Embankment Settlement in Bangladesh:
A Study on the Self-generated Pattern of Vernacular Architecture

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ABSTRACT

Due to the erosion caused by the aggressive river Jamuna in Sirajganj, Bangladesh, every year many villagers have move their homes. The poor, who cannot afford land at a safe distance from the aggressive river, generally move to the nearby flood protection embankment. Without any land ownership, the embankment settlement in some ways appears as a 'rural slum.' But the embankment settlement differs from traditional rural architecture. Scarcity of land and strong linear direction of the embankment control the total organization of the settlement. This paper is focused on the unique features of flood embankment settlement as a self generated pattern of vernacular architecture.

Keywords: *River erosion, vernacular architecture, linear settlement, rural homesteads, rural poverty*

1. INTRODUCTION

With a population of over 150 million living in an area of 147,570 square km, or 1,045 persons per square km, Bangladesh is a densely populated country with one of the lowest land-person ratios in the world (Bangladesh Bureau of Statistics, 2001). The situation is further aggravated every year through an irrevocable reduction of per capita land for housing. About 80% of the population lives in rural areas and more than two thirds of the rural population is landless or functionally landless (owning less than 0.2 hectares of land). 44% are below the national poverty line and 29% are classified as very poor and most of the poor (81%) live in the rural areas (Bangladesh Bureau of Statistics 2005).

Bangladesh is the most disaster prone of the least developed countries. Between 1970 and 1998, 171 large-scale water-related hazards such as cyclones, storm-surges, droughts, floods and river erosion disasters killed an estimated half million people and affected more than 400 million. The poor are hit hardest because they live at greater

density in the most poorly constructed housing settlements on lands prone to hazards. Annually up to 20,000-30,000 households loose their homes, land and livelihood as a result of erosion and thus become destitute (Embassy of the Kingdom of the Netherlands 2007).

As Indra (2000) noted flood and riverbank shifting have played a major role in shaping the physical, biotic and demographic landscape of Bangladesh for a very long time. Because of the endemic and widespread nature of flood and riverbank shifting in the region, people all across what is now Bangladesh have a long history of adaptation to flood. In some areas, the destruction of land due to riverbank erosion has been a critical part of daily experience for centuries. In many locations, uprooting people from their home villages is a comparatively new phenomenon. Riverbank erosion has progressively affected more and more people as population density has increased over time. Current rural population density often exceeds 2,000 per square mile, and the human cost of riverbank erosion is incalculable. Roughly a million people a year are believed to shift residence, either as their homes and land are washed away or to take advantage of newly accreted land While they are interconnected physical phenomena, riverbank erosion and flood are distinct, and each has unique consequences for those affected. Local people in affected areas make sharp distinctions between the two (Indra 2000).

Uprooted people living near the river, in some cases, established their settlement on a nearby embankment. On first inspection, housing among embankment dwellers appears to be “very poor” (Elahi 1989, cited by Indra 2000). Considered more carefully, the typical embankment house may not be all that inferior to the regional norm. According to Hasan (1985) a traditional rural ‘Bengali House’ is an inheritance from the past, exists in the present and has a potential for the future. Local houses may look less substantial than elsewhere in Bangladesh, but this at least partially reflects its functional adaptability in a region where erosion is endemic. This study is focused on this type of settlement pattern on this specific embankment location. This paper takes the normative vernacular of Hasan and places it in the risking embankment situation based on Indra’s ethnography.

2. CONTEXT OF THE STUDY

The context of the study is situated beside the aggressive river Jamuna at the Kazipur Upozila in Sirajganj District of Bangladesh. It is located 75 miles northwest of Dhaka; the 138 square mile area encompassed by Kazipur Upozila in Sirajganj District is one of the most erosion-prone in the country (Haque 1988 cited by Indra 2000). It is a region that is considered poor by Bangladesh standards. Thana officials estimate that over three-quarters of the local population are functionally landless; many of these people at some point lost land to the river.

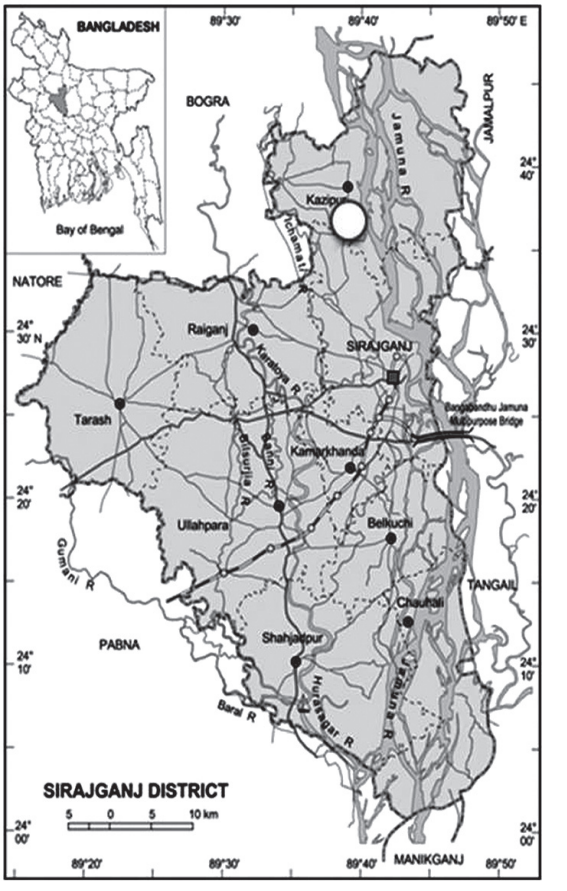

Figure 1:
Map of the Sirajganj district. Circle indicating the study area. (Source: http://www.banglapedia.org)

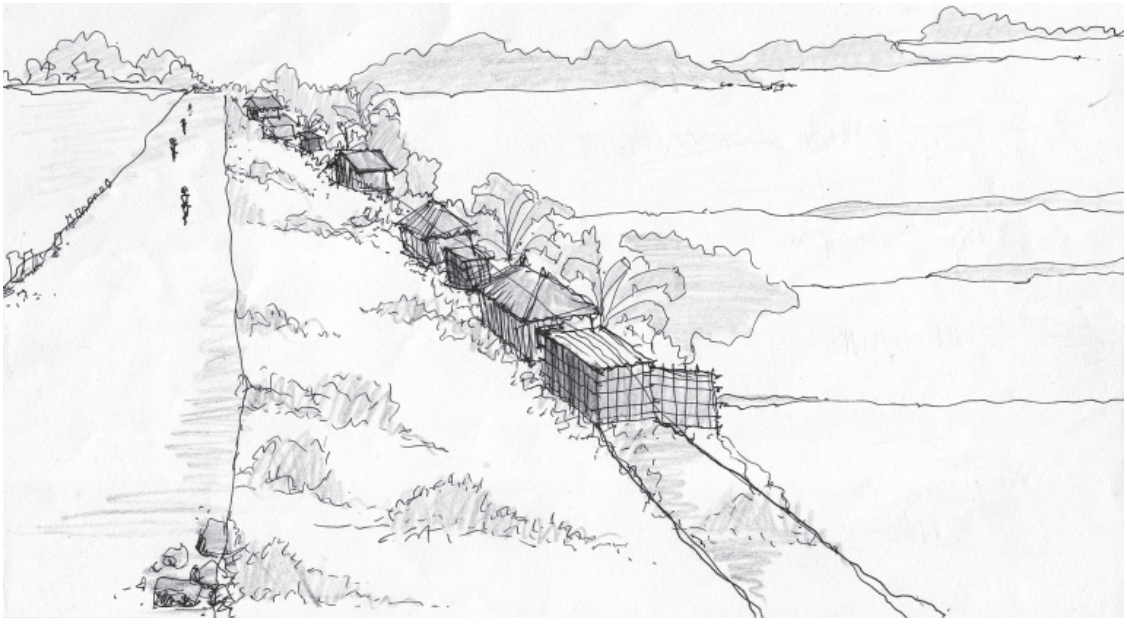

Figure 2:
Perspective view of the embankment. (Source: author)

Subhagaccha locality, one of the Kazipur Upazilla's eleven unions, is among the worst river erosion affected areas. In the early 1920s, the most westward branch of the Jamuna River was four miles to the east. Since then, it has grown and inexorably shifted westward. Long ago, it destroyed Kazipur Town, the region's major marketing and administrative center. Although the 125 mile long Brahmaputra Right Bank Flood Control Embankment passes through the Union, its purpose is to stop annual flooding, not erosion. The river periodically has breached the embankment, resulting in it being rebuilt further west, thereby destroying and threatening still more local land. Altogether, more than three quarters of the Union's current residents have been forced to move during the past fifteen years (Zaman 1988, 1991). In the past 15 years, more than half of the union's population has been uprooted, many families several times. Despite these challenges, people have found ways to survive, and some, to prosper.

3. HOUSING AND RE-SETTLEMENT STRATEGIES OF THE CONTEXT

Due to river erosion occurred by the Jamuna River each year, a great number of people lose their lands and houses. Comparatively rich people move with their houses, and re-locate them in another village at a safer distance from the river. In most cases, they buy land for their safe resettlement. But poor people cannot do so. Under erosion conditions, they shift their house and relocate them beside or occasionally on the flood protection embankment (*beri bandh*) which is government owned. Thus the linear embankment settlement is established. This type of resettlement by poor households never becomes a permanent one. Indra (2000) gave a description of the river-eroded people.

People threatened by the river disassemble their houses on the eroding parts of the embankments, move houses, household goods, animals, and even banana plants and small trees to the safer parts of the embankments, reassemble them, and reestablish some semblance of household order in two days. Those under inevitable but less acute threat of erosion so methodically remove everything of utility and value from their land that the abandoned homesteads look like moonscapes.

Since the late 1970s, other displaced people have decided to settle on the embankments. When the first displaces moved there, virtually all had alternative residence possibilities. Most chose embankment residence because they lacked sufficient resources to re-settle in another place where their status,

independence, security and economic benefits would be higher. More recent displaces have had fewer advantageous residence options, leading to a dramatic increase in the embankment population in the late 1980s and early 1990s (Indra, 2000).

Throughout Kazipur, houses of poorer people are built with a frame of wooden support poles, to which are lashed discrete woven wall and ceiling sections, typically made of catkin, a tall, coarse grass. Better-off people build larger houses using the same construction, but with galvanized metal roof panels and sometimes wooden doors, symbolic of past or present prosperity. The still better off add galvanized wall panels. There are very few houses made of sun-dried brick; when erosion comes such structures are entirely at its mercy, as was the fate of many local brick and concrete public buildings. (Photograph 1)

Each of these one-storey dwellings is made of locally derived modules that can be disassembled quickly, and with little waste of materials when faced with immanent threat of river erosion. Each of the modules can be transported rapidly by no more than six to eight men. A typical house can be re-erected in a day or two using only household labor, particularly when extensive preparation of the new site for homestead is not required. If necessary, the reconstructed house can be made smaller and the surplus materials sold.

Most other tangible real properties are easily transportable and can be quickly set up in a new place. Structures that are not transportable, such as the baked clay cooking stoves of the poor, are soon remade at the new site. The efficiency with which people can move their dismantled houses is remarkable. Over the years, a wide range of differentially preferred and executed local strategies has been developed concerning where to move. Needless to say, strategies for re-settlement depend on individual and familial circumstances. People who remain well off or have non-farming occupations have the most options available for them, and typically resettle to previously owned or purchased land, either within a few miles of their previous homes or outside the region. Most people lack substantial resources for such resettlement, but have developed complex strategies to rent very small pieces of land for house plots and agricultural use. The majority of the displaced people who remain in the area eventually make use of some kind of rental or lease option. Others opt to take advantage of kin-based residence entitlements, either temporarily or permanently. All across Bangladesh powerful patriarchal ideologies confer greater status on families that can maintain patrilocal residence. Resettlement with the husband's father or brother is, therefore, the usual custom, but often such relatives have been displaced as well and cannot help much, despite their intensions (Indra 2000).

When options from family relations become difficult or non-existent, choosing the location of re-settlement with wife's or husband's more distant paternal kin becomes an increasingly common phenomenon. Reportedly, a good percentage of resident households currently may be patron-client relations called *uthuli* (Indra and Buchignani 1997). Elsewhere in Bangladesh *uthuli* often have a strongly

Photograph 1:
House wall and roof sections are 'modular' and can be quickly disassembled and moved. (Source: Indra, 2000)

inferior client relationship to their landlord/patrons. Landlords demand agricultural labor, household service, and political support in exchange for a house plot. In contrast, over the last generation, *uthuli* patron-client relationships in mainland Kazipur have become both more common and more reciprocal. They are now extensively used by the poor to provide mutual aid in times of deep personal crisis. More than three-quarters of *uthuli* relations in Kazipur are between kin, with patrons often being little better off than their clients. In contrast to the prevailing patrilineal bias, they are usually dependent on the kinship claims and entitlements of displaced women, rather than those of men (Indra and Buchignani 1997).

4. THE EMBANKMENT SETTLEMENT

Once on the flood-protection embankments, people have generated a rich variety of orderly adaptations to life in restricted circumstances. The suggestion that these are "rural based slums" (Elahi 1989) is only accurate in the deeper sense that studies of poor urban communities in Bangladesh have shown them to be highly organized places full of innovation. As in urban "squatter settlements," space on the embankments is at a premium and logically constructed. Rising roughly four to five meters above the surrounding land, embankments are at most 15 meters wide, including usable side slopes. Until 1991, people settled densely on some parts of the local embankment system, leaving other parts unoccupied. They have done so for security reasons, to maintain a sense of community, and to have access to jobs and weekly village markets *(hats*). There were never any scattered settlements or isolated dwellings. Houses and other structures are immediately adjacent to each other, lining both sides of a central roadway. The physical distribution of houses, kitchens, work areas resemble those in local, linearly arranged *char paras*. The use of the open roadway changes seasonally; it is used as a collective space for drying fuel, fodder, and spices. Shallow tube wells have been sunk by some households for drinking water, and are extensively shared. Occupancy conveys strong use rights. It is clear to all which household "owns" what land, and where one's boundaries are. Adjacent landowners, who also claim these small areas for cultivation, do not accept such down-slope boundaries and many vigorous disputes arise out of their use (Elzbieta M. Gozdziak and Dianna Shandy, eds. 2000). Women intensively use household and roadway spaces for household production (Figure 3).

The riverside of the embankment is not used for the resettlement. The landside of the embankment is used for the resettlement. It is safe from the monsoon flood when the water level of the river remarkably increases. People's post-resettlement circumstances also varied greatly, particularly in a temporal sense. People who can afford to purchase land at a distant location, in most cases move. They feel safe to resettle a good distance from the Jamuna River. They become socially attached to their adopted village and mingled with the community in the daily affairs.

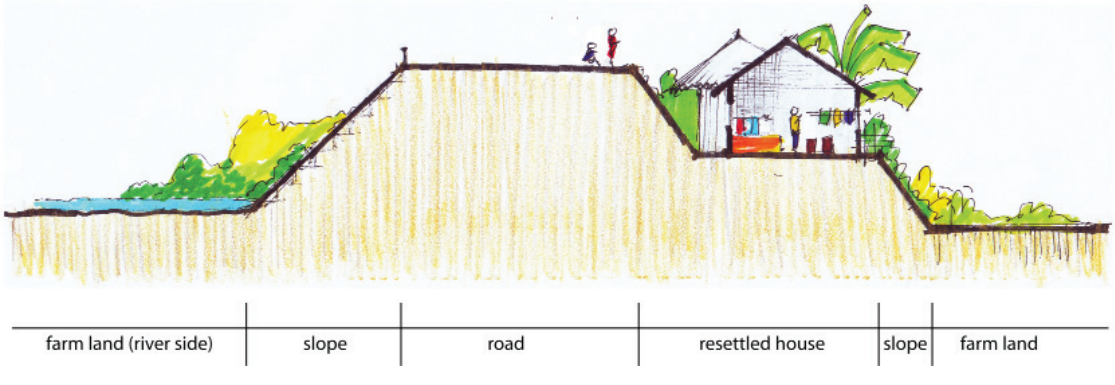

Figure 3:
Section through the embankment has shown the settlement on the down-slope of the embankment. (Source: author)

Some people cannot afford to purchase new land to migrate. In such cases they might lease a piece of land in order to migrate. And when they cannot afford to lease they, migrate to the embankment. In some cases the leased land is also situated within one km from the embankment. The land rent nearby the river is relatively low and affordable; second, it is easy to move an old house within a short distance. Long distance migration needs a huge expense and hassle. Thirdly, many people have land to cultivate beside the river or in their old village which is erosion effected. They have to maintain a close relationship to monitor and to collect crops, so they do not prefer to migrate a long distance. It should be noted that this type of settlement never becomes permanent, but in most of the cases, people spend a long span of time within the same location. They generally move when the embankment collapses due to river erosion.

5. TRANSFORMATION OF THE COURTYARD FROM THE TRADITIONAL RURAL HOMESTEAD

Hasan (1985) mentioned the traditional house in its basic form is a cluster of small 'shelters' or 'huts' around a central courtyard called the *uthan*. The huts are usually single roomed, detached and loosely spaced around the central court. An extensive landscaping is done to define the house in the surrounding environment. The latrine and bath are never considered as parts of the main structures and are always kept at a distance. The combination of all the huts is called the *bari*. In the traditional system, *bari* represents the nuclear, joint or extended family while the huts represent individual households. The courtyard or *uthan* serves to maintain both unity and individual identity of the families in the house (Hasan, 1985, p 29-31).

A typical morphological feature of the rural homestead or *bari* is the arrangement of a number of closely spaced single-storied, or occasionally double-storied, one to two roomed rectangular buildings (*ghors*) around a square or rectangular open courtyard (*uthan*). There is usually a single row of buildings around a courtyard. In the homesteading process, a pond is excavated to obtain soil for raising the land; a backyard pond with bathing steps (*pukur ghat*) can be found in many large homesteads. The pond provides for rearing ducks and fish, and for bathing - a frequent purification ritual in this tropical land (Ahmed, 1999). In the embankment settlement, it is not possible to arrange these basic features of a traditional rural homestead. In such way the homestead of an embankment settlement is different from a traditional rural homestead.

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. All the activities of a house are arranged by following these zones (Hasan, 1985). The zones are specified as: a. Formal zone (outer part of the house), b. Family zone (inner part of the house). These zones have been organized on the basis of social, cultural, religious and climatic considerations, representing Bengali society. (Photograph 2)

Photograph 2:
Roadway spaces are intensively used by women for household production. (Photo by the author)

These two zones are not so distinguished in the embankment settlement, due to the scarcity of land. The top of the embankment, which is also used as the communication road, is used as the formal zone. The functions of an external courtyard, which is used for the cultivation and household production purpose in the traditional rural homestead, are done in this space. Thus the individual courtyards are transformed into a linear and combined one where the ownership demarcation is totally absent. The housing clusters contain some piece of small open spaces to organize the houses. This space is considered the internal courtyard.

6. FEATURES OF THE EMBANKMENT SETTLEMENT

The scarcity of land and the strong linear direction of organization of the embankment settlement have some special characteristics different from the traditional rural homesteads. From observation the following characteristics are found in the embankment settlement:

The linear settlement The embankment dwellers' homesteads have a linear pattern along with the embankment for the mobility of their houses due to riverside erosion. This is because the scarcity of the land of the dwellers. (Photograph 3)

Photograph 3:
Linear settlement along with the embankment.
(Photo by the author)

Photograph 4:
House without proper plinth.
(Photo by the author)

Organization with a small piece of land The great problem of the embankment settlement is the scarcity of land. People have to accommodate their homestead within a small piece of land. It is already discussed that the land is on the embankment slope. That is why the land is not large enough to fit the traditional courtyard house. Embankment dwellers rarely have a choice to organize the houses according to their need.

Absent of plinth In many times peoples have to shift their house within a very short time when river erosion occurs, generally in rainy season. And they do not make a proper plinth for the house. In some cases it is found that the plinth of the house is totally absent. After some times of establishment a plinth may created. (Photograph 4)

Introducing boundary wall Due to scarcity of land sometimes it is not possible to organize the houses in such a way to create any internal court and to avoid a boundary wall. Dwellers make boundary walls to distinguish individual homestead and ensure privacy. This boundary wall is made of jute sticks and thatch materials. (Photograph 5)

Absence of verandah According to Ahmed (1999), traditional dwelling units flanking the courtyard often have shaded open verandahs, which provide cool outdoor spaces. In some cases verandahs are partially or fully enclosed by screen-type walls for shade and privacy. But in the settlement on the embankment this traditional feature is absent within the homesteads.

7. BUILDING MATERIALS

7.1. Roofing materials

In Sirajganj, like all over Bangladesh, bamboo, thatch and corrugated iron (C.I.) sheets are common roofing materials. Among these roofing materials, bamboo and thatch is the most common. For its availability and durability against the warm-humid weather and the heavy rain the use, C.I. sheet is increasing rapidly. Clay tiles have not yet appeared in this region as a roofing material.

7.2. Enclosing materials

The following types of houses are found in the study area of the embankment settlement:

Bamboo-walled houses Some bamboo-walled houses are found in the Sirajganj, where bamboo is used for making posts and enclosing elements, 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.

Thatched/straw-walled houses Straw, long grass, jute sticks and thatch are available and cheap in this region. Relatively poor people use them for walls and also for roofing purposes, except jute sticks. Flood-prone vulnerability and hazards like bank erosion compel people to build relatively cheaper houses that can be dismantled when threatened.

Photograph 5:
Boundary wall has been introduced to ensure privacy and individual demarcation of homestead.
(Photo by the author)

Corrugated iron (C.I.) sheet-built houses: In this region the most common building material is the C.I. sheet. For the durability it became one of the major building materials in local tradition. It is very common to use C.I. sheets for both walls and roofs. C.I. sheets are widely used in this region for the following reasons:

- Unavailability of other materials. The earth is not suitable for used for mud wall construction here.
- Due to river erosion, mobility is an important criterion for choosing building materials. Walls made by C.I. sheet can be transferred easily.
- Mud or timber is not suitable during flood. As flood is a common phenomenon for this region, people avoid mud or timber as a building material. (Photograph 6)

8. CONCLUDING REMARKS

Where there is a flood protection embankment, embankment settlement is an unavoidable feature along a river where erosion affects people. Due to its height, people consider the embankment as a safer place from flood. The traditional homestead architecture transforms in such situation. The vernacular method of architecture found its own dimension and form when it sets up on the embankment. Special type of space allocation and the necessity of shifting quickly are the key features that play vital roles in this process. Housing on the embankment created a new vernacular architecture in Bangladesh with the same facilities and almost similar community and economic conditions as the old.

Photograph 6:
Use of C.I. sheets as an enclosing and roofing material.
(Photo by the author)

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