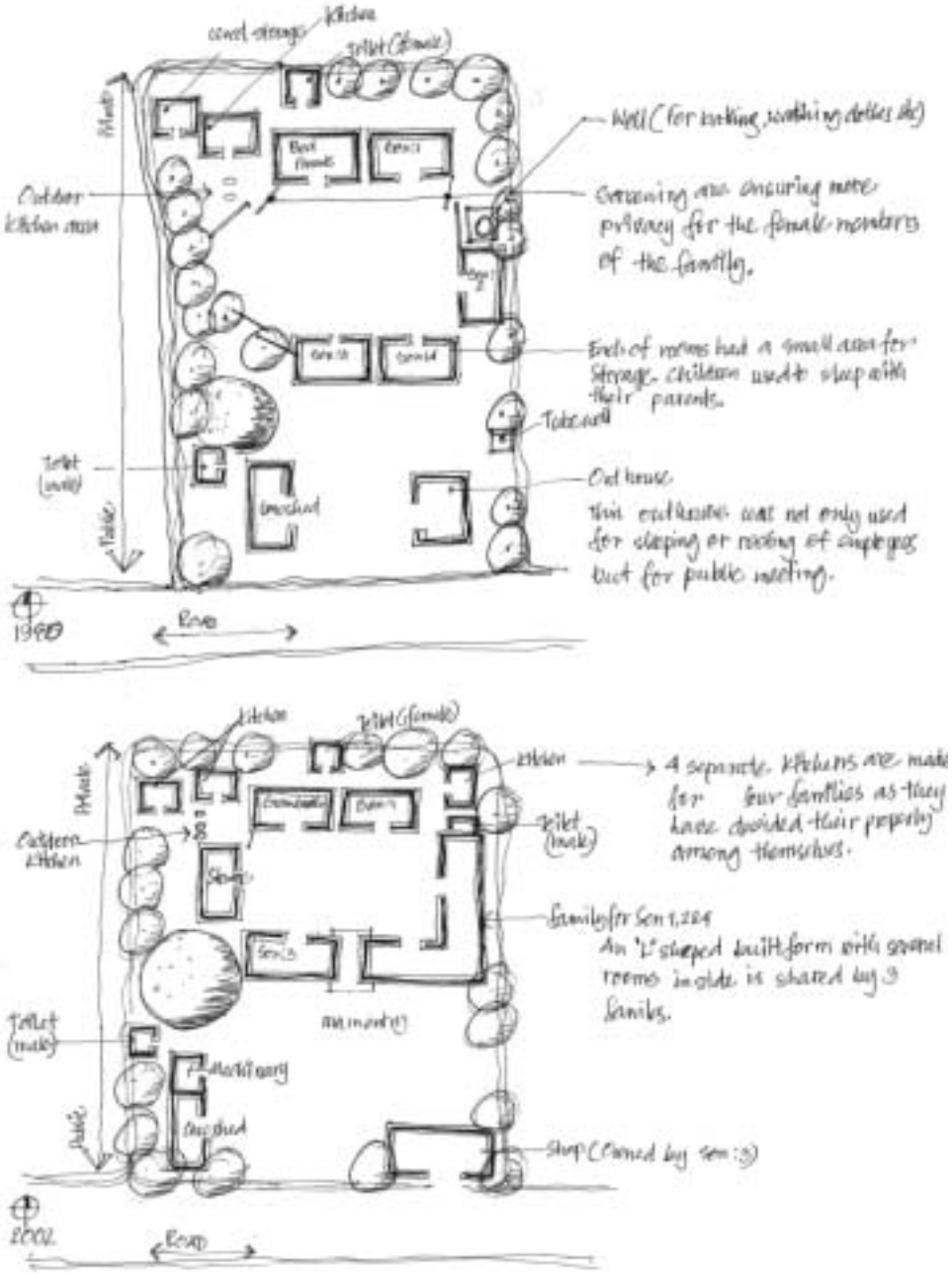


Figure 5.22: Stages of developments and changes (Rural/4)

e. Checklist for the assessment of vernacular characteristics

Case: (Rural/4)	Charac	Level	1	2	3	4	5	6	7	8
	Process	H	•	•	•	•	•	•	•	•
		M								
		L								
	Product	H	•	•	•	•	•	•	•	•
		M								
		L								

Legend
1-8 are the numbers that are representing the proposed characteristics (see list 2: in the chapter 3)

H=high, M= medium, L= low

5.4 Semi-urban settings

Case no: (Semi/1)
Name of the respondent: Md. Tanvir Hasan
Occupation: Government service and small business
House type: Single-family house
Village: Shalgaria (Moktar para)
District: Pabna

a. The family, land and locality

Mr. Hasan has the family of three members. The number of the family member was six when his father started living here. Later on, the family expanded to ten members. All the other brothers and sisters of Mr. Tanvir were moved away for job or to the husbands place. At present, Mr. Hasan is the owner of this house and land. The Increase of the family members required the addition of more rooms at different times. Some of the additional constructions have been smashed down, as they seemed unnecessary for the present time.

b. The dwelling and its construction materials

Externally the dwelling has some influences from the British colonial buildings like column, arch and brickwork with red colour. Besides this external appearance, the house holds the tradition internally in terms of the use of spaces, functional linkages, formal relationships etc.

Basically brick with lime morter used in this house as the main building material for walls whereas roofs are constructed with wooden beams and tiles. The thick (15") brick walls are working as the thermal barriers in hot and cold seasons.

Figure 5.23: View towards the services. The detached toilet placed at one end of the inner court.

Figure 5.24: View towards to the main living unit from the court.

c. The stages of development and changes

The dwelling has experienced different phases of developments and changes. Addition and subtractions are made to meet the demand but the main living unit is still remaining unchanged. Living started here in the year of 1910 with one main living unit and two isolated service units of kitchen and toilets. Toilets are placed at the corner of the site not only for the segregation but also to provide scopes for cleaning manually. The approach and the spatial linkages can be considered as the influences from traditional rural houses.

Figure 5.25: The commercial activities at the outer part of the house.

Figure 5.26: The living room. Sufficient light and ventilation are ensured from the openings to the east and the south.

Figure 5.27: Details and ornamentations. Traditional handicraft with the figure of a rural house, which indicates the affinity towards the vernacular house.

Figure 5.28: The details of the buildings. The red colour, the ornamented capital are indicating the colonial influences.

Near about 1960s with the increase of family size, two rooms were constructed. This addition of rooms made the inner court more enclosed, which enriched the environmental quality of the inner house in terms of privacy and scale. One of the additional rooms was built with C.I. sheet as bedroom, which is destroyed now. The other one was built with brick walls and C.I. sheet roofing, which is still being used as kitchen now. The respondent is thinking to add an attached toilet with the main living unit. A few years ago commercial functions have been added with the construction of two rental shops in front of the site.

d. Formal relationships and Spatial organisation

Rectangular shape of the house followed the configuration of the site. The living unit is making two zones within the site by its placement while the boundary wall is making the enclosure. Land scarcity and the desire to have an open court lead to compact arrangements of forms and functions.

The orientation of the main living room and the house form also guided by the cardinal directions to have good ventilation and light from the south and east. Keeping an open court to the south and the orientation of all the other functions towards the court is the conventional practice in a rural house.

The house can be approached by formal or informal entry. The informal entry leads to the inner house and court. The approaches to the inner court from the living room are made through a shaded veranda. The formal entry is used to get an access to the formal living room. These spatial organisations are recalling the patterns of vernacular houses in Bangladesh.

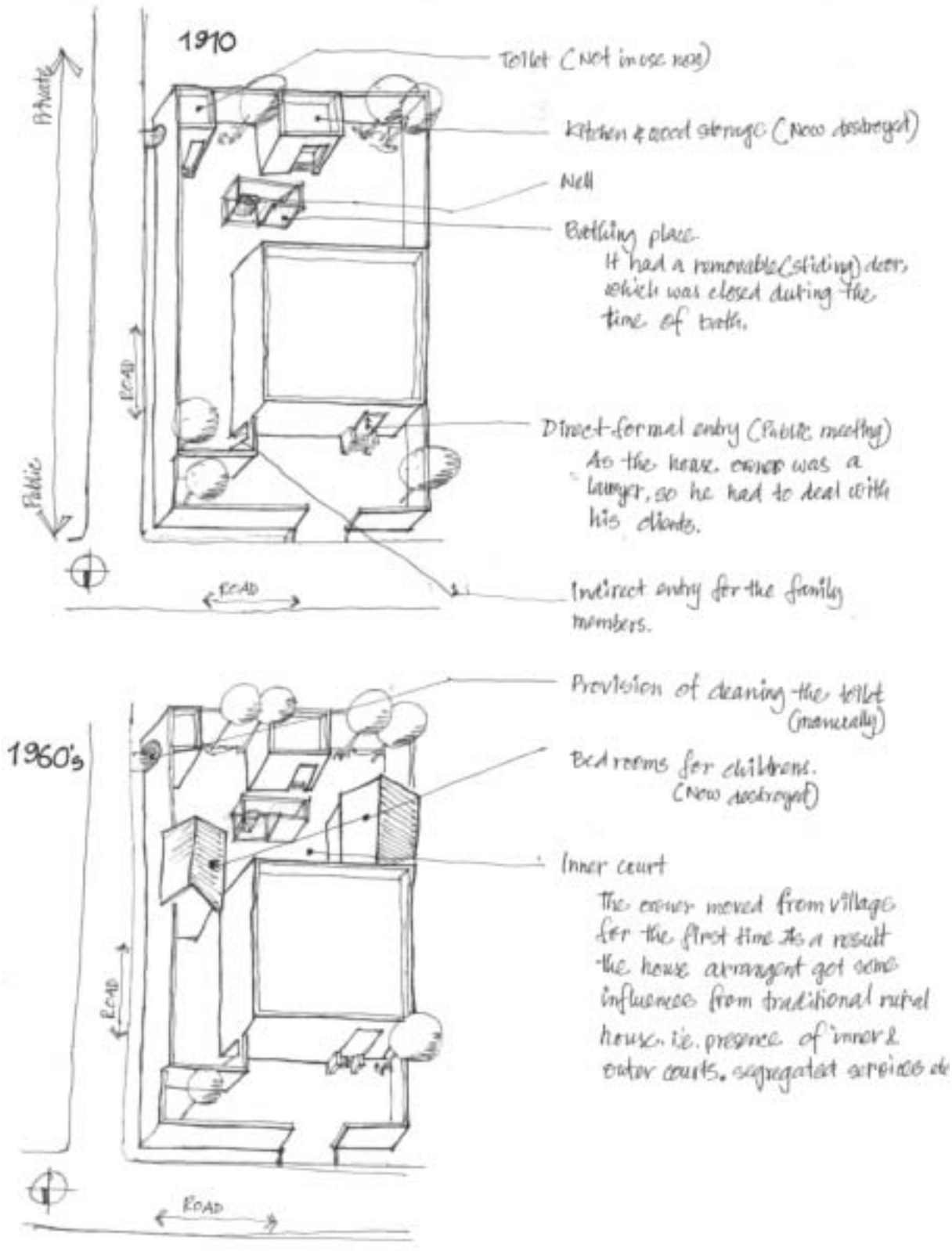


Figure 5.29: Stages of developments and changes (Semi/1)

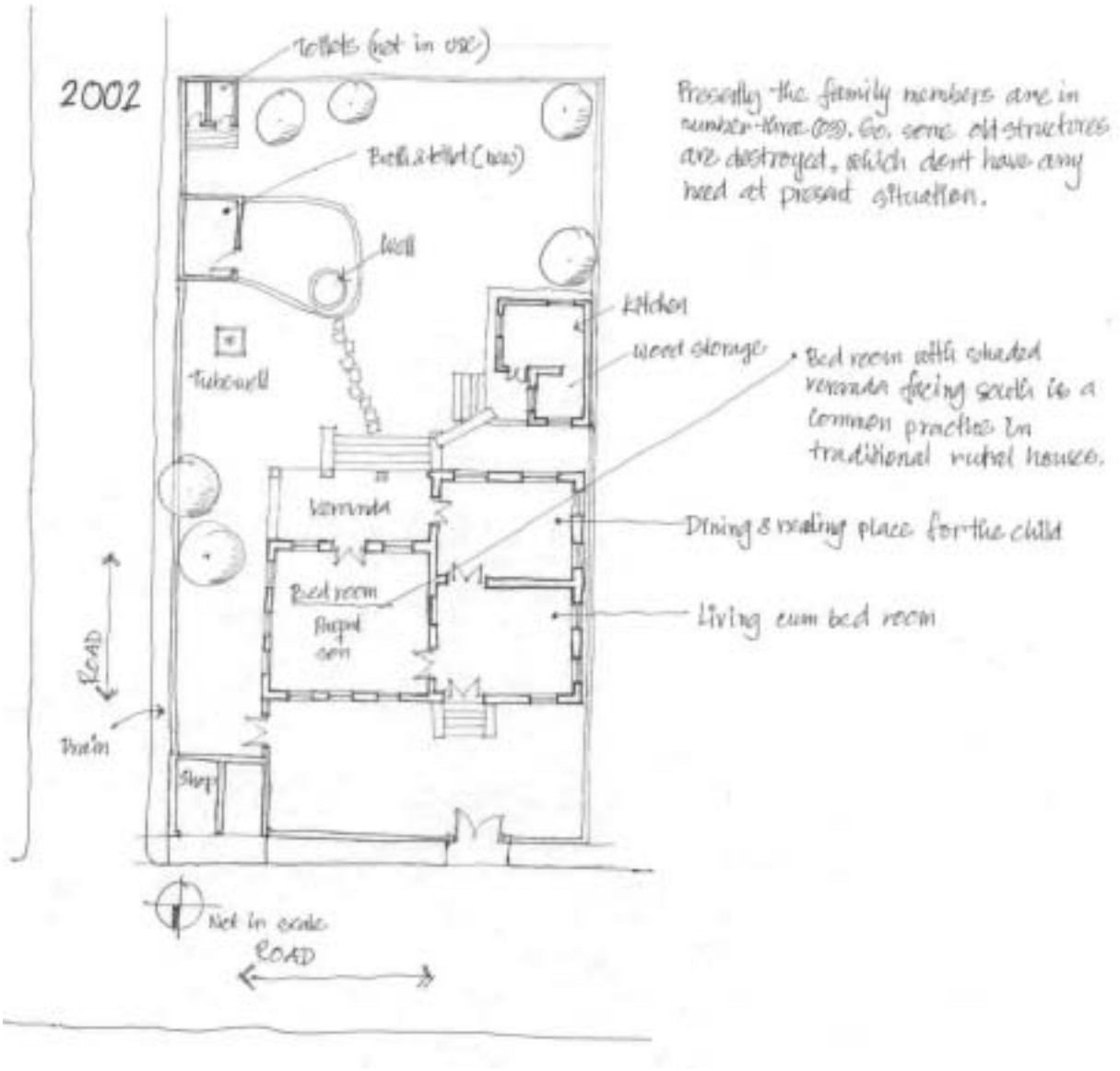


Figure 5.30: Existing plan (Semi/1)

e. Checklist for the assessment of vernacular characteristics

Case: (Semi /1)	Charac	Level	1	2	3	4	5	6	7	8
	Process	H		•		•	•		•	
		M	•		•			•		•
		L								
	Product	H			•			•		•
		M	•	•		•	•		•	
		L								

Legend
1-8 are the numbers that are representing the proposed characteristics (see list 2: in the chapter 3)

H=high, M= medium, L= low

Case no: (Semi/2)
Name of the respondent: Md. Nazmul Ehsan
Occupation: Businessman
House type: Single house
Village: Shalgaria (Moktar para)
District: Pabna

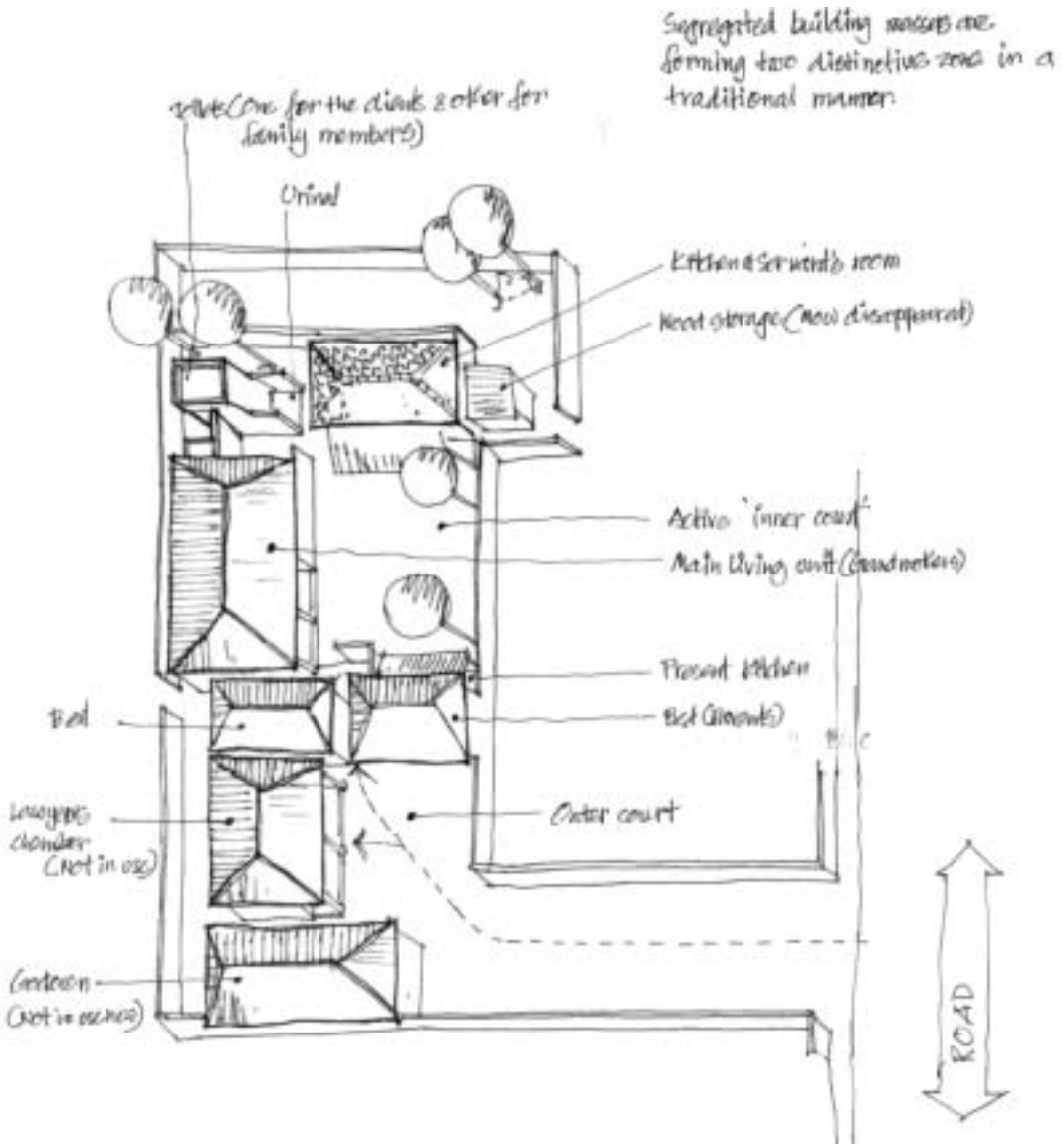


Figure 5.31: Axonometric view (Semi/2)

a. The family, land and locality

Mr. Ahmed, the founder of this house was a lawyer and businessman. In 1940s he bought this land and started living with his wife and two children. Within next ten years he got the other four children thus the number of his family members became eight.

The house was not designed by any professional designer or engineer. Mr. Ahmed migrated from a rural area and built this house that can be assumed as the great influences of building such a rural typed house in an urban context. All of his (Mr.Ahmed) activities (business and dealing with clients) took part in making decisions about the functional and formal arrangements of the house.

b. The dwelling and its construction materials

Brick is used for the construction of walls and C.I. sheets for roofing. At present the rooms are not in a good condition and some of the rooms are already in a deteriorated condition.

Figure 5.32: View towards the main living unit form inner court. The activities at the veranda are similar to a vernacular house.

Figure 5.33: View of the inner courtyard showing the detached kitchen (now abandoned).

c. The stages of development and changes

The major portions of the house were built at a time. At the time of construction there was a high demand for several rooms for different types of activities like 'out house' (for dealing with clients), a storehouse for business and a room for *jaigir*[29]. The rooms in the out house are not in use now because there is no more need to use them.

After the death of Mr. Ahmed, the business is closed. The other family members are not interested in the pervious business. As a result the previous rooms are not in use. Due to the reduction of family size, the house is squeezed in its functions like kitchen has become small and attached to the main living unit.

Figure 5.34: The approach to the inner court. The indirect entrance gave the characteristics of a vernacular house. At the same time the use of columns is indicating the colonial influences.

d. Formal relationships and spatial organisation

Primarily all the functions of the house were arranged like a rural house pattern. Scattered built forms are arranged along the boundary of the site and formed two zones as formal and informal. All the other formal relationships are recalling the essence of vernacular house patterns like living rooms are facing toward the inner court, indirect entry towards informal zone, services are grouped at the one corner of the site etc.

It can be assumed that the organisation and linking of spaces were influenced by traditional beliefs. The access provision to the neighbour's plots is ensuring the enhancement of the good relations and strong social bondages in the society.

[29] At that time in the 1940s there was a tradition of keeping a male student who will look after the education of the younger students of the house.

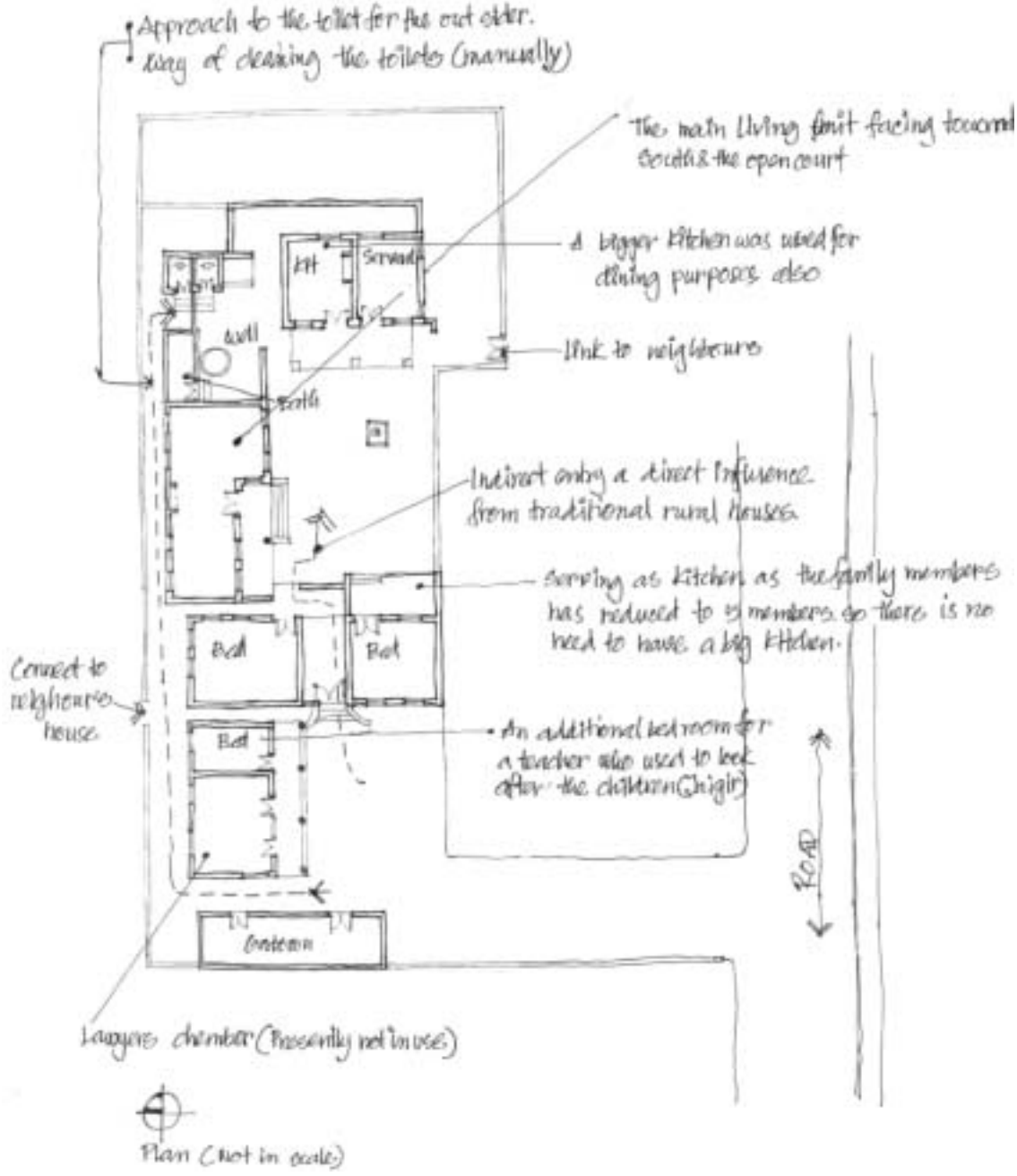


Figure 5.35: Existing plan (Semi/2)

e. Checklist for the assessment of vernacular characteristics

Case: (Semi /2)	Charac	Level	1	2	3	4	5	6	7	8
	Process	H	•	•	•		•	•	•	
		M				•				•
		L								
	Product	H	•	•		•	•	•	•	
		M			•					•
		L								

Legend
1-8 are the numbers that are representing the proposed characteristics (see list 2: in the chapter 3)

H=high, M= medium, L= low

Case no: (Semi/3)
Name of the respondent: Mr. Habibur Rahman
Occupation: Lawyer, businessman
House type: Single house
Village: Shalgaria (Moktar para)
District: Pabna

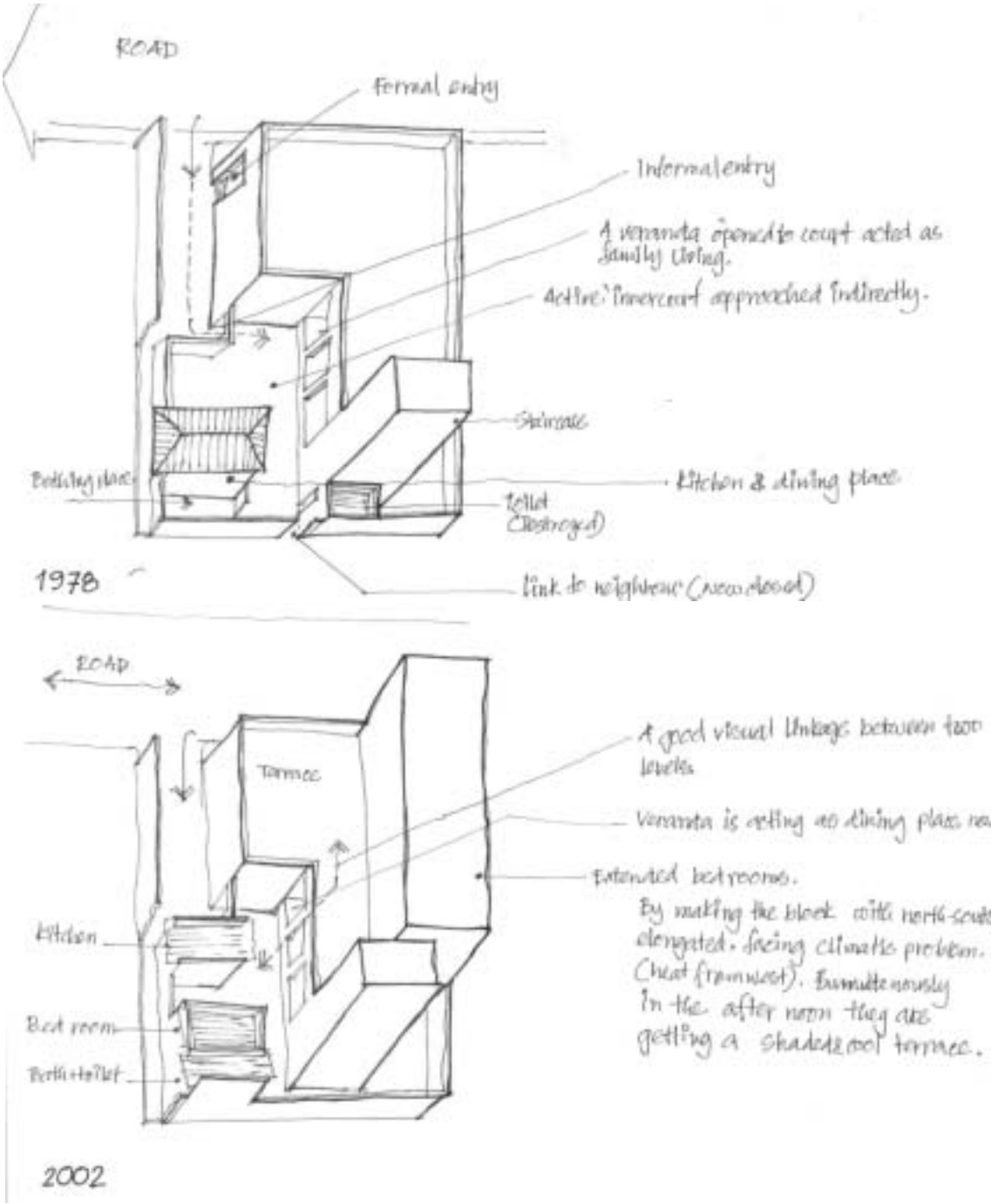


Figure 5.36: Stages of developments and changes (a) (Semi/3)

a. The family, land and locality

This house was founded by Asutosh Roy in 1920 and later bought by Mr. Abdus Sattar in 1935. The plot is just beside the former Dhaka-Pabna road. The number of his family members was seven in 1975. There was sufficient space in the house for accommodating the family members. Now most of the family

members are moved away to different places for job or other purposes. Only Mrs. Sattar and one of her daughters with her family are living in this house though the property is jointly owned by all of the brothers and sisters.

b. The dwelling and its construction materials

The house is now in a very good condition with its permanent building materials. Walls are constructed with brick while wooden beams made roofs, which are covered by tiles and lime terracing. The service units are built with brick wall and C.I. sheet roofing. Thick walls (15") are acting as thermal buffer for the indoor spaces. At the first floor, roofs are made with R.C.C and C.I. sheet partially. There are objections about thermal discomfort in the rooms at the upper floor having the roofs with C.I. sheets.

c. The stages of development and changes

Initially the house was constructed as a single storied building. A staircase was added to the one end of the living unit for the future expansion and access to the roof to get more spaces for outdoor activities. This situation remained unchanged for the next twenty years approximately.

The outer appearance of the dwelling has been changed with the introduction of commercial activities. The veranda at the roadside with two rooms has converted into shops for rental purpose. At that time three additional rooms were built on the first floor. The toilet was moved to a new place after the introduction of the drainage system. Later on the previous kitchen was converted into a bedroom and a new kitchen is built beside the entrance. Now all of the owners are thinking to demolish the house for building a multi-storeyed apartment in this place.

Figure 5.37: The approach towards the detached toilet.

Figure 5.38: View towards the multi purpose inner court.

d. Formal relationships and spatial organisation

The formal relationship has the characteristics that is similar to the rural Bengali houses by having different zones, detached service units etc.

Two different zones (formal and informal) are clearly demarked. Like traditional way the informal zone is approached by an indirect entry whereas the formal zone has a direct entry. The hierarchy of privacy like a vernacular house is clearly maintained in this house. The internal court is acting as the centre of all informal activities. The terrace on the first floor has a good visual linkage with the court, which makes the court live.

Figure 5.39: The dining place, exposed to the inner court.

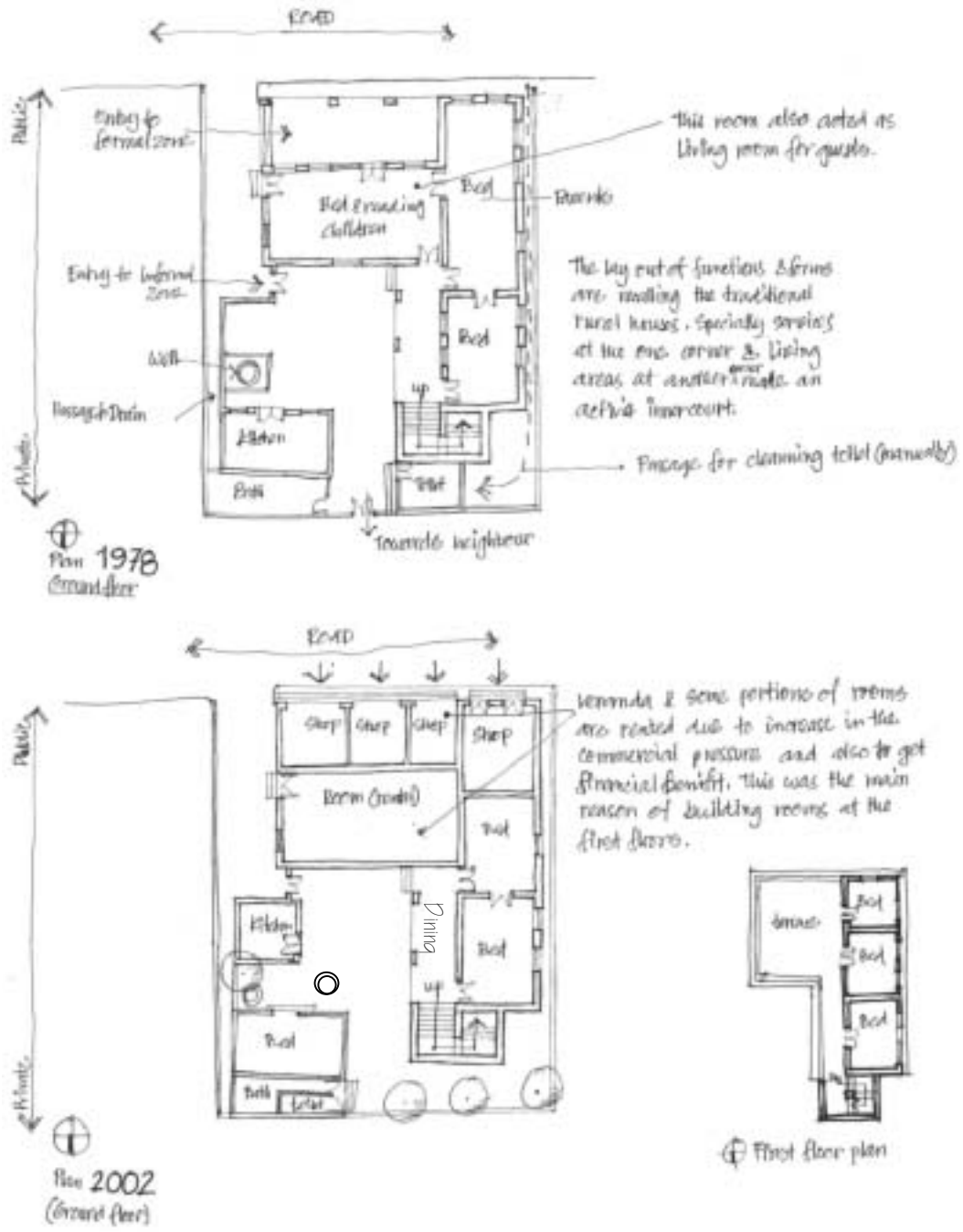


Figure 5.40: Stages of developments and changes (b) (Semi/3)

e. Checklist for the assessment of vernacular characteristics

	Charac	Level	1	2	3	4	5	6	7	8
Case: (Semi /3)	Process	H				•	•		•	
		M	•	•	•			•		•
		L								
	Product	H						•	•	•
		M	•	•		•	•			
		L			•					

Legend
1-8 are the numbers that are representing the proposed characteristics (see list 2: in the chapter 3)

H=high, M= medium, L= low

Case no: (Semi/4)
Name of the respondent: Md. Nurunnabi
Occupation: Businessman
House type: Dual family house
Village: Shalgaria (Moktar para)
District: Pabna

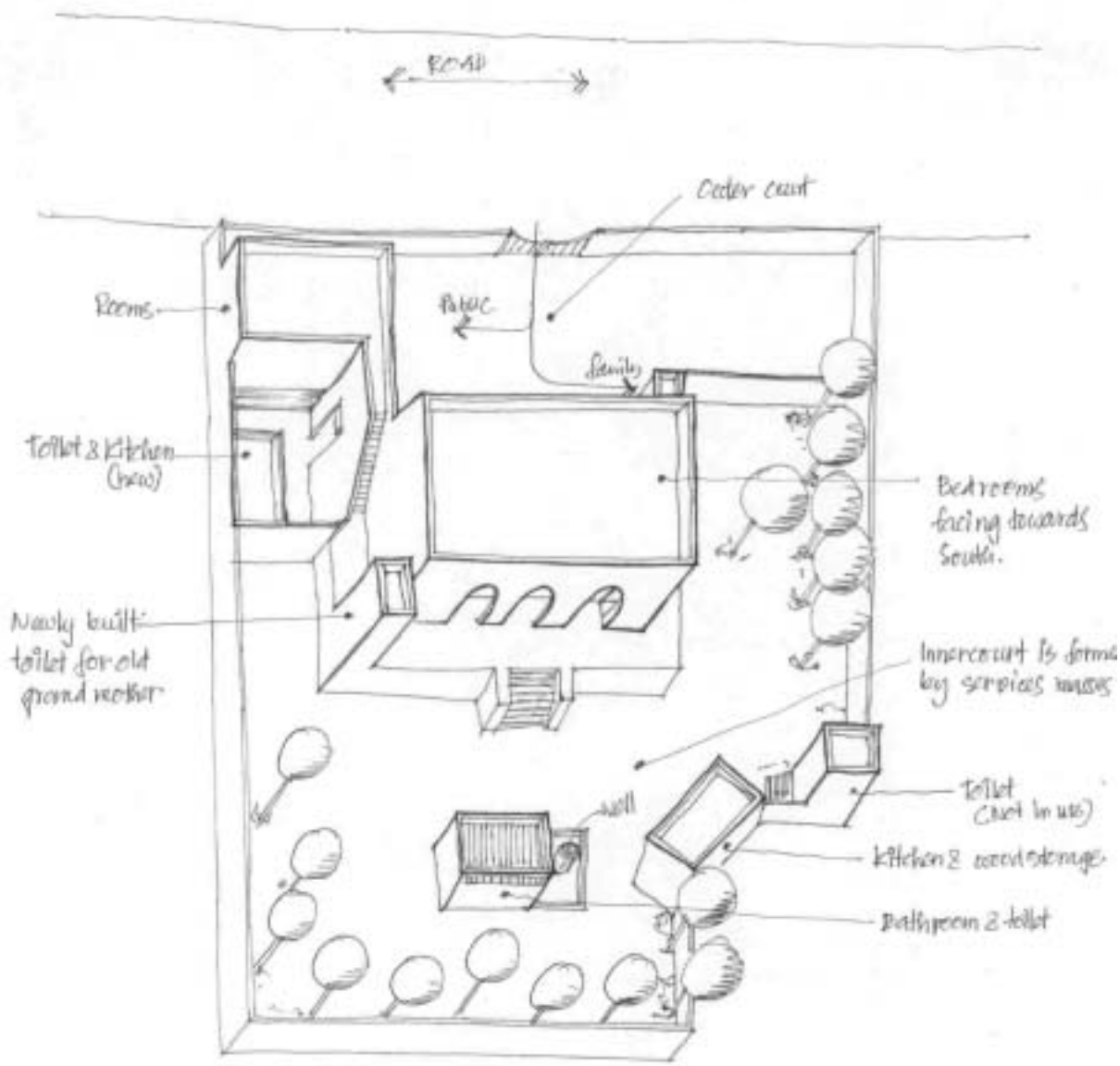


Figure 5.41: Axonometric view (Semi/4)

a. The family, land and locality:

Mr. Mohammed Jane was a lawyer who bought the land in 1900s. He started construction of the house in 1905 and completed in near about 1915. At that time he had a family of four members only which became ten within next fifteen years. It can be assumed that experiences from his (Mr.Jane) origin in rural area and work places at administrative courts, both guided the pattern of the house form in dual character with Bengali and Colonial influences at the same time.

b. The dwelling and its construction materials

Brick with lime morter is used to construct the 15" thick walls of this house. Roofs are constructed with tiles and lime terracing that is supported by steel beams. Thick walls and roofs are helping to keep a cool environment within the house in summer and a comfortable temperature in winter. Formal outlook and the building details have the strong influences from colonial style with its red coloured walls, arches over doors, windows and veranda. Though the house has the outlook of the colonial style but it has the strong relations with vernacular tradition in its arrangement of functions and zones.

c. The stages of development and changes

For several years the house was unchanged up to the death of Md. Jane. With the addition of a toilet and a kitchen, the outer house is converted into a small living unit, which is now rented to a single small family.

Figure 5. 42: The outhouse. Details of the buildings are copied from the colonial architecture.

In the later phases most of the family members are moved away to different places for job and education purposes. The room at the western side of the main living unit is now used as store, previously, which was a bedroom. By this time a new toilet and a bathroom were added near the kitchen area. Another toilet was also added to the inner veranda for Mrs. Jane, as she is no more capable to go to the detached toilets.

Figure 5.43: The detached kitchen and the storage.

Figure 5.44: The indirect approach to the inner house.

d. Formal relationships and spatial organisation

The 'outhouse' and the main living unit made formal zone while the informal zone is created by placing the services functions linearly and closely to the main dwelling unit. Approaches to the formal and informal zones are made direct and indirect respectively. The main living unit is facing towards south with a veranda, which is the conventional way of orientating the living rooms in the tradition.

Figure 5.45: The inner veranda. The columns and arches are still carrying the identity of colonial architecture. (right)

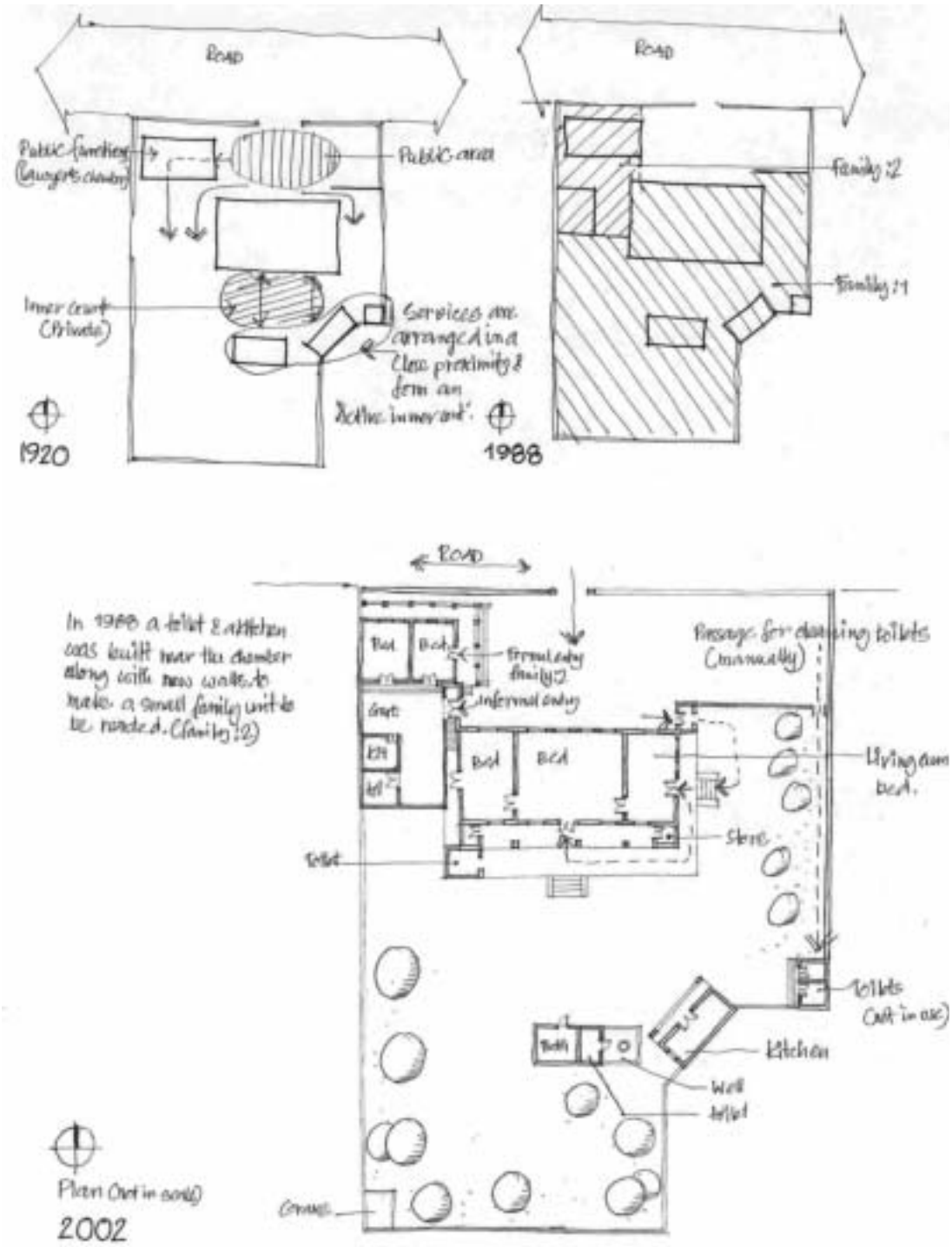


Figure 5.46: Stages of developments and changes (Semi/4)

e. Checklist for the assessment of vernacular characteristics

	Charac	Level	1	2	3	4	5	6	7	8
Case: (Semi /4)	Process	H				•	•		•	
		M		•	•			•		•
		L	•							
	Product	H	•	•		•		•		
		M			•		•		•	•
		L								

Legend
1-8 are the numbers that are representing the proposed characteristics (see list 2: in the chapter 3)

H=high, M= medium, L= low

Case no: (Semi/5)
Name of the respondent: Mr. Istiaq hossain
Occupation: Service in commercial bank
House type: Single-family house
Village: Shalgaria (Moktar para)
District: Pabna

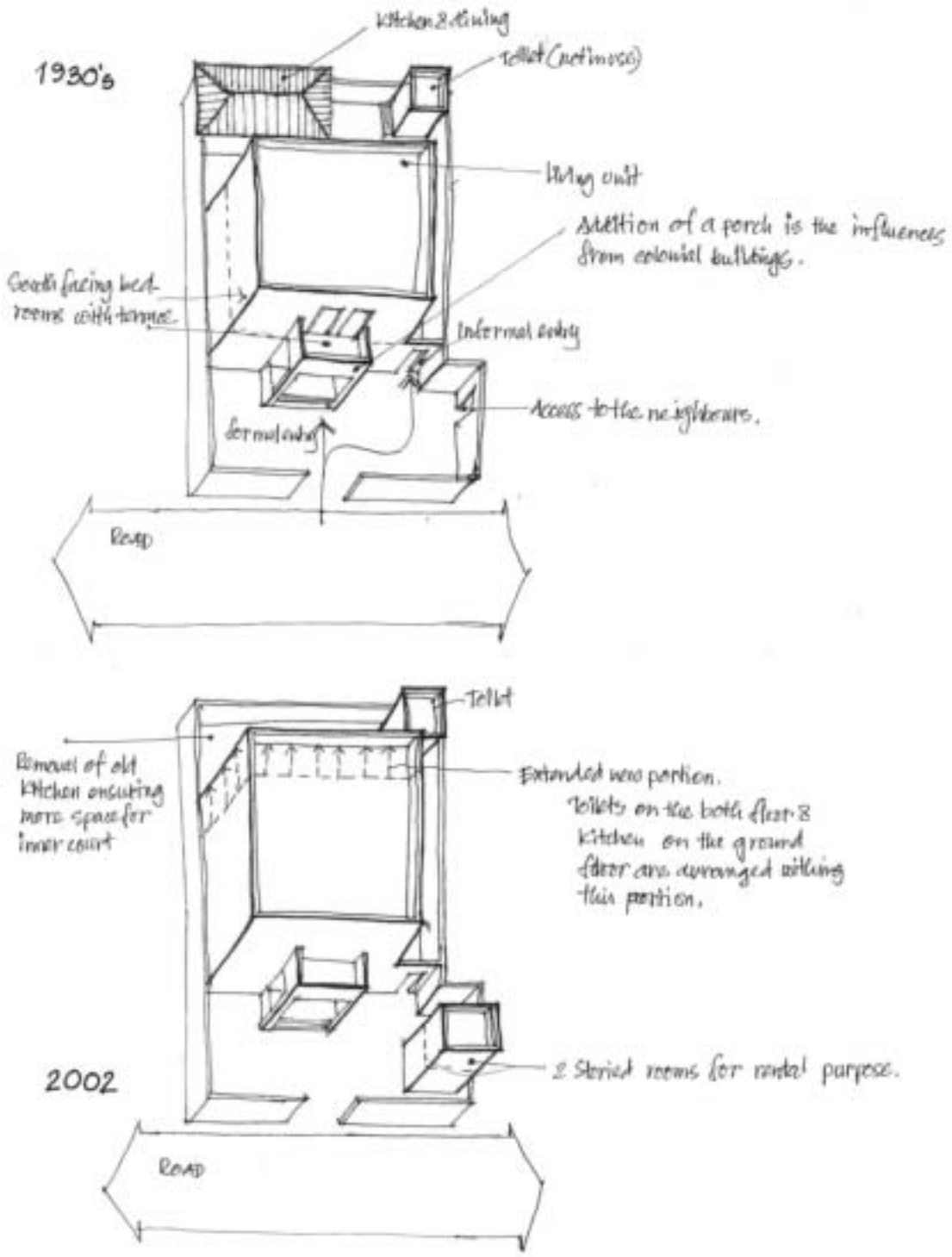


Figure 5.47: Stages of developments and changes (a) (Semi/5)

a. The family, land and locality

The father of Mr. Hossain was a physician who bought this land in near about 1940s. After living there for three years he moved with his family to another city for his job. For the next twenty years the house was rented to another tenant. At present Mr. Hossain is living here with his own family. Like the other examples, his (respondent's father) job was not related to the administrative courts so it can be assumed as the reason for less influence from the colonial buildings.

b. The dwelling and its construction materials

The house followed the conventional building materials and technology like brick walls and roofs with tile and lime morter supported by wooden beams. Plasters with lime coating are maintaining the condition of the building in a good quality. Like the previous examples this building is also showing good performances in maintaining the thermal comfort with thick (15") walls.

c. The stages of development and changes

Though the house has passed several years with different occupants but there are not so many changes were done. It is assumed that as it was rented for twenty years so at that time no alteration or changes were not possible for the tenants. But some alterations and changes of the house were made when the owner of the house started living there.

Later on a small kitchen and toilets were added to the northern end of the main dwelling unit as the previous places for those services were not considered as comfortable and convenient to the inhabitants. The additions of these new portions to the old house are making discomfort by blocking the cross ventilation. A two-storied building constructed in front of the house later on for rental purpose.

Figure 5.48: The main living room with a veranda oriented toward south.

Figure 5.49: The new dining place. This new addition blocking the natural light and ventilation.

d. Formal relationships and spatial organisation

The limitation of land guided the building layout and formal characteristics. At the beginning, the intention was to make a compact arrangement for efficient utilisation of spaces. But all the other aspects followed the traditional features of a vernacular house i.e. kitchen and toilets are placed separately, clear division of zones and their different approaches etc. The indirect approach to the informal zone and a provision to go to the neighbour's house are followed as a common practice of the rural society.

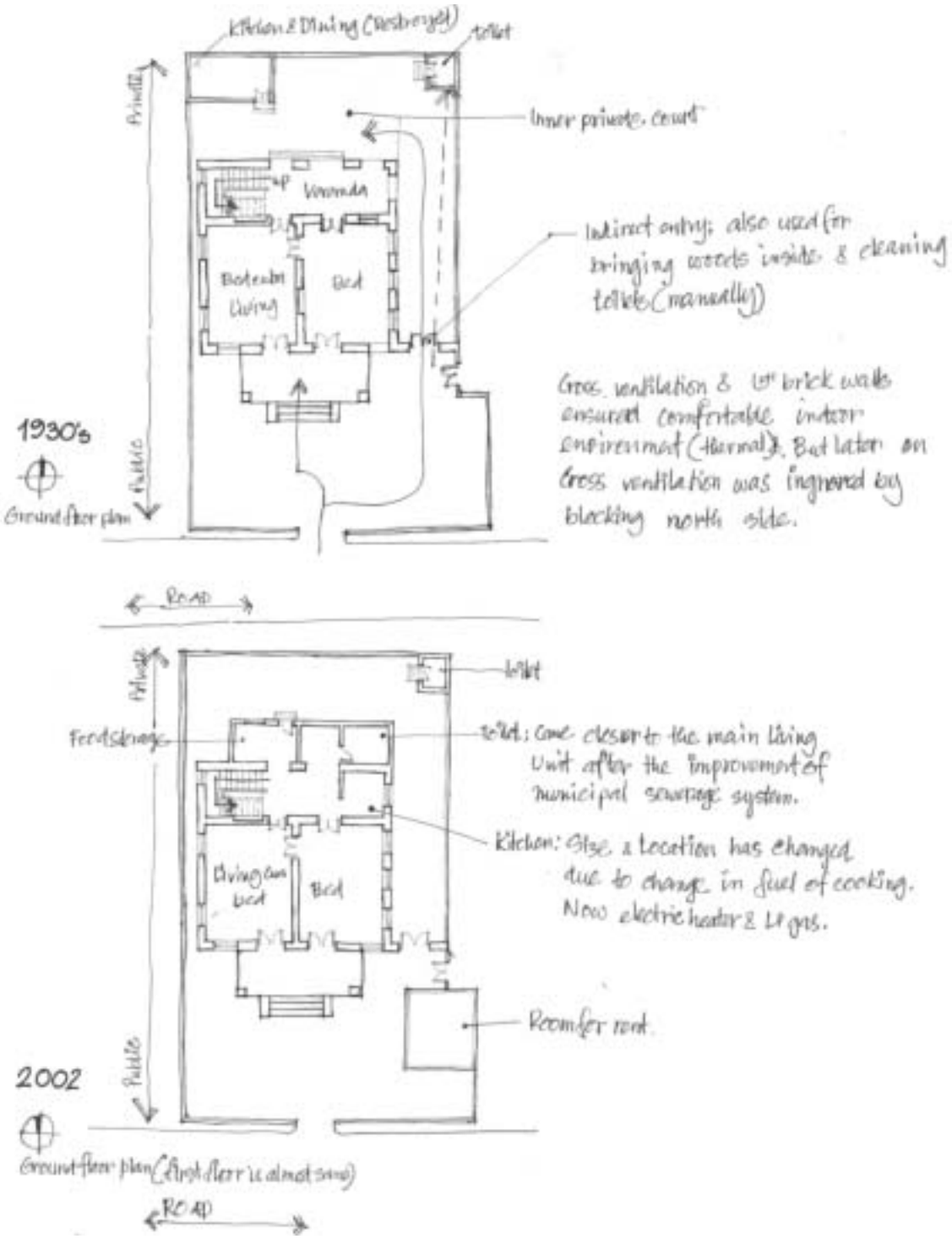


Figure 5.50: Stages of developments and changes (b) (Semi/5)

e. Checklist for the assessment of vernacular characteristics

	Charac	level	1	2	3	4	5	6	7	8
Case: (Semi/5)	Process	H			•	•	•		•	
		M	•	•				•		•
		L								
	Product	H	•			•		•	•	•
		M		•	•		•			
		L								

Legend
1-8 are the numbers that are representing the proposed characteristics (see list 2: in the chapter 3)

H=high, M= medium, L= low

5.5 Urban settings

Case no: (Urban/1)
Name of the respondent: Unknown
Occupation: College teacher
House type: Multi-family house
Village: 26, Purana Mughaltuli lane ("Apas' house)
District: Dhaka

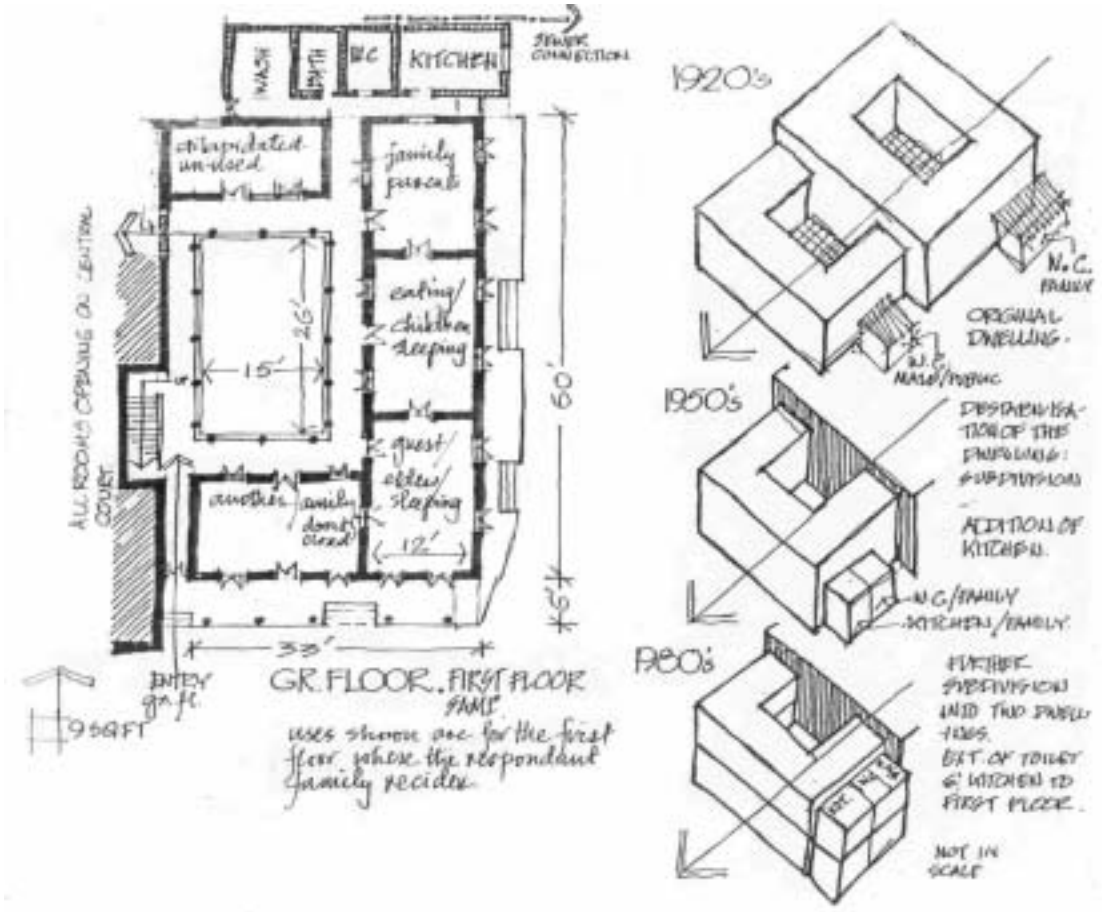


Figure 5.51: Plan and the stages of development and changes (Urban/1)
(Source: Khan, 1982)

a. The family, land and locality

The primary owner of this house was a Hindu person who migrated to India in 1947. After his migratation, the land was requisitioned by the government to accommodate employees. But later on the present owner occupied the land illegally and rented to different tenants. There are six families currently living in this house. The respondent is a lady teacher in the local college and one of the tenants of this house living at the ground floor.

b. The dwelling and its construction materials

This two-storied house has 16 rooms at the ground floor and 15 rooms at the first floor with 6 W.C.s totally. One of the rooms at the first floor has the roof with C.I. sheets. Brick is used as the main building material. Pre cast steel columns with the ornamented capitals and steel beams are supporting the balconies on the upper floor. Brick as construction material gave the opportunities to expand the house vertically and the scopes for internal divisions. Presently, the house is not in a condition to expand any more.

c. The stages of development and changes

The house has passed several stages of changes and alterations since 1920s to the present time. Changes were made to accommodate the increased numbers of families and their members that initiated the construction of the first floor and the additional kitchens and toilets. A two-storied building on a small plot has become compact and more dense for accommodating six families.

d. Formal relationships and spatial organisations

Rooms are arranged as the linear pattern around a central courtyard. All the rooms with shaded veranda are facing towards the court, which is recalling the essences of the traditional rural courts (Uthan). The rectangular shape and the orientations of the layout of this house also support the vernacular house forms. Primarily the services were built as detached forms, which later on came closer to the main living unit after the development of service facilities by municipality.

Two domains (male and female) and the definite front/back relationship are easily recognisable in this house. The male domain (outer court) is used as the entry court of the house while an indirect approached inner court is serving as the female domain. This court is also acting as the transitional space to the services, which is similar to the vernacular house pattern.

e. Checklist for the assessment of vernacular characteristics

	Charac	Level	1	2	3	4	5	6	7	8
Case: (Urban/1)	Process	H				●	●		●	●
		M	●	●	●			●		
		L								
	Product	H				●	●	●	●	●
		M	●	●						
		L			●					

Legend
1-8 are the numbers that are representing the proposed characteristics (see list 2: in the chapter 3)

H=high, M= medium, L= low

Case study no: (Urban/2)
Name of the respondent: Tara Miah
Occupation: Businessman
House type: Mixed type (residential and commercial)
Village: 7/8, Purana Mughaltuli
District: Dhaka

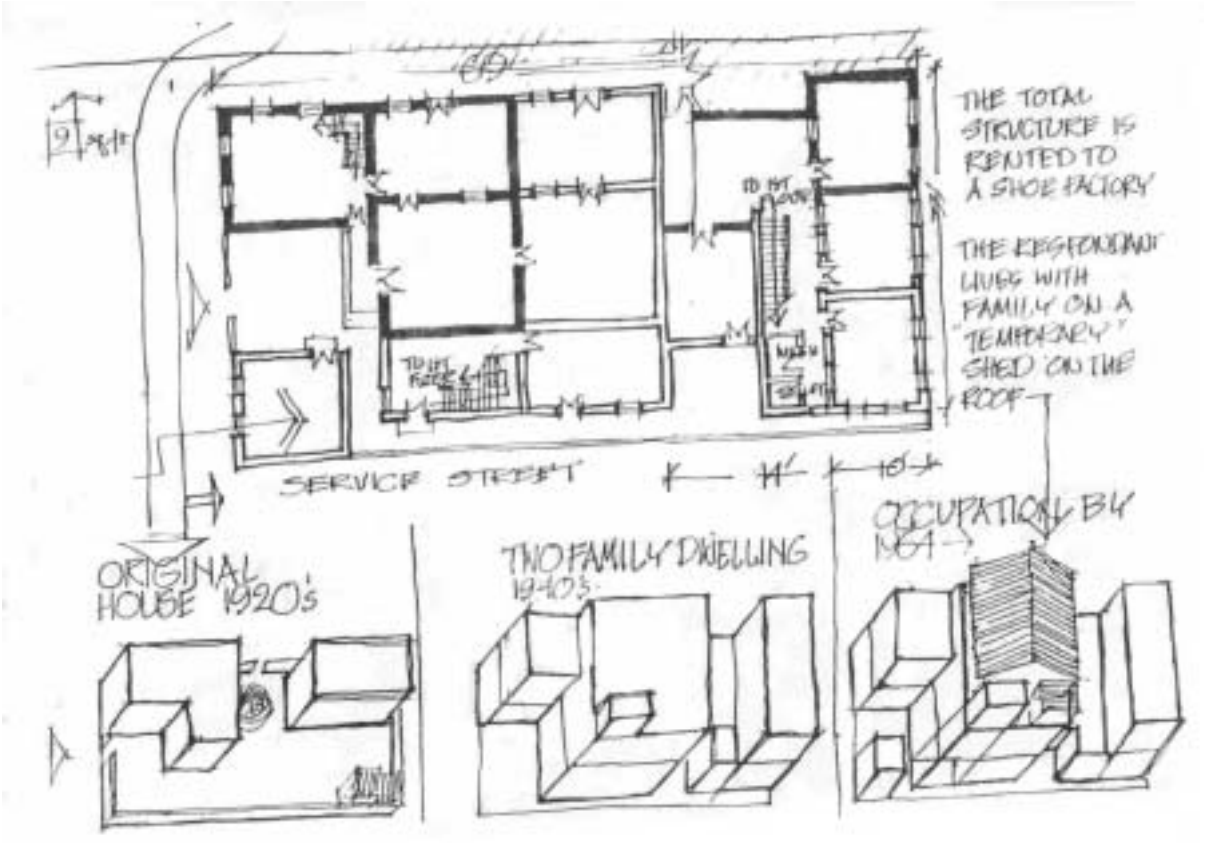


Figure 5.52: Plan and the stages of development and changes (Urban/2)
(Source: Khan, 1982)

a. The family, land and locality

The house has a history of human living from 1920s. The respondent acquired the land ownership in 1950s but it was illegal till 1971. Later on he negotiated with the erstwhile owners and became the legal owner of the land. Now the house is being used for both residential and commercial (shops and a small shoe factory) purposes.

Shops and a small shoe factory are occupying the ground floor. The first floor is rented to eight employees of that factory while the owner has his living unit at the top floor.

b. The dwelling and its construction materials

Brick is used as the main building material for the major portion of the house. The respondent's living unit at the top floor is built with the temporary building materials (bamboo and C.I. sheet). The owner is using the toilets at the ground floor, as there is no provision of that facility at the top floor.

The house is not in a good condition because of its low quality building materials and lack of maintainance. So that the owner built his own living unit with temporary materials. Now he is thinking to build a new apartment on this plot after demolishing the present structures.

c. The stages of development and changes

From 1920s to the present time several stages of changes and developments of the house have been done. The house started with the spirit of a vernacular house in its arrangements and space distributions. Later on illegal ownership motivated the owner to the rapid expansion of the house so that more money can be earned as early as possible from the rent. This unwise rapid expansion of the house compromised with the good qualities of the residential environment. With the densification of forms and functions, several problems started as the lack of ventilation and daylight.

d. Formal relationships and spatial organisation

The essential formal relationships of a residence are absent here with incorporating the factory to the house. Presently the house has more similarities with a commercial building than a residence. Up to 1940s the building was totally used for the residential purpose. Later on, the profit maximising intention of the owner motivated to increase the floor spaces rather than to improve the environmental qualities.

At the earlier stage the house had the spatial organisations like a traditional house form with the clear segregations of male and female domains. Later on functions are arranged vertically without considering the provisions to the services and their linkages. The living unit on the second floor is facing lacks in adequate spaces and a good living environment.

e. Checklist for the assessment of vernacular characteristics

	Charac	Level	1	2	3	4	5	6	7	8
Case: (Urban/2)	Process	H	●				●		●	
		M		●	●	●		●		●
		L								
	Product	H	●	●		●		●	●	●
		M			●		●			
		L								

Legend
1-8 are the numbers that are representing the proposed characteristics (see list 2: in the chapter 3)

H=high, M= medium, L= low

Case no: (Urban/3)
Name of the respondent: Mr.Sadeq
Occupation: Businessman
House type: Mixed type (residential and commercial)
Village: 69, Malitola Road
District: Dhaka

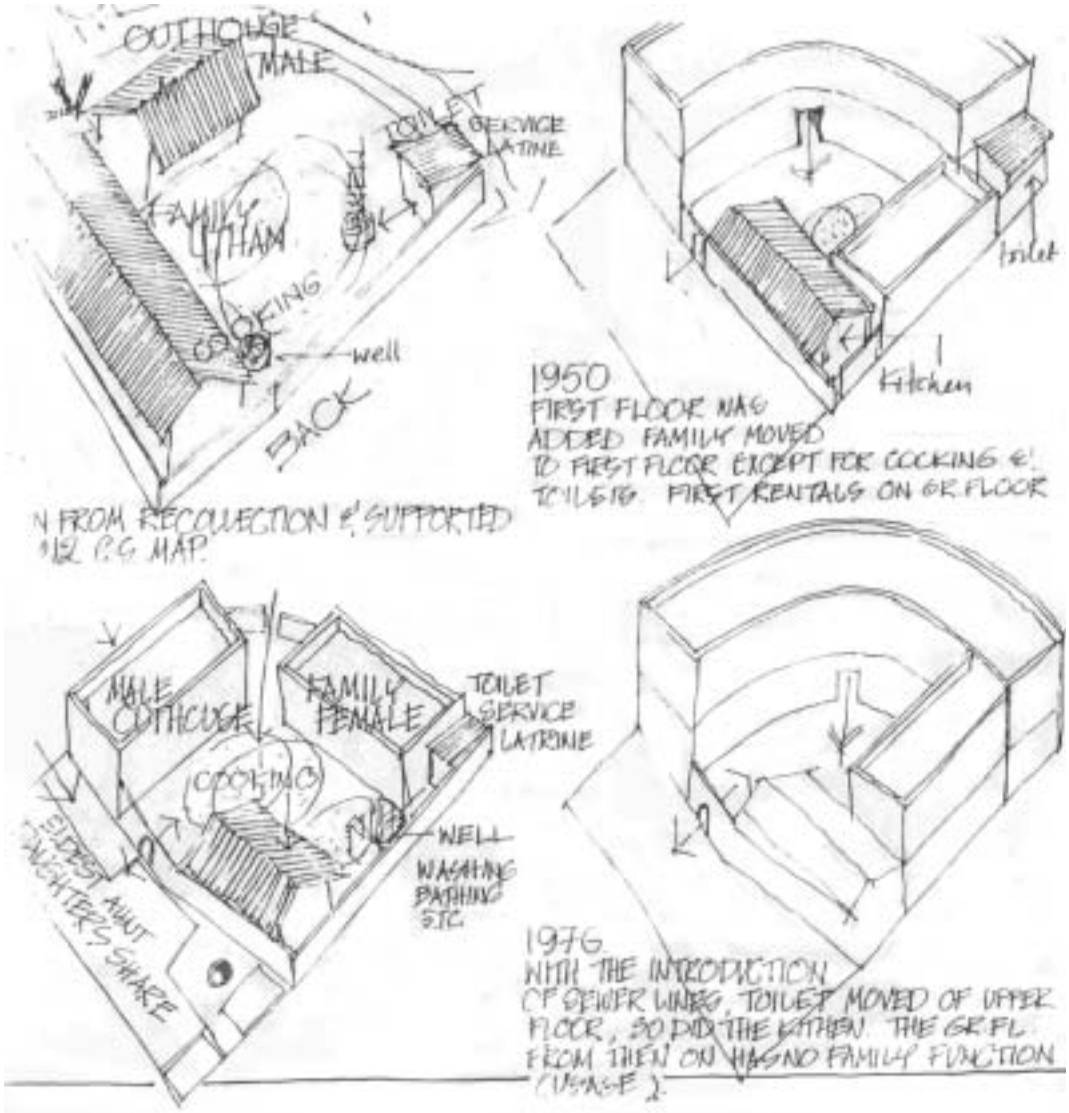


Figure 5.53: Stages of developments and changes (Urban/3)
(Source: Khan, 1982)

a. The family, land and locality

The family has the good reputation for business in this locality for about one hundred years. The father of Mr. Sadeq bought this piece of land in 1900s and built a small living unit here. Finally 14 members of a big joint family are living in this house. The elder son (respondent) is looking after the house after the death of his father since 1971.

b. The dwelling and its construction materials

The house is a two-storied building where ground floor is totally rented to the businessmen and the upper floor is being used for the residential purpose. Brick with lime morter is used as the main building material for this house except the old kitchen at the ground floor, which was built with bamboo and C.I. sheets. Brick construction allowed the vertical extension (the first floor) of the house for living purpose.

c. The stages of development and change

Primarily traditional values and later on commercial pressure guided the development of the house from. The changes took place with the increase of land values, provision of public sewer and increase of the family members. Now the owners have decided to build the second floor to meet the increased need of spaces for a newly married couple. As the open court is not in use for the family purpose so they are thinking also to construct more shops there to rent. But this court is acting as the light well for the house in that highly densed area. The provisions of piped gas and water supply, the increased commercial pressure encouraged the habitants to move at the first floor. The new toilets and kitchens were also added to the first floor with the shifting of the family.

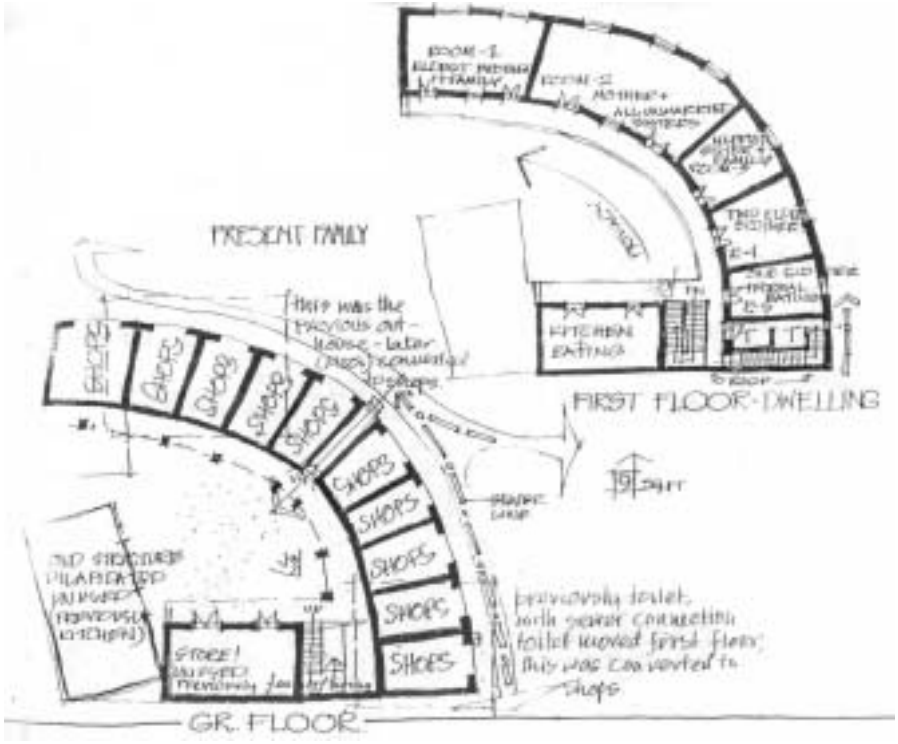


Figure 5.54: Existing Plan (Urban/3)
(Source: Khan, 1982)

d. Formal relationships and spatial organisations

At the primary stage three detached rooms formed an inner court but later on those rooms were replaced by a linear building. The linear built form followed the configuration of the site and became curvilinear. The lower part of the main built form has the direct linkages with the roads and surrounding commercial functions. The older kitchen and the store at the corner of the plot are ensuring more privacy to the inner court. At the first floor, all of the rooms are connected by a linear veranda and facing towards the court which helped in making the introvert nature of the house.

e. Checklist for the assessment of vernacular characteristics

Case: (Urban/3)	Charac	Level	1	2	3	4	5	6	7	8
	Process	H			•	•			•	
		M		•			•			
		L	•					•		•
	Product	H	•	•						
		M			•	•	•	•		•
		L							•	

Legend
1-8 are the numbers that are representing the proposed characteristics (see list 2: in the chapter 3)

H=high, M= medium, L= low

Case no: (Urban/4)
Name of the respondent: Ahmed Hossain
Occupation: Businessman
House type: Mixed type (residential and commercial)
Village: 9/7, Purana Mughaltuli
District: Dhaka

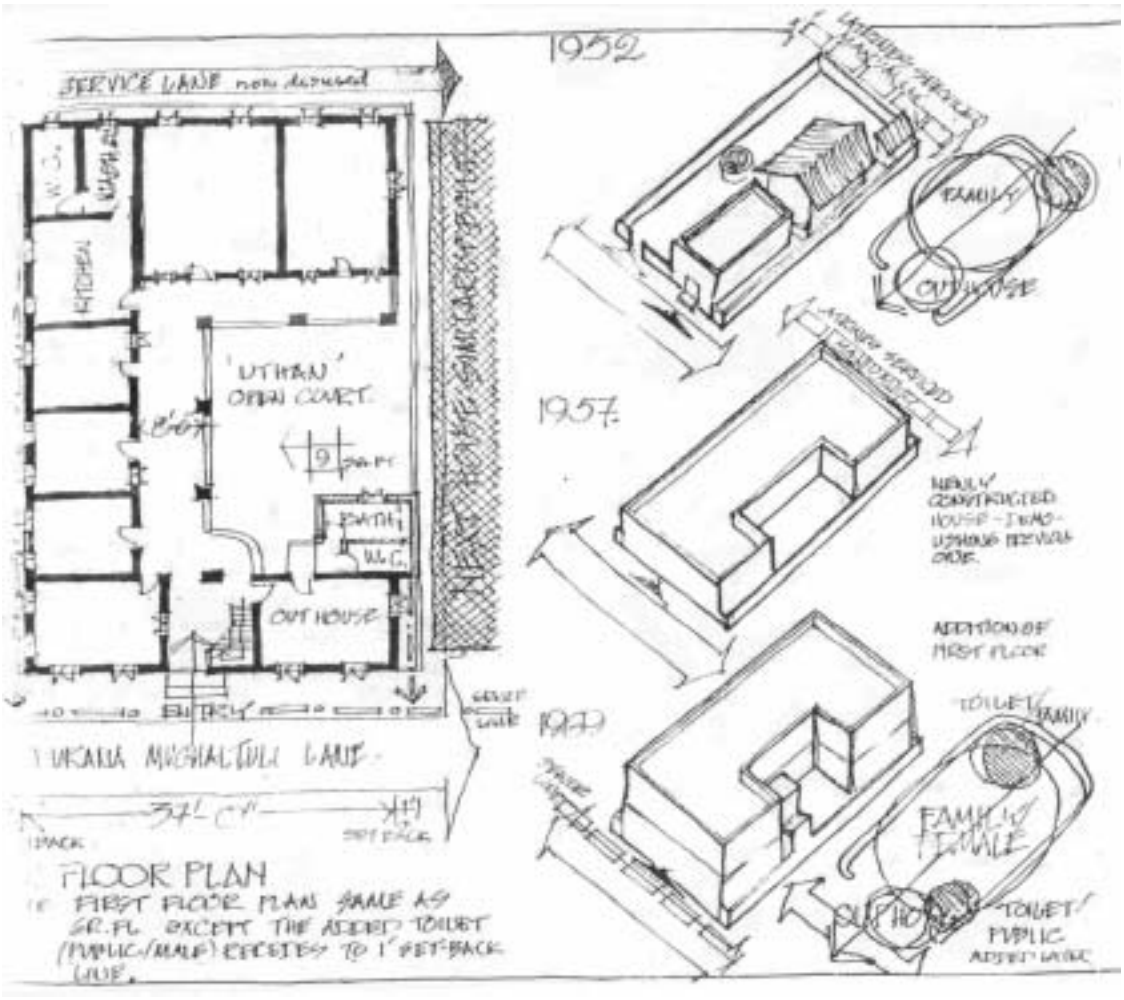


Figure 5.55: Plan and the stages of development and changes (Urban/4)
(Source: Khan, 1982)

a. The family, land and locality

In 1952, the respondent and his brother bought this land to build a house basically for business purpose. The intention was not only to build a house for business but also to get an address in the city. Their business was basically to import raw commodities from rural areas and to sell them in the city market. The additional inspirations to own a house in the city were also to provide scopes of higher education for their children and to get the higher status in rural areas.

In 1957 the house was designed by an engineer and built by a contractor, which completed in 1969. Each of the floors can accommodate one family. The notion of the owners of constructing this house was to make an asset as well as a living place in the city also.

b. The dwelling and its construction materials

Brick is used as the main construction material for the walls while tiles and lime terracing supported by wooden beams are used for roofs. Brick columns support the open veranda at the first floor. Now ground floor is rented to the tenants and the owners are occupying first floor.

c. The stages of development and changes

Primarily the house had characteristics similar to traditional house form with the spatial organisations, making two distinct zones for male and female etc. This house has been completed pre planned so there is less diversity in its development stages. At the earlier stage the temporary house form had similarities with the vernacular house pattern. This house is still remaining unchanged after the completion of first floor.

d. Formal relationships and spatial organisation

The house is occupying the major portion of the plot with leaving a small piece of land to create an inner court. The provision of an inner court can be assumed as the influences of the owner's interest. Forms are arranged in such a way that the court can be arranged to the south. By facing towards the court all of the rooms are reminding the essences of vernacular house pattern. Toilets are approached through the kitchen, which is very unfamiliar in this region. In a vernacular house toilets are placed detached and generally approached by separate entry. By approaching through the kitchen the arrangement made a break of the traditional rules.

e. Checklist for the assessment of vernacular characteristics

	Charac	Level	1	2	3	4	5	6	7	8
Case: (Urban/4)	Process	H								
		M		●	●	●	●			
		L	●					●	●	●
	Product	H								
		M		●		●		●		
		L	●		●		●		●	●

Legend
1-8 are the numbers that are representing the proposed characteristics (see list 2: in the chapter 3)

H=high, M= medium, L= low

Case no: (Urban/5)
Name of the respondent: Mr. Rabiullah
Occupation: Business
House type: Joint family
Village: 25, Mlitola Lane
District: Dhaka

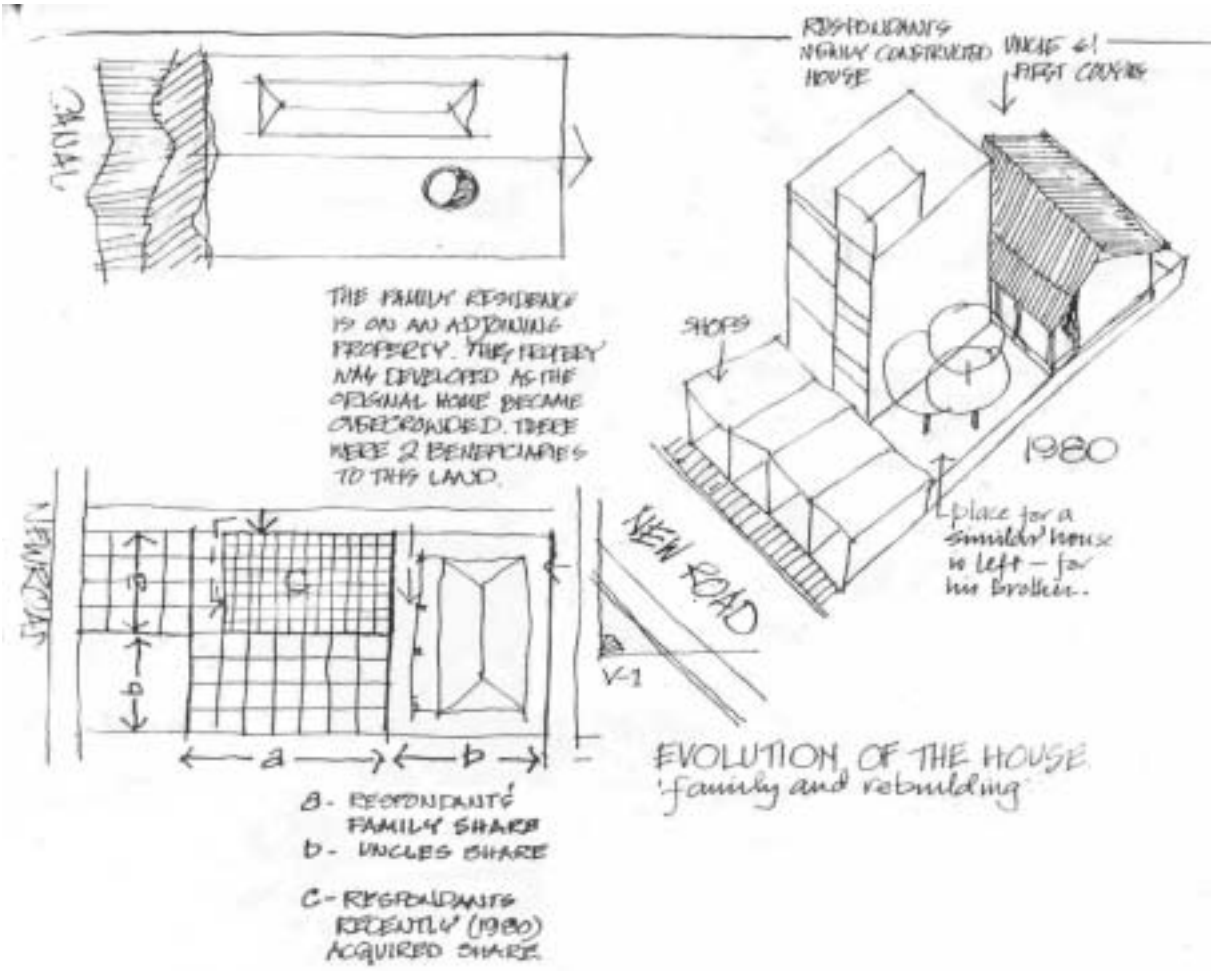


Figure 5.56: Stages of developments and changes (Urban/5)
(Source: Khan, 1982)

a. Family land and locality

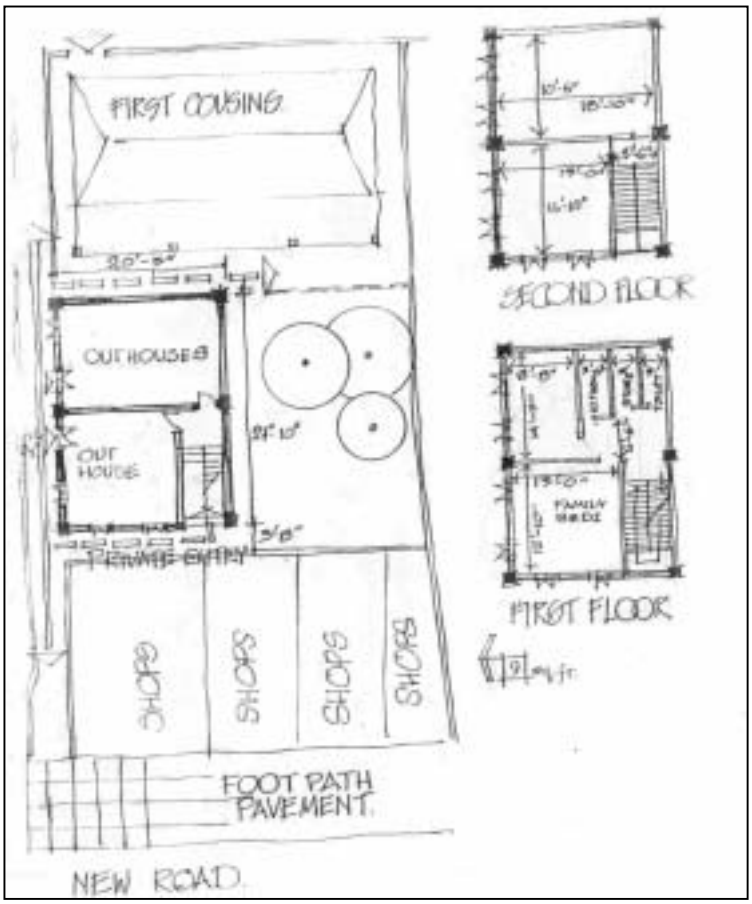
In the early 1900s the respondent's father bought some small pieces of land adjacent to each other and merged them into a bigger plot. At the beginning only a small portion of the land was ready to build house because of the presence of a canal at one side. The plot got the improved accessibility with the construction of a new road, which insisted the construction of a residential building. At present the elder son (the respondent) is taking care of the house. The house was not designed by any professional designer but guided by the owner himself. Now the house is being used as both commercial and residential purposes. The rental shops are ensuring the regular income sources for the family.

b. The dwelling and its construction materials

The older part of the house is constructed with brick and C.I. sheets for walls and roofs respectively. For the newer part of the house R.C.C is used for making frame structure while walls are constructed with bricks.

c. The stages of development and changes

At the beginning there was only a room constructed with brick that was shaded with C.I.sheets and a well for the temporary living purposes. A house for a single family was built there after the development of the land and approach to the site. After the death of the respondent's father, the land was divided in to parcels thereafter a new construction began at the mid of the plot by elder brother. The younger brother owns the vacant part of the plot and he desires to build a new house there.



d. Formal relationships spatial organisation

The intentions of building such a densed and compact arrangement of built forms was to utilise the spaces as efficiently as possible within this very small piece of land. The open space on the plot is providing the scopes for lighting and ventilation but in near future a house is going to be constructed there. The lighting and ventilations are going to be interrupted by building this new house on the open space.

The ideas of vernacular houses can be traced here very interestingly. The horizontally segregated zones of the vernacular houses are shuffled here in vertically. The ground floor is used as the outhouse while first floor is for services like kitchen, toilets, family living etc. The second floor is using as the inner house with the bedrooms.

Figure 5.57: Existing Plan (Urban/5)
(Source: Khan, 1982)

d. Checklist for the assessment of vernacular characteristics

	Charac	Level	1	2	3	4	5	6	7	8
Case: (Urban/5)	Process	H								
		M	•	•	•	•	•	•		
		L							•	•
	Product	H				•				
		M	•	•			•	•		•
		L			•				•	

Legend
1-8 are the numbers that are representing the proposed characteristics (see list 2: in the chapter 3)

H=high, M= medium, L= low

5.6 Conclusion

The cases have been studied in three different contexts of human settlements to trace the pattern and changes of vernacular architecture in Bangladesh. The cases of different settings have shown their similarities, specific characters and their relations to vernacular architecture. The case studies can be summarised as follows:

For the rural settings, with the open-ended character, all of the houses are well adapted within the environments. The changes within the houses made the environment rich at the same time as it maintained the equilibrium of space qualities properly. The changes of any component in a rural house have taken place with considering the whole system, which helped in maintaining the equilibrium quality of spaces. By studying the changes of vernacular houses in different stages it can be said that the studies are not only giving the information about formal and materialistic transformations but also the changes of the lifestyle of the people as well the changes of the society.

The cases from semi urban and urban settings are apparently different from the rural houses with the built forms, the use of construction materials etc. There are lots of constrains present in the urban settings like the land scarcity, heterogeneous character of the people, varied culture, a mixed society and their different modes of demands, etc. These constrains are thought as the factors for the differences of house forms and their characters compared to the rural settings.

The examples of semiurban and urban settings are showing the extent and the possibilities to implement the potentialities of the form and pattern of vernacular architecture in urban contexts. Within the cases that are studied in urban and semi urban settings, it is found that the houses were started with essence of vernacular house forms in their arrangements of forms and functions. Later on some of them transformed from the specified vernacular trend and become less vernacular. These changes are described in the Chapter 6.

6. Analysis of vernacular architecture

6.1 Assessment of the cases in three different settings

In this chapter all of the cases are analysed under the process and product characteristics proposed by Rapoport but with a modified version[30]. The methodology and the analytical process have been described elaborately in the chapter 3 (the methodology). Results from the case studies are analysed and co-related to trace the significant attributes of vernacular architecture in Bangladesh. All of the cases are assessed by the levels of the proposed characteristics. Each of the settings is assessed separately and they are presented by different tables in the following discussions. These levels of presence are mentioned as high, medium and low, which are considered as the parameters of assessing the vernacular characteristics in different settings.

The rural Context:

	Charac	Level	1	2	3	4	5	6	7	8
Case: (Rural/1)	Process	H	●	●	●	●	●	●	●	●
		M								
		L								
	Product	H	●	●		●	●	●	●	●
		M			●					
		L								

	Charac	Level	1	2	3	4	5	6	7	8
Case: (Rural/2)	Process	H	●			●	●	●		
		M		●	●				●	●
		L								
	Product	H	●		●	●	●	●		
		M		●					●	●
		L								

	Charac	Level	1	2	3	4	5	6	7	8
Case: (Rural/3)	Process	H	●	●	●	●	●	●	●	●
		M								
		L								
	Product	H	●	●	●	●	●	●	●	
		M								●
		L								

	Charac	Level	1	2	3	4	5	6	7	8
Case: (Rural/4)	Process	H	●	●	●	●	●	●	●	●
		M								
		L								
	Product	H	●	●	●	●	●	●	●	●
		M								
		L								

Legend

Process characteristics

1.Identity and the degree of anonymity of the designer: 2.Intention and purpose of the designers: 3. The Reliance, presence, nature and extent of sharing of a model: 4.Consistent uses of a single model for different parts of house settlement system: 5.Degree of congruence and nature of the relationship between environment and culture/lifestyle: 6.Degree of self-consciousness or un-self consciousness of the design process: 7.Degree of constancy/invariance vs. the form of change/originality (and speed of change over time) of the basic model. 8.Extent of sharing of knowledge about design and construction:

Product characteristics

1.Degree of cultural and place specificity. 2.Presence of specific formal qualities and relation to landscape. 3.Use of specific materials, colour, and textures. 4.Efficiency in the use of resources. 5.Complexity at the largest scale due to place specificity. 6.Clarity, comprehensibility and the effectiveness of the environment due to the order expressed by the model used. 7.Open-ended ness, additive and subtractive qualities and the presence of "stable equilibrium". 8.Complexity due to the use of a single model with variation over time.

H=high, M=medium, L= low

Table 6.1: Checklist for the position of characteristics (Rural setting)
Showing the position of the characteristics for four different cases of rural setting.

[30] See chapter 3. List 2 (The modified characteristics for this research)

From the assessment of the houses in rural setting it is observed that most of the houses are more vernacular with the presence of the characteristics in higher level. In the case rural/4 all of the characteristics are ranked high as the existence of the vernacular characteristics are found as higher levels in the assessment.

The cases rural/1 and rural/3 have one of the characteristics, which are ranked as the medium. Some of the characteristics in the case rural/2 are ranked as medium when they are assessed for less or more vernacular. In the case rural/2, the 2nd product characteristic is applied to assess the presence of specific formal qualities and the relation to landscape. But the specific formal qualities and the relations are not fulfilled in the development stages of this house. The courts (court 1 and court 2) are segregated by fences while traditionally these courts should have connections internally. The basic criteria of solid-void relationship of a vernacular house are not noticed in the later developments. The size of the court 2 is not spacious enough to accommodate different household activities and the court 3 is not getting the proper enclosed character with the linear arrangement of built forms. In the 7th process characteristic, the degree of constancy/invariance and the form of changes (speed of change over time) are assessed. The constancy of change is identified as medium and the changes over time have found rather fast. With these features, the 7th process characteristic is considered as medium for the assessment of its vernacular character.

In the case rural/1, the 3rd product characteristic is ranked as medium. According to the assessment criteria, the vocabulary of the model should be rich with the use of specific materials, colour, and texture in architecture to be more vernacular. In this case (rural/1), different types of materials have been used in different built forms. The plinths of two living units are constructed with brick while the others have mud plinths. The roadside wall of the cowshed is constructed with C.I. sheets and the other adjacent walls are constructed with jute sticks. This situation made the model of the house inconsistent by the use of different building materials and textures. With the understanding form the analysis it can be said that the architecture of rural setting in Bangladesh is more vernacular.

Semi Urban settings:

Case: (Semi /1)	Charac	Level	1	2	3	4	5	6	7	8
	Process	H		●		●	●		●	
		M	●		●			●		●
		L								
	Product	H			●			●		●
		M	●	●		●	●		●	
		L								

Case: (Semi /2)	Charac	Level	1	2	3	4	5	6	7	8
	Process	H	●	●	●		●	●	●	
		M				●				●
		L								
	Product	H	●	●		●	●	●	●	
		M			●					●
		L								

Case: (Semi /3)	Charac	Level	1	2	3	4	5	6	7	8
	Process	H				●	●		●	
		M	●	●	●			●		●
		L								
	Product	H						●	●	●
		M	●	●		●	●			
		L			●					

Case: (Semi /4)	Charac	Level	1	2	3	4	5	6	7	8
	Process	H				●	●		●	
		M		●	●			●		●
		L	●							
	Product	H	●	●		●		●		
		M			●		●		●	●
		L								

Case: (Semi/5)	Charac	Level	1	2	3	4	5	6	7	8
	Process	H			●	●	●		●	
		M	●	●				●		●
		L								
	Product	H	●			●		●	●	●
		M		●	●		●			
		L								

Legend

Process characteristics

1.Identity and the degree of anonymity of the designer: 2.Intention and purpose of the designers: 3. The Reliance, presence, nature and extent of sharing of a model: 4.Consistent uses of a single model for different parts of house settlement system: 5.Degree of congruence and nature of the relationship between environment and culture/lifestyle: 6.Degree of self-consciousness or un-self consciousness of the design process: 7.Degree of constancy/invariance vs. the form of change/originality (and speed of change over time) of the basic model. 8.Extent of sharing of knowledge about design and construction:

Product characteristics

1.Degree of cultural and place specificity. 2.Presence of specific formal qualities and relation to landscape. 3.Use of specific materials, colour, and textures. 4.Efficiency in the use of resources. 5.Complexity at the largest scale due to place specificity. 6.Clarity, comprehensibility and the effectiveness of the environment due to the order expressed by the model used. 7.Open-ended ness, additive and subtractive qualities and the presence of "stable equilibrium". 8.Complexity due to the use of a single model with variation over time.

H=high, M=medium, L= low

Table 6.2: Checklist for the position of characteristics (Semi urban setting)
Showing the position of the characteristics for five different cases in semi urban setting.

The assessment indicates that the vernacular characteristics also exist in the houses of semi urban settings. In some of the cases, the characteristics are found more vernacular and some are less. The case semiurban/2 seems more vernacular in the assessment where most of the characteristics are identified as high level of existence. In this case the 4th process characteristic is applied for the assessment of the consistent uses of a single model for different parts of the house settlement system. C.I. sheets are used for roofing in this house, which is uncommon for the different parts of this particular human settlement. This inconsistent use of a single model within the settlement ranked this characteristic medium. At the same time one can face difficulties with the assessment of the model when it is compared with a rural house. For this case roofs of the built forms are constructed with C.I. sheets whereas the surrounding houses have flat roofs, which made this model inconsistence and incongruous within the settlement. If the settlement is considered as rural then this characteristic should be ranked high. In a rural setting this house will find similarities to the surrounding built forms having slope roofs those are constructed with C.I. sheets.

In the semi urban setting the characteristics have shown their average distribution levels within the high and medium ranges. But within these levels, the existences of the characteristics are more prominent in the medium level than the higher so at this point, the architecture in semi urban setting can be considered medium vernacular.

Urban settings:

Case: (Urban/1)	Charac	Level	1	2	3	4	5	6	7	8
	Process	H				●	●		●	●
		M	●	●	●			●		
		L								
	Product	H				●	●	●	●	●
		M	●	●						
		L			●					

Case: (Urban/2)	Charac	Level	1	2	3	4	5	6	7	8
	Process	H	●				●		●	
		M		●	●	●		●		●
		L								
	Product	H	●	●		●		●	●	●
		M			●		●			
		L								

Case: (Urban/3)	Charac	Level	1	2	3	4	5	6	7	8
	Process	H			●	●			●	
		M		●			●			
		L	●					●		●
	Product	H	●	●						
		M			●	●	●	●		●
		L							●	

Case: (Urban/4)	Charac	Level	1	2	3	4	5	6	7	8
	Process	H								
		M		●	●	●	●			
		L	●					●	●	●
	Product	H								
		M		●		●		●		
		L	●		●		●		●	●

Case: (Urban/5)	Charac	Level	1	2	3	4	5	6	7	8
	Process	H								
		M	●	●	●	●	●	●		
		L							●	●
	Product	H				●				
		M	●	●			●	●		●
		L			●				●	

Legend

Process characteristics

1.Identity and the degree of anonymity of the designer: 2.Intention and purpose of the designers: 3. The Reliance, presence, nature and extent of sharing of a model: 4.Consistent uses of a single model for different parts of house settlement system: 5.Degree of congruence and nature of the relationship between environment and culture/lifestyle: 6.Degree of self-consciousness or un-self consciousness of the design process: 7.Degree of constancy/invariance vs. the form of change/originality (and speed of change over time) of the basic model. 8.Extent of sharing of knowledge about design and construction:

Product characteristics

1.Degree of cultural and place specificity. 2.Presence of specific formal qualities and relation to landscape. 3.Use of specific materials, colour, and textures. 4.Efficiency in the use of resources. 5.Complexity at the largest scale due to place specificity. 6.Clarity, comprehensibility and the effectiveness of the environment due to the order expressed by the model used. 7.Open-ended ness, additive and subtractive qualities and the presence of "stable equilibrium". 8.Complexity due to the use of a single model with variation over time.

H=high, M=medium, L= low

Table 6.3: Checklist for the position of characteristics (Urban setting)
Showing the position of the characteristics for five different cases in urban setting.

The urban settings are characterised by various activities like industries, public housing, administrative activities, business etc, which made them different from the rural settings. The people in urban areas are also considered heterogeneous[31] compared to rural people. As for this basis the level of vernacular characteristics in urban setting were expected not higher but either medium or low. Surprisingly the results indicate that, in some of the cases (urban/1, urban/3 and urban/5), the characteristics have found within the range of higher level. The higher levels indicate that to some extent the houses in urban setting are more vernacular.

For an example, with the 4th product characteristic, the efficiency of the uses of the resources of case urban/1 is assessed. The higher efficiency in the use of resources is found in this case. The maximum utilization of land is achieved with the arrangement of functions surrounding a central multipurpose court. The court is also providing the scopes for sunlight and ventilation within that tight urban setting, which indicates the efficient use of the resources. The 7th process characteristic assessed the degree of constancy and the form of change over time. Form the information by Khan's (1982) study, one can conclude that the degree of constancy in the case urban/3 is very high and the change over time is slow, which placed the characteristic within the higher level.

All the other characteristics have assessed in the same procedure and the checklists are the representations of those assessments. From the analysis it can be considered that the average levels of architecture are medium vernacular in urban settings.

[31] The heterogeneous characteristics of urban people are described in the chapter 6.2

6.2 Core and the other significant attributes of vernacular architecture in Bangladesh

Rappoport (1990) proposes that the existences of the characteristics with higher levels in any environment will indicate its character as more vernacular. In this research the higher level of existence is categorised by the range[32] of H (see Tables 6.1, 6.2, and 6.3). The characteristics within high (H) range are considered as core attributes. For the domestic environment these attributes with the high levels are essential for a sustainable[33] built environment. The tables 6.1, 6.2 and 6.3 are showing the relative positions of characteristics in different settings when they are assessed for their levels of existence. All of the characteristics (process and product) of the rural cases expected to get the higher positions in the assessment. The table 6.1 is illustrating that the architecture in rural settings is close to vernacular architecture i.e., more vernacular.

As we move from rural to semi-urban or urban settings, some of the characteristics are getting the medium or the lower positions in the tables. Though these characteristics did not get their positions within the higher range (H), they still seem more close to the core attributes. The attributes within these characteristics are proposed as 'significant attributes' that placed within the medium (M) range. The existences of the characteristics of semi-urban and urban settings are found dominant within this range.

These significant attributes are not different from the core but they are modified/transformed by several aspects/impacts of a new setting. For an example, the concept of the rural court is sometimes applied in the urban houses. But with the pressure of different constrains like land scarcity and high land value, those courts have become smaller and sometimes disappeared in an urban house. Like this situation, some other characteristics of vernacular architecture have been transformed or modified when they are applied in the architecture of urban contexts[34].

The results from different studies indicate that the architecture in urban settings is transformed and they are different compared to rural settings. The cases from the semi urban settings are indicating how different factors can influence the elements of vernacular architecture. Sometimes houses in the semi urban setting are strongly influenced by the colonial style (case: semi/4) and sometimes by the commercial pressures (case: semi/3). By this analysis it is clear that the architecture in urban areas are different in character though it has roots in rural settings with the similarities of space organisations, functional linkages, orientations of built forms etc.

People migrate from rural areas with their own traditional beliefs and usually try to adapt some of those ideas in their newly built urban houses. From the result of the case (semi/2) it is understandable, how an image of vernacular architecture can be reflected in an urban house. In this case the organisation of spaces, forms, and approaches are very similar to any typical vernacular house from. The factors of changing the characteristics within the rural and urban settings are illustrated as follows:

The people in rural areas can be considered homogenous as well as heterogeneous in characters. The diversities of land ownerships, different positions and status of male and female in the society etc can make the heterogeneous characters of rural people. There are some big landowners and some groups of people with higher classes (both in Muslim and Hindu religion) in rural areas but these groups are small in numbers. The major portions of the people in the rural areas are poor and directly or indirectly

[32]The ranges are proposed by the present author as H (high), M (medium), and L (low) as a part of the proposed analytical model. The ranges are proposed to see how a model can work in the assessment of vernacular architecture.

[33] See the chapter 1/ Sustainable architecture

[34]See the vernacular influences in the urban houses in the chapters 5.5 and 5.6 (cases of semi urban and urban settings)

related to the agricultural activities. The same occupation and the very close/similar economic and social status of the majority of the rural people are making less class differences in rural society. With this understanding it can be said that people in rural areas are generally homogenous in character.

Heterogeneous[35] characters can be found in the urban people as it is considered that they came from different origins with varied customs and beliefs. Class differences with economic and social aspects in urban people are the prominent factors for becoming heterogeneous. Diversified characteristics of the people with their different influences, choices and preferences made the architecture of urban settings different from the rural and not homogenous in nature. The transformation of architecture within any particular context or within different settings can be considered as the consequential result of the changed lifestyle.

6.3 Changes of vernacular architecture with the change of lifestyle

It is considered that the change in the lifestyle of people influences to change their architecture. It refers to the transformations of architecture with the changes of the demands by human. With the changed lifestyle, humans try to modify/change his/her built environment and the result can be seen within the changes/transformations of architecture. Changes of lifestyle in different settings are happening due to different reasons. Social, cultural and economical aspects are thought as the major modes for changing the lifestyle.

Transformation in architecture is taking place in both urban and rural settings. But the changes in urban setting are faster than rural. People in urban areas get more and more new ideas and information about the lifestyle of different parts of the world and try to adapt those to their own lifestyle. Following this changed lifestyle the architecture in urban areas also influenced. As the rural people are not as much exposed to the information as urban people, so the pace of the change in rural areas is comparatively slower. The following discussion focuses on the changes of lifestyle of rural people and their influences on vernacular architecture.

Since the last 10-15 years, the Government is giving more emphasis on the developments of new infrastructures in rural areas. For this purpose new legislations are being proposed for the regularisations of the rural infrastructures. Such a development project is Rural Infrastructure Development Project[36] by LGED (Local Government Engineering Department).

Figure 6.1: Growth Center by LGED. The introduction of the regularization of built forms in rural areas. (Source: http://www.lged.org/growthcentre.htm on 19.12.2002)

[35] But at the same time it can be said that the heterogeneous characters in urban area can became homogenous as time passes. In urban areas the business class, the groups of people with different jobs of higher status can also generate new homogenous character. But in urban areas there are other factors for what people are moving from one place to another, which indicates that heterogeneous character is still prominent in urban areas.

[36] *The types of rural infrastructure development activities carried out by LGED comprises the following*:
Construction of feeder road type-B, construction of rural roads, construction of bridges and culverts on feeder road Type-B and rural roads, development of growth centres and rural markets, construction of small scale water resource scheme, construction of small sluice and regulators, re-excavation of khals and other ponds, tree plantation on slopes of feeder road type-B, rural roads and embankment, routine maintenance of earth roads, Herring Bone Bond (HBB) roads and other paved roads, repair and routine maintenance of bridge/culverts, **construction of school buildings, office buildings, residential quarters, cyclone shelters** etc (BIDS & UNDP, 2002).

Within these projects, the Growth Centres[37] and Rural Markets are already being implemented. New types of constructions are taking place within the rural areas such as schools, hospitals, administrative buildings, permanent markets etc. These buildings are representing a new style of architecture for the rural people. The style of these buildings generally follows the functional style of modern architecture. As an example, the new school and administrative buildings are generally representing the functional style of architecture with their simplicity of built forms, no ornamentations, logical uses of building materials etc. People are becoming familiar with this new architecture gradually, which influences and changes their conceptions about built forms. This changed conception ultimately can be traced within the changes of their houses. The changes in rural house are taking place in terms of the use of different building materials, colours, rearrangements of functions etc. For example, brick is now using for the construction of the houses in rural areas. In some wealthy families R.C.C flat roof can also be seen.

The position of women in a rural society is also changing. Women are encouraged[38] to take part in different jobs for earning money with the goal for the betterment of their life. Nowadays in the construction, operation and maintenance of the growth centres; women are specially encouraged. Different organisations[39] are also providing loans to rural woman to invest the money in small business or in the development and construction of their houses. These events provide scopes for the woman to earn money, which is uplifting their position in a family. Nowadays women can take part in decision-making about the construction or changes of their houses. At the same time woman are now allowed to come outside, which is bringing the changes in the strict concept of zones (formal and informal).

Developments of communication such as road networks, electricity and telecommunications including the electronic media, are bringing changes to the lifestyle of rural people. Those developments are providing opportunities for them to get in touch with urban lifestyle, which results in changes of behavioural pattern of rural people. Rural electrification in recent years inspired the rural people to buy television and radio. Different programmes in these media have an impact in the lifestyle of rural people. Drama, cinema shown in television, the campaign for family planning, the health and hygiene awareness education by the government through the television and radio are influencing the people. Now people in rural areas are more conscious about the benefits of the limited family members, which is

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[37]. *Growth Centres and Rural Markets:*
Growth Centres/Rural markets (GC/RM) constitute focal points for economic and trading activities serving rural hinterland. The GC/RM is the market place with physical feature like roads and pedestrian areas, platforms, and sheds, public water supply and sanitary facilities as well as provisions for drainage and refuse disposal.
The aim is to have an integrated development of physical infrastructure within a thana (a lower administrative area). Such a scheme of integrated development will be known as master scheme. In selecting a master scheme, more emphasis shall be given to the development of growth centre/rural market scheme and upgrading of market connecting roads while rehabilitation and construction of road structures shall be considered as support/auxiliary scheme.
The types of schemes that can be taken up under a master scheme shall be:
Development of growth centres/rural markets which can include the following facilities: Tube wells, Earthwork for sight improvement/elevation of market area, Drainage, HBB (Herring Bone Bond) surfacing of Internal roads and trading areas, Pucca sheds, Latrines and urinals, Pucca open sales area, Garbage pits etc (LGED, 2002).

[38]*Women's Marketing Section In Growth Centres (Wms):*
In Bangladesh, women constitutes about 50% of total population. They are mostly engaged in traditional household activities. Only about 8% of them are working outside the household. **In order to promote women's participation in non-traditional activities**, the program for development of "Women's marketing section" in Growth Centres is undertaken (LGED, 2002).

[39]The Grameen Bank provides loans for the poor rural people where, **in delivering credit, priority has been increasingly assigned to women.** Some of their objectives of giving loans are; a) To raise the social and political consciousness of the newly organized groups. b) **To focus increasingly on women from the poorest households, whose urge for survival has a far greater bearing on the development of the family.** c) To encourage their monitoring of social and physical infrastructure projects - housing, sanitation, drinking water, education, family planning, etc (Grameen Bank, 2002).

gradually resulting in smaller families. The new generation is becoming more educated and getting experience of urban lifestyle that is gradually being manifested in their architecture.

Generally it is considered that in this 21st century, the people in rural areas are becoming more flexible in adapting new ideas to improve their lifestyle. Such as rural people are interested about new styles of dresses, which are available in urban markets. Rural people are also becoming interested in other aspects of urban lifestyle in this way. These changes in the lifestyle or behaviour ultimately get manifested in their architecture. These changes and transformations are sometimes making their environmental quality rich. Such as the compactness of the functions and the interconnections between them are ensuring easy and safe movements. At the same time the environmental qualities are becoming poor compared to the earlier situation when any component of architecture is just being copied from urban settings without understanding its compatibility and applied to a rural house. Such as the provisions of formal living room, dining places in a rural house are used just for special purposes or occasions. Sometime densifications of the forms and functions are making problems for daylight and ventilations. These aspects are explained more in the following discussions.

The following discussions about the changes of vernacular architecture are presented here to share some thoughts with the reader.

- **Compactness and densification of house forms and functions**

Densification and compactness of functions are also taking place in the rural houses to accommodate more members on the same piece of land. It is considered that the demand for a smaller living unit in rural Bangladesh is increasing due to very slow economic growth. Family planning is influencing the people to have a smaller family that resulted in the need for smaller and compact houses. Along with family planning, the increased prices of the construction materials and the decreased land for houses are also forcing people to compact their houses.

The scarcity of land and the development of sanitary facilities are forcing the isolated rooms to come closer and now most of the time they are making linear and L-shaped forms. Toilets and kitchens are also attaching to the main living unit and connected by a linear shaded veranda (see case: rural/1). The reason behind these changes can be mentioned as the changes of the attitude of rural people who become more conscious about safe movement, and hygiene.

- **Changes in the functional arrangements with the changes in the sense of privacy**

The changing attitude for the desired privacy level is influencing the arrangements of functions, like the separations of sleeping place for children at an early stage and the preferences for the close location of toilets and kitchen. In a well to do family, separate rooms or spaces are provided for boys and girls after 6-8 years of age. To ensure privacy, the partitions within the house can be observed in a rural house. These partitions are being made either by placing a wall constructed with jute sticks /bamboo or by placing a storeroom (see case: rural/ 3).

- **Changes in the use patterns of spaces**

The changing patterns of cultivation, harvesting and processing of crops are bringing the change in the use pattern of spaces in rural houses. Nowadays cultivation is done by mechanical means (power tiller, pumps etc.) and crop thrashing are done in another place by machines. Earlier these activities were done in the house by employing cows. Those changed activities reduced the needs of cows and the cattle-sheds, which was usual in a vernacular house. These factors reduced the need for those spaces for cows and crop thrashing that resulted in a compact court.
Nowadays the dining tables are introduced in the rural houses but the residents do not use them regularly. Still the family members are taking their food at the kitchen or at the veranda sitting on

mat, and the table is used for serving the guests or in some special occasions. This addition of dining table is considered more important as a status symbol in the society rather than the use purpose. It can be assumed that in future the use of dining table will be common and essential element in a rural house. This new addition also influences the form of the household. Such as a dining table requires comparatively larger floor space in the rooms, which might influence in constructing the larger rooms.

- **Addition and alteration of new forms and elements**

The needs of a cowshed and an outhouse for the employees to look after the cattle are decreasing and as a result the sizes of those structures are getting smaller. A new machine room is added to almost all the houses in a rural area (see case: rural/1 and rural/4). However, a barn use to be there traditionally but the use pattern and location has changed in the contemporary context.

The introduction of commercial functions to the households is indicating the changed attitudes of rural peoples about their occupations. The transformation in the service sector and trade already took place in rural areas. People are now searching for new ways for livelihood rather than wholly dependency on cultivation that resulted in the additions of new forms for shops, machine servicing centres with the households (see case: rural/4).

Close proximity and the enclosed bathing places are obviously influenced by the changed lifestyle, which is considered as adapted from urban areas and information from different media. Conventionally toilets and bathing places in a rural house are arranged apart from the main living units, which are approached through an open court. In the rainy seasons mud forms in the open courts, which become very slippery and unhygienic. Sometimes these slippery courts are causing accidents also. One of the main reasons behind placing the toilets apart and isolated from the main living unit was to get the facility for removal of excreta by natural drainage through canals. Encouragement to use sanitary latrine by government and NGOs through different media and the availability of those system also initiated rural people to use sanitary latrine. The facility of placing the sanitary latrine in different places within the compound is initiating people to construct that structure adjacent to the main living units.

- **Changes in the use of building materials**

The impacts from urban areas, the "less durable"[40] indigenous building materials and the availability of durable building materials through good transportation facilities are influencing the rural people to adapt the new building materials. The change in the building material usually does not change the form of the house but obviously changes the environmental qualities and physical appearances. Such as the uses of bricks or C.I. sheets for the construction of walls are not changing the house forms but with their texture, they represent a more finished outlook of the buildings. This changed outlook obviously changes the environmental qualities.

The plinths of the houses are now built with the permanent building materials like bricks. This cement-mortar finished brick plinths are ensuring easy and safe movement within the houses all over the year. Simultaneously it is also providing hygiene and the higher status in the society. The mud plinths contribute in keeping the indoor temperature cool and comfortable. But at the same time the mud plinths can make problems to the human also. Such as the dampness from these mud plinths can generate if these mud plinths are not compacted enough. The corrosions of the C.I. sheets and the decompositions of the bamboo and wooden posts are also occurred by the

[40] The indigenous building materials like mud, thatches etc considered durable in the dry regions. But these materials are less durable in the areas where heavy flood and rain are common. These flood and rain cause heavy damage to those building materials.

dampness from the mud plinths. The dampness and dust from the mud plinths can spread diseases to the foods and clothes. Sometimes the dust from the mud plinth creates different types allergy to human by contaminating the air.

It is evident that some of the houses in rural areas are constructed completely with brick and concrete, which is durable but needs special treatments and detailing for thermal protections. Such as projections of the roofs, false ceiling, shading by trees etc can contribute in protecting the buildings from sun. The absence of those treatments makes the indoor environment uncomfortable by storing the heat by walls and roof at the daytime and releasing that at night. The materials like brick and concrete used in the construction are making the rural houses incongruous with the setting or surroundings. The vernacular house forms has the homogeneity by using the same building materials like bamboo, thatch, jute sticks etc. The brick and concrete constructions are making the discontinuities in the surrounding environment.

The above phenomena are indicating the changes and transformations of architecture in formal and spatial qualities with the changes of lifestyle. The changes of lifestyle and the changes of architecture can also take place in the reversed direction. The new schools, hospitals, administrative buildings constructed with modern building materials and techniques that introduced the new type of architecture to the rural area. These buildings with their different qualities like high durability and a different outlook for making a higher status in the society, which inspired the rural people to use the materials or the styles in constructing their houses. The above-mentioned phenomenon indicates that the change of architecture can also take place in any setting before the changes of lifestyle and the changes are happening in both directions. The lifestyle can be varied or evolved in course of time, which will accordingly make further changes in the architecture as a continuous process.

7. Discussion and recommendations

This study has been conducted on the basis of Rapoport's polythetic theory about vernacular design. Rapoport's theory has the base on some characteristics (process and product) of built environments. According to him, these characteristics can help to assess the environments so that the vernacular quality of the environments can be distinguished. With this assessment an environment can be considered as more or less vernacular. (Rapoport, 1990). Rapoport did not propose any scale or measuring instruments in his theory so that different environments might be ranked with their characteristics. In this study not only his approach has been taken but also different scales[41] have been proposed and applied in the assessment. The scales have been applied to observe the levels of vernacular characteristics existing in the houses of different levels of human settlements.

Some of the characteristics proposed by Rapoport are sometimes similar to each other by overlapping with their assessment criteria. Such as in the 15th process characteristics, the degree of constancy and the speed of changes of the model over time is discussed while in the 16th process characteristics, the form of temporal change is mentioned. Both of these characteristics are dealing with the changes of the model in relation with time. Like this there are also some other characteristics, which are similar with their assessment criteria. In this research those similar characteristics are combined and proposed as single characters. This overlapping of assessment criteria within the characteristics is explained more in the chapter 3.2 (The methodology and analytical process).

Besides this overlapping, this study also faced difficulties with the assessment criteria of the characteristics. Most of the characteristics seemed uncomplicated to apply for the assessment with their specific criteria. But there are also some characteristics that have general criteria, which were difficult in the assessment process. Some of these characteristics are not taken in the assessment. The characteristics with general criteria are identified as follows:

Process Characteristics[42]

7. *Nature of schemata underlying the model* and their relation to the taxonomies[43] of the group, subgroup etc:

According to Rapoport the schemata can be physical, dimensional, of meaning, of social relations, of cosmology, etc. But the specific relationships with the taxonomies of the group and subgroups are not explained elaborately, which can be followed in the assessment of the vernacular characteristics of the models.

9. *The types of relationships among models in different types of environments:*

This characteristic is dealing with two basic aspects i.e., a) the relationship among the models and b) the different types of environments. In the other characteristics Rapoport explained the relationship among model in a particular environment. But in this specific characteristic, less indication is given about the nature of relationships by which the models can be assessed within different types of environments.

[41] See the scales in the chapter 3

[42] The numbers are indicating the specific characteristics proposed by Rapoport (1990).

[43] a) Taxonomy; the science, laws, or principles of classification; systematics of organisms in an ordered system that indicates natural relationships (Dictionary, 2000).

b) Taxonomy is the principle of classification. Typically there are three types of scales used for classification: 1. *Epistemic* (concerned with *properties* of phenomena). 2. Generic (Concerned with presumed *causes* of phenomena). 3. Functional (referring to presumed *effects* of phenomena). In the case of built environments, classifications will clearly be of the first type, i.e., epistemic. We are concerned with properties with environments (Rapoport, 1990 pp.69-70).

10. *Specifics of the choice model of design*: *The specifics can be described in terms of the mature of the initial field of alternatives, the nature of choice criteria, who applies the criteria in what order, the level of congruence among the criteria and the temporal scale of application*.

Here, Rapoport mentioned only the specifics such as a) the nature of the initial field of alternatives, b) the nature of the choice criteria, c) who applies the criteria and in what order, d) the level of congruence among the criteria and e) the temporal scale of application. But the nature, order, level, scale are not explained and elaborated. In elaborating this characteristic Rapoport indicates one of his books "*Human Aspects of Urban Form"* for understanding the *choice model of design* (Rapoport, 1990). It would be convenient for the reader if those aspects were explained in the main text of his article *Defining vernacular design* where he proposes the polythetic approach. At the same time there exists less indication about the parameters of these assessment criteria for distinguishing vernacular from other environments.

Product characteristics

4. *Presence of specific formal qualities*:

In this characteristic Rapoport mentioned that in vernacular design one also finds great irregularity, curvilinearity, continuities, rough texture etc. Among these factors irregularity and rough texture basically depend on arrangements of built forms and the materials used respectively. In the product characteristics (14th) Rapoport (1990) mentioned, "*Since the environment is always changing, although within a clear order and preserving the model, it becomes extremely rich and complex*." Following this statement it can be said that the irregularities, rough textures can also be turned into regular and smooth textures in the process of becoming the rich and complex model. It is well known that usually humans try to organise their built forms when they want to improve their environmental quality. In this way these characteristics are making ambiguity in the assessment process.

This study also faced difficulties with some of the characteristics in the assessment stage i.e., the placement of the characteristics in the checklists. For example in assessing the case rural/1, the 3rd product characteristics made dilemma about its placement in the chart i.e., high or medium. In this house for most of the built forms, some specific materials are used which are making continuity and a strong vocabulary of materials and textures. But in constructing two adjacent walls of a built form two types of materials are used, which also break its continuity and loose the strong vocabulary of materials (see fig: 5.6). As in this house the use of specific materials is dominant so one can place this characteristic in the high range. With the above-mentioned inconsistency of material use in a built form, this characteristic is assessed as medium by the present author.

The objectives of this research have been carried out in the following ways.

One of the objectives of this research was to analyse the pattern of vernacular architecture in Bangladesh. In this research some selected cases have been studied in three different levels of human settlements. The cases can be considered as some of the typical examples of houses from each of the levels. The characteristics of the cases and the selection considerations[44] of these different settings made the cases potential for the research to understand the pattern of architecture. The analysis of the cases within the proposed framework tried to trace the pattern of vernacular architecture and its transformations[45] with the changes of lifestyle.

[44] See the justification behind the selection of the cases in the chapter 5.

[45] See the case studies in the chapter 5 and the changes of vernacular architecture with the change of lifestyle in the chapter 6.

Another objective was to identify the core attributes of domestic environment. The polythetic approach was used to assess the house forms and has identified the core attributes of vernacular architecture of the selected regions. These core attributes are elaborated and discussed in chapter 6. In this chapter not only the core attributes are explained but also some other significant attributes of domestic environments are traced out and discussed.

Completion of the previous objectives of this research increases the probability of fulfilling the last one i.e., the objective was to contribute towards an analytical framework for the evaluation of vernacular architecture. If the ambiguities in the characteristics can be simplified and specified more and the cases are selected more carefully then it is expected that the proposed analytical model can be applied in the study of vernacular architecture.

Interest in the study of vernacular architecture is gradually increasing among architects and researchers, who believe in the necessity of having the regional architecture for a sustainable built environment. This sustainable built environment can be understood from a careful study of vernacular architecture of a particular region.

In the time of globalisation, the approach to vernacular architecture has become a critical issue to the architects. This discussion is not suggesting to study vernacular architecture with the notion as 'new' or the 'best solution' for future. Rather a careful study is expected to find out the potentialities of vernacular architecture, which can be applied to the architecture of this new millennium. The future applicability of the learning from the study of vernacular architecture is proposed in the following recommendations.

- Vernacular architecture should be studied to know the basic aspects of sustainable built environment that are related to the particular society and its culture. The sustainable aspects of architecture of a civilization are maintained and enriched by generations. The learning from the study refers to follow the pattern of vernacular architecture and to apply them selectively for different settings.

  The positive features of vernacular architecture in the Bengal region can be achieved even in an urban house such as the separation of zones or functions, special approach to these zones, the level of privacy, etc. The separation of zones can guide the movement pattern in a house. This separation of zones can also ensures the desired privacy levels of the users, which will also ensure the personalisation of spaces in a house. If these aspects of a vernacular house can be applied in an urban house then the functional suitability, the acceptability of spaces are expected more to users.

- Generally it is mentioned that the building materials used in vernacular architecture are well adapted to the local context. But sometimes these building materials are facing difficulties with different environmental hazards. Specially for Bangladesh, where warm-humid climate[46], heavy rain and flood are common for the country. These natural calamities are not favourable for the longer life of the indigenous building materials like thatch, bamboo, mud, jute sticks and recently C.I. sheets[47]. These materials are subject to deteriorate within a short time period. The moisture

[46] Warm-humid climate has the following characteristics, *"• Moderately high-time air temperature with fluctuation between day and night and little seasonal differences.• High humidity at all times of the year.• High rainfall, often concentrated into two monsoon seasons, but continual dampness of atmosphere, and generally low wind velocities.• High solar radiation modified by frequent cloud cover and vegetation, resulting in little re-radiation"*(Spence & Cook, 1983 p.13).

[47] C.I. sheets are not used as the indigenous building material. As it has been using for more than 200 years in the rural area so now it is being considered as the traditional building material.

from heavy rain and the damp air frequently cause corrosions to the metal sheets. Along with this moisture the high temperature, low wind velocity creates high humidity, which decreases the strength of those building materials. Cheaper price and the availability of those materials and the conventional construction technique instigate people to use them for the construction of their houses.

It is evident that negligence about the application of building materials is making inappropriateness to the context and society in the urban areas. The energy dependent western style of architecture is considered incompatible in this region in terms of economic and climatic aspects. In the countries of northern hemisphere, sun is expected to the indoor spaces for light and heat. To ensure light and heat, the uses of huge glass surface to the buildings are the common practice in those regions. Moreover the use of glass surface has become a style for architecture rather than the consideration of functional aspects.

The use of huge glass surface to the buildings in the countries of hot climate like Bangladesh cannot be considered as an appropriate solution or style for architecture. The uses of huge glasses are allowing more sun and heat inside the building that ultimately subject to solve mechanically i.e., air conditioning and mechanical ventilations. Considering the aspects of energy dependency, it can be said that the economic inability of the state and the warm-humid climate are not suggesting to apply those design solutions of the western architecture in Bangladesh.

The solution of vernacular architecture demonstrate their suitability for this region with passive solar design[48], which can be followed in the new developments of architecture in urban areas. The cases[49] of the rural settings explained the climatic considerations in their designs, such as the orientation of the main living room towards south for getting air, shaded veranda for the protection from the sun and driving rain. This orientation of built forms, additions of veranda are the common practice in a vernacular house, which can be considered as an example of passive solar design.

The increased density of the house forms and settlements and the combustible quality of the traditional building materials have the risk of spreading fire quickly, which can cause a lot of damage to the poor rural people. The improvement of construction materials and their applications based on specific climatic conditions will obviously help in the development of regional architecture. So, proper researches should be carried out to develop the environmental friendly, durable and inexpensive building materials and techniques. More research should be carried out to search for the development of the regional identity in architecture based on the potential aspects of vernacular architecture.

- It is well known that in the 21st century, a major part of architects in Bangladesh have the bias to the western style of architecture. They prefer the western style for the newer developments of architecture. Often this new architecture fails to represent the regional identity and some of the sustainable aspects of built environment. The users may have the preferences to the

[48] Passive solar design refers to the use of the solar energy for the heating and cooling of living spaces. In this approach, the building itself or some element of it takes advantage of natural energy characteristics in materials and air created by exposure to the sun. Passive systems are simple, have few moving parts, and require minimal maintenance and require no mechanical systems.

[49] See the cases in rural settings in the chapter 5

specific style of architecture without knowing its compatibility in the local context. In this situation, the responsibility of an architect is to make them understand the negative aspects of the architecture, which are not compatible with the local climate and social aspects. At the same time the architects should also convey the potentialities of vernacular architecture to the users, but unfortunately it is not happening in practice.

One of the main reasons behind this information gaps could be the lack of ideas about vernacular architecture that is not taught at different levels of institutional educations and trainings[50]. Interests can be created among architects and policy makers by providing more education and trainings to inform them the potentialities of vernacular architecture. So, more emphasis and the importance of studying vernacular architecture can be given at different schools of architecture and institutions.

It is expected that the fulfilment of the recommendations can help to develop a regional identity of architecture, which will ultimately indicate the further developments of built environment in a sustainable way.

[50] It is claimed that most of the architectural schools are not giving the emphasis to study vernacular architecture. This less emphasis to the study of vernacular architecture is making the knowledge gap for the architects. Different researches regarding this matter also support the stated argument.

a) Before the discovery of vernacular, architects were trained in schools, which did not formally recognise the vernacular architecture as important field to study. Outside the profession, 'vernacular' tradition had no generic names, hence no existence in the young minds (Guvenc, 1990).

b) Yasemin Aysan studied the curriculum of different architectural schools and found that less or no emphasis has been given to vernacular architecture. In some schools 'vernacular' is considered as elective or optional course, while dealing with the 'vernacular' under different headings, leaving it largely unintegrated with the main body of curriculum. She also found there are some schools where courses specializing in issues related to the 'vernacular' are well-established although more at the postgraduate than at undergraduate level (Aysan & Teymur, 1990).

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