

The Changing Patterns of Rural House Form in Floating and Permanent Households in Sirajganj

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Abstract: This article investigates the changing patterns of rural housing in Sirajganj, Bangladesh. The rural housing in Bangladesh is traditionally effected by many cultural and environmental factors. These transformations are studied along with the spatial allocation of some homestead cases, identified as permanent and floating households. The changing pattern of rural homesteads found by the field survey are explained through a comparative analysis of housing transformation of permanent and floating households. There are some factors like river erosion that establishes its importance over other traditional housing factors like religious and cultural issues. In such situation the concept of privacy, gender and religious belief have been observed playing their role in influencing housing transformation through the housing features and house forms.

Keywords: Rural housing, housing transformation, vernacular architecture, river erosion, rural homestead

1. INTRODUCTION

A homestead is a socio-spatial manifestation of peoples dwelling in the rural settlement. It connotes an identity of a household as well as a property with tangible boundary. A traditional rural 'Bengali House', according to Hasan (1985) is an inheritance from the past, that exists in the present and has a potential for the future. The traditional house in its basic form is a cluster of small 'shelters' or 'huts' around a central court-yard called the '*Uthan*'. Different huts are constructed for different functions; such as, the outer house

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(Out-house or *Baithak Ghar*); the inner house (Dwelling unit or *Ghar*); the kitchen; the cattle-shed. For larger houses there appear two more huts- the store house (fuel storage, granary etc.) and the rice husking shed or the '*Dheki Ghar*'.

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 larger landscaping and 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*' or the 'House'. 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)

One century ago Dr. F. Buchanan (1810) (cited by Hasan, 1985) described the rural house as

“Among the natives the poor man has one hut for himself and cattle, the richer man increased the number without altering the plan of the building and there is no contrivance by which a person can go from one apartment to the other without being exposed to sun and rain.”

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 process of making a homestead, 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).

This article is based on a Master of Architecture theses titled by 'The Role of Rural Home-Based Enterprises on the Housing Transformation in Sirajganj' in the Department of Architecture, Bangladesh University of Engineering and Technology in 2013.

2. METHODOLOGY

Objective of this research is to understand the changing patterns of rural house form of the specific context of Sirajganj district in Bangladesh. Possible outcomes are- i) Understanding of general social and settlement profile; ii) Understanding of the formation and organization of rural homesteads and

house forms in the permanent and floating households of the survey area and
iii) A comparative observation of housing transformation in permanent and
floating households.

The research has been designed in two parts: a theoretical part based on
the literature review of the existing theories and analysis, and an empirical
part based on field survey and interviews in the local context. The research
methodologies employed in these two parts are explained below.

Relevant literatures have been reviewed to determine the key concepts and
developed an understanding to prepare a theoretical background in order to
carry out the field survey and analyze the data.

A number of homesteads have been selected for investigation in the
district of Sirajganj in Bangladesh. The selected cases are situated in two
villages in Sadar and Kazipur Upozilas. Two different contexts of ‘permanent’
(people of old traditional village) and ‘floating’ (river erosion effected people)
households were considered to investigate the housing transformation. Physical
observation, questionnaire survey, photographs and drawings are taken to
analyze the cases.

- *Permanent households:* These types of households contain the permanent
dwellers (people who live in a fixed location for more than three
generations). For this study two adjacent villages named *Bagbati* and
Pipulbaria within the Sadar Upozila of Sirajganj district are taken as the
context of permanent households. They are in approximately ten kilometer
distance from the Sirajganj town. Both are old traditional village and have
a good number of established inhabitants.
- *Floating households:* These types of households contain the floating
dwellers (people who are displaced due to river erosion and live in social
and economic hardship). They are mainly established their house in
riverside villages by taking land on a rental basis. Three adjacent villages
named *Shimanto-bazar*, *Ghati Shuvogachha* and *Baikhola* are considered
for the context of floating households for this study. They have a distance
of twenty kilometer from the Sirajganj town.

The defining characteristics of the selected two villages are contrasting:
while the former is old traditional village the latter a new formation
situated beside the bank of the river Jamuna whose most inhabitants are
living there temporarily as a result of river erosion. In these two different
contexts, a preliminary observation suggests differences in the nature and
extent of housing pattern. It also suggests that the devastating impacts of
river erosion on shelter affects dwellers’ adaptive response to living and
livelihood.

3. GENERAL SOCIAL AND SETTLEMENT PROFILE

This section describes the general social and settlement conditions of both the permanent and floating households in the specific context of this research. The general condition of the selected two areas outlines a contextual background for later exploring the settlement pattern and the organization of the house forms therein.

3.1. Social and Settlement Profile of the Floating Households

Shuvogachha Union is one of the Kazipur Upazilla's eleven unions, that rank high among the worst river erosion affected locality in the Sirajganj district. In the early 1920s, the most westward branch of the Jamuna River was four miles to the east. Since then, the Jamuna River has had grown and shifted westward. Rapid erosion continued along the west bank of this seasonally mile-wide channel. The floods of 1984, 1988, 1990 and 1991 caused severe devastation. Severe erosion continued during the 1991 and 1992 rainy seasons, destroying more of the Union and significant portions of previously unaffected villages. Many old inhabitation including Mallickpara, Dhulaura, Majbari, Manik Patal, Kazipur, Meghai, Tarakandi, Tengalahata are gradually getting extinct by river erosions. The 125 mile long Jamuna-Bhramaputra Flood Protection Embankment known as WAPDA embankment, built in the 1960 on the west side of the Jamuna could help much neither to resist river erosion nor flood control. Its purpose is to stop annual flooding, not erosion. It has periodically been breached by the river only to be rebuilt further west, thereby destroying and threatening still more local land. Bangladesh Water Development Board maps show that at some points the bank line shifted westward a quarter mile during 1989-90, and a full mile during 1979-92. Altogether, more than three quarter of the union's current residents have been forced to move during the past fifteen years (Banglapedia, 2012; Zaman 1988, 1991).

During this last 15 years, more than half of the union's population has been uprooted from their ancestral homesteads; many families shifting homesteads occurred several times. Despite challenge arising from river-erosion, people have found ways to survive, and some to prosper.

3.2. Resettlement Strategies of the Floating Households

On first inspection during the reconnaissance survey prior to the main field survey, housing among embankment dwellers appears to be 'very poor'. But when observed more carefully during the field survey, the typical embankment house appeared not be all that inferior in terms of the regional norm. Local houses may look less substantial than elsewhere in Bangladesh in terms



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



Figure 2: Rebuilding of a traditional house with precast RCC post and CI sheet roof. (Source: Rashid, 2013).

of permanence of construction, but this partially reflects their functional adaptability in a region where erosion is endemic. Throughout Kazipur Upozila, houses of poorer people are observed built on a frame of wooden support poles, to which are lashed discrete woven wall and ceiling sections, typically made of ‘*Schon*’ (a tall, coarse grass). Better-off people build larger houses using the same construction method, but with galvanized metal roof panels (corrugated iron sheet) and sometimes with decorated wooden doors symbolic of their past or present prosperity. The still better off households add galvanized wall panels (CI sheet). There are very few permanent houses made of sun dried brick in the locality; when erosion hits the homesteads such

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Figure 3: Settlement on the down-slope of the embankment.

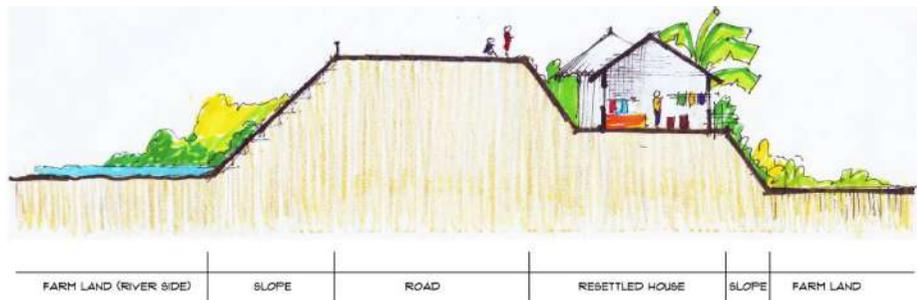


Figure 4: Section through the embankment shown the settlement on the down-slope of the embankment.

structures are entirely at its mercy, as the fate of many perished local brick and concrete public buildings.

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 imminent threat of river erosion. Each of the modules can be manually transported rapidly by no more than six to eight men (Figure 1). This module is made with 5-8 pieces of CI sheet with a wooden support frame. 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 the homestead is not required. If necessary, the reconstructed house can be made smaller and the surplus materials sold.

Most other structural elements of the house are easily transportable and can be quickly set up in a new place. Household fixtures that are not transportable,

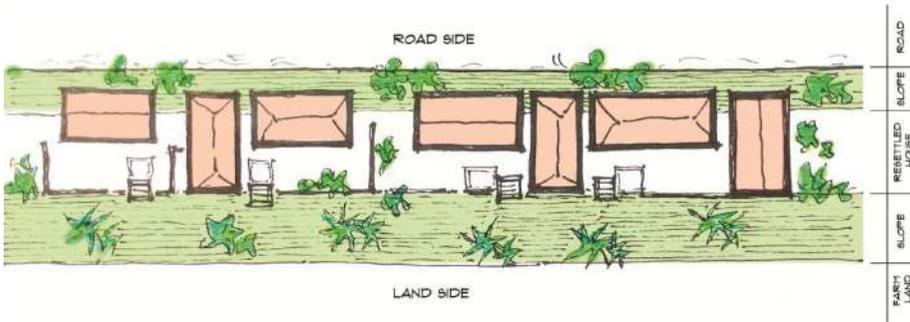


Figure 5: Linear settlement on the embankment.



Figure 6: Roadway spaces are intensively used by women for household production.

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 have been developed concerning where to move. Needless to say that these strategies for re-settlement depend on individual and familial circumstances. People who remain well off or have non-farming occupations have the better 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, however, lack substantial resources for resettlement; but they 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 the kin-

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based residence entitlements, either temporarily or permanently. All across Bangladesh powerful patriarchal ideologies confer greater status on families that can maintain patrilocal residence. Re-settlement with the husband's father or brother is, therefore, the usual custom, but often such relatives as well have been displaced and cannot help much despite their intensions (Indra 2000).

When tapping options from kin-based 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 the current re-settled resident households are *uthuli* (Indra & Buchignani 1997), and most of them are resident with such kin. Elsewhere in Bangladesh *uthuli* often have a strong subordinate client relationship to their landlord/patrons. *Uthuli* is a Bangla word that means landless, partially dependent poor people who had been allowed to place their houses on the land of others rent-free. 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*-patron relations in Kazipur are between kin (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. It is found by the field survey that, living on the embankments or as *uthuli* is a mark of loss of independence and honor, and some women and men feel this stigma particularly acutely. Rates of marriage discord and breakup do appear to be markedly higher among displaces (Indra & Buchignani 1997).

Once re-settled on the flood-protection embankments, people manually generate a rich variety of orderly adaptations to life in restricted circumstances of limited resources and options. The suggestion that these re-settled areas are "rural bastes (slums)" (Elahi 1989) is only accurate in its functional connotation that studies of poor urban communities in Bangladesh have shown them to be highly organized places full of innovations for survival. As in the urban "squatter settlements," many of these adaptation measures are spatial as 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 in 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 *hats* (weekly village markets). 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 the local, linearly arranged *paras (villages)*. 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 among the re-settlers. It is clear to all regarding which household “owns” what land, and where one’s boundaries are. Such down-slope boundaries are not accepted by adjacent landowners, who also claim these small areas for cultivation, and many vigorous disputes arise out of their use. Household and roadway spaces are intensively used by women for household production (Figure 6).

People’s post-resettlement circumstances also varied greatly, particularly in a temporal sense. People who have an affordability to purchase land at a distant location, usually move in most cases. They feel safe to make a settlement with a good distance from the river Jamuna. They become socially attached to their adopted village and mingled with the community in the daily affairs. On the other hand, some people may not afford to purchase new land to migrate. In such cases, they might take lease a piece of land to do the migration. In most cases, the leased land is situated within one kilometer distance from the embankment. By interview, it is found in the field survey that the possible reasons include:

- The rent of the land near by the river is relatively low and it is easy to afford them.
- It is easy to move with an old house within a short distance. Long distance migration needs huge expense and hassle.
- Many people have land to cultivate besides the river or in their old village which is erosion effected or in the *char*. They have to maintain a close relationship with them to monitor them and to collect crops. So they prefer to not migrate at a long distance.

Indra (2000) gives an insight for re-settlement into the straggle 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 important threat of erosion so methodically remove everything of utility and value from their land that the abandoned homesteads look like moonscapes.

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Figure 7: House of the original traditional inhabitants.



Figure 8: Houses of the Guchha Gram, their temple and pond.

Since the late 1970s, other displaced people have decided to settle on the embankments. When the first displacees moved there, virtually all had alternative residence possibilities. Most choose 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 displacees have had fewer advantageous residence options, leading to a dramatic increase in the embankment population in the late 1980s and early 1990s (Indra, 2000).

3.3. Social and Settlement Profile of the Permanent Household

Bagbati Union of the Sirajganj Sadar Upozila is one of the ten unions with some old traditional villages. It is five kilometer far away from the river Jamuna and fifteen kilometer distant from the Sirajganj town. The total union is consisting of some old and traditional village with good agricultural lands. People of river side villages which are almost five kilometers away consider this union as a safe village from the erosion. In last two decades river eroded people who have certain level of financial solvency, developed a tendency to resettle their house in this union especially in Bagbati village. Though there is no specific data found through the field survey it is seen that a good number of people migrated here from the river eroded people. As there is a high demand of land in this locality the land price is increasing day by day and richer people are resettling here.

From the field survey of this research, three types of permanent dwellers are found in this region.

- *Original traditional inhabitants.* People who lived in these villages for several generations. They are the original inhabitants (*adi bashinda*) of these villages. Main occupation of these people is agriculture but now-a-day, when demand of land is increasing many sold their land to get quick money. This is how a big portion of land already changed hands to the resettled people. They maintain their own society (*somaj*) where the other two types of people do not get access. This research deals with this type of households identified as the permanent households.
- As the formation of this social group is very old it reflects their homesteads too. Observed old houses with *uthan* and *dheki ghar* (Figure 7) and other traditional features of rural houses are an indication of several generations' living in a specific homestead.
- *Guccha Gram dwellers.* People who came due to the rehabilitation program by the government for the hardcore poor since late 90s. The *Guccha Gram* has its own society. From this investigation it is found that they are not river-effected people. They majority of them have the religion of 'Hindu'. They have their own temple inside the village. They are introvert in their society and the whole *Guccha Gram* is a compact settlement (Figure 8). Generally no one leaves this village for resettlement elsewhere. As a result *Guccha Gram* is becoming more congested and highly populated. Most of the inhabitants are daily labour or rickshaw-van puller.
- *The migrant people.* Due to river erosion some people move their settlement to a safer village which is relatively far from the river; and on the other

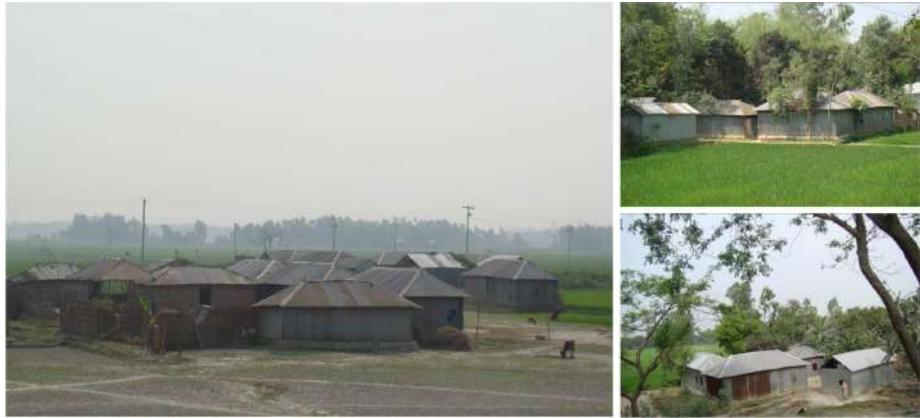


Figure 9: House of the migrant people.

hand the distance is not so far (like other district) to achieve. They bought land in this villages and start living. These types of people maintain a different society for their own. They established their own mosque, *eid-gah*, club and madrasa. They also have their own *matobbor* (head of the community, not the Union Porishod Chairman) and guardian for their community. These migrant people are called “*Puiba*” (people of the east) by the local people as they came from the east.

The migrant people’s settlements are much more opposite to the *Guccho Gram* settlement. All of them are not living in compact area. As they have to purchase land for their settlement it is not possible to make all of their houses side by side (Figure 9). The interesting thing is that the *Puiba* people established their houses in between many old houses. They go to their own mosque by passing the old local mosque. Generally the *puiba* peoples are found more financially solvent than the local original people and there is a competitive tendency between these two types of dwellers.

3.4. Levels of the Housing Transformation

The primary stage of housing transformation in the survey area had been extensively acting since the 1980s, due to the erosion of river Jamuna effecting people living beside the river banks of Shuvogachha Union (information got by a reconnaissance survey). The severe river erosion led to social and physical transformations of the effected household. Some of the people with permanent households became floating households. The permanent households are shifted from their ancestral land in a place with a new type of land ownership into a new (or sometimes no) society.

The initial transformation level that had occurred due to the river erosion is the changing of the location of the household. By this, re-located households had to adopt in a new society and community. The dwellers shifted to the following new location:

- *Flood protecting embankments:* As embankments are made in government acquired land and relocated homestead will never become a permanent one. Poor households generally take this option.
- *River bank adjacent villages:* In most cases, possessions of these lands are lease-basis. River erosion effected people select this option for not having sufficient time and money to arrange purchasing land in a distant safer place.
- *Distant village:* In most cases, solvent households purchase a new land in a distant and safe village and move their house. This required sufficient financial solvency and preparation time.

In a new land, re-located dwellers have to re-construct their old house. Land area and its configuration play the main role over the subsequent housing transformation. Besides, the user's habit and attitude towards their household that they carry from their old homestead also influence the transformation process. This initial transformation creates differentiation between the permanent and floating households in terms of the quality and quantity of spaces available for livelihood and living.

4. HOUSING AND HOUSE FORM IN PERMANENT AND FLOATING HOMESTEADS OF SIRAJGANJ

We have developed earlier a general understanding about the rural homestead pattern of Bangladesh (Section 3.1, 3.2 and 3.3). From that overview, housing characteristics in the plain land are shown in the houses of the Sirajganj district. Geographical and climatic conditions affect the building materials along with the basic layout of the settlement in the study areas of Sirajganj. Housing pattern of the permanent and floating households and the building materials used in the survey area are described next.

4.1. Housing Features of the Permanent Homestead

The homesteads of the 'permanent' dwellers are a kin to the typical rural settlement pattern. From observations during the field survey the following characteristics are being found in the permanent homesteads:

The double plinth: in most cases, permanent homesteads are stand on a double plinth where the bottom one is the '*viti*' or mound to raise the maximum (in



Figure 10: House with a 'viti' and the plinth.



Figure 11: House with 'pucca' plinth.

some cases total) homestead area to protect from the damages caused by flood which is a common feature in this region. And the second one is the plinth beneath the house. The 'viti' achieves a safer height from the monsoon flood which makes a sense of property demarcation. The raised 'viti' distinguished the homestead from surrounding fields or roads (Figure 10 and 12).

The pucca plinth: There is a tendency to give permanency to the houses of the permanent homesteads. To achieve this, permanent dwellers make their plinth by brick and cement rather than mud. It shows the permanent and more durable nature of their houses. This plinth height is generally 2' to 2'-6" and steps are used to reach this level. It is found in some houses that they use ramp to take motor-bike inside the house. A 'pucca' plinth is sometimes represents the financial solvency of the dwellers. Time span of the establishment of the household in a same location is also a factor for this type of construction (Figure 11).

After the 'pucca' plinth dwellers have a tendency to make it beautiful and attractive. For this, ornamentation with texture (by cement works) and color is used. Bright color and ornamental plinth gives the satisfaction about the house to the inhabitants (Figure 13). A slope direct from the road is constructed for the entrance provision of motor-bike. In most of the cases neither the separate entry nor the separate shed is used for motor-bike. The 'baithak ghar' is used for such parking and the main entrance with a ramp that achieves the plinth height is used for its entrance (Figure 14 and 15).

Construction materials: When peoples are found themselves safe in a permanent village they always try to make their homestead and house more permanent. This permanency is ensured by durable and permanent building materials (Figure 16). In Bagbati and Pipulbaria villages, there are some brick-walled buildings are found by the field survey. It is found that they made some necessary supporting structures like kitchen, chicken shed also by some permanent materials like concrete slabs (Figure 17).



Figure 12: Section showing the house with a 'viti' and the plinth.



Figure 13: Ornamented plinth of the houses with permanent homesteads.



Figure 14: 'Pucca' plinth with a provision of motorbike entrance.



Figure 15: Section showing the plinth with a provision of motor-bike entrance.



Figure 16: House with brick wall shows more permanency.



Figure 17: Concrete slabs are used to build the chicken shed.



Figure 18: Sanitary latrine made by CI sheet and brick wall in the permanent homestead.

House constructed with bricks and cement plaster shows the more permanency along with the financial affordability of the dwellers. An RCC (reinforced cement concrete) roof with brick walled house represents more permanency and might be called a real 'permanent one'. But in the survey area such establishment is not so common. Concrete is treated as the symbol of permanency. Chicken sheds of the permanent and established households are made by concrete slabs. These small sized concrete slabs are ready-made sold in local bazaar.

Sanitation system: When people live in a permanent dwelling it is a common feature that the sanitary system progressively developed for household convenience. In most cases, the sanitation system is more developed in the permanent homesteads compared to the floating or temporary homesteads. The wall and roofing materials for the latrine is the CI sheet like the main house. The floor is made of cement concrete with a RCC sanitary slab which they buy as ready-made from the local market (Figure 18). In some cases it is found



Figure 19: Individual clusters make a linear organization by shearing the front verandahs.



Figure 20: ‘Viti’ as the boundary of the homestead. **Figure 21:** Houses organized in such a way to enclose the periphery of the homestead.

the brick walled and RCC roofed latrines in the permanent homesteads. One bathroom adjacent to the latrine is made. Comparatively solvent households have a separate tube-well inside the bathroom.

Linear house: It is found in the permanent homesteads that the individual clusters some times make a linear organization to share the front verandahs (Figure 19). Front veranda is a common feature of the homestead. Series of individual clusters of homesteads can create a linear common verandah. The case (Figure 19) is found by the field survey with migrant people’s house (Section 3.4). Some *puiba* people purchased a long piece of land and divided among them and resettled their house side by side attached their front verandah at once. Thus the composition of six individual homesteads makes the linear house and local people called this house as ‘*veranda bari*’ (the house of verandah). By this approach the dwellers express their unity and strength to the others as they always have such tendency (discussed earlier in Section 3.4).

Absence of boundary wall: In most cases, the ‘viti’ makes the sense of a homestead; no boundary wall is required to demark the property boundary.

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Homestead detached from a congested village sometimes is established on the open cultivable field. Such homesteads are called '*faita bari*'. In most of the cases there is no boundary wall within them. 'Viti' creates the sense of individual identity of such homestead (Figure 20).

In some cases the houses itself is organized in such a way to enclose the periphery of the entire homestead. In such cases, boundary wall is absent around the homestead. Houses are organized along with the property-line of a homestead can create the sense of a boundary wall. Generally homestead with a single or two houses cannot make such introvert organization (Figure 21).

4.2. Housing Features of the Floating Homestead

Due to river erosion occurred by the river Jamuna 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 re-settlement. But poor people cannot do so. They shift their house and re-locate them beside or occasionally on the *beri bandh* (flood protection embankment) which is constructed on public land. The outcome is the establishment of the linear settlement. This type of re-settlement by the poor households never becomes a permanent one.

From observation the following characteristics are being found in the floating homesteads:

Organization of houses: When the floating homesteads are being arranged on the embankment (Figure 6) their organization is completely guided by the embankment. Others climatic and local influence do not get preference for the organization of the houses. Sometimes the composition of houses achieves a linear pattern along with the embankment. The scarcity of land does not allow the homesteads to receive the traditional rural housing pattern.

Organization of land: The great problem of floating 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 might be a slope of the embankment or a rented land. That is why the land is not large enough to fit the house. Floating people rarely have choice to organize the houses according to their need (Figure 22).

Slope of the flood-protection embankment is used for the resettlement of river erosion affected people. Such resettlement has to be done within a very small piece of land. They can accommodate maximum one or two houses. Household activities are adjusted within this small homestead.

Absence of plinth: In some cases people have to shift their house with in a very short time when river erosion occurred (generally in rainy season and



Figure 22: Homestead with a small piece of land.



Figure 23: House of floating dwellers without proper plinth.

during flood). And they do not make proper plinth for the house (Figure 23). In some cases, the plinth of the house is totally absent. After some time, they may create plinth. Shortage of preparation time to resettle houses in a new land creates the absence of proper plinth. In most of the cases, when river erosion occurred the dwellers have to dismantle the house very quick and resettled it on a new place. As the houses are made of is C.I. sheet, it is possible to shift it quick. But preparation of plinth is a time consuming job.

Boundary fencing: 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 boundary wall which is widely found in permanent households. Dwellers make boundary wall to distinguish individual homestead and ensure privacy. This boundary wall is made of jute sticks, thatch etc. materials (Figure 24).

When many homesteads are resettled together and everyone gets a small piece of land it is not possible to create the property demarcation by a ‘viti’ or the houses itself which was discussed in figure 19 and 20. Fencing wall is necessary to achieve them. This fencing wall is made of low cost and temporary materials like thatch, straw or jute stick.

4.3. Comparative Housing Features of the Permanent and Floating Homestead

In the two previous sections (4.1 and 4.2) some key features of the permanent and floating homesteads are analyzed that are found in the filed survey. A comparative analysis among them is presented in the following table.

4.4. Building Materials

The house forms of a traditional rural homestead are assessed with two vital aspects and they are roofing and enclosing materials. In this section the available

Table 1: Comparative housing features of the permanent and floating homestead.

| Features | Permanent Homestead | Floating Homestead |
|------------------------|--|--|
| Plinth | In some cases it is found 'double plinth' where bottom one is the 'viti' and upper one is the traditional plinth. As a symbol of permanency, most of the cases plinth is 'pucca' and in some cases they are ornamented and colorful. | Simple plinth made of earth is found for floating homesteads. Absence of proper plinth is found in some households of this category. |
| Boundary wall | Boundary wall is not a common feature for the organization of the houses. Houses are organized in such a way that property demarcation by wall or fencing is not required. 'Viti' is also act as a property demarcation object for the homestead. | Boundary fencing is widely used to ensure privacy and property demarcation is the scarcity of land and limitation to organize the houses as a traditional layout. |
| Construction materials | Brick wall with cement plaster is used for wall construction and CI sheet for roof. CI sheet is widely used to make the wall. RCC roof is rarely found in this context. Pre-cast RCC made slabs for kitchen shed and other household necessity is widely used. | CI sheet is used for roof and wall as an easy moveable material. Brick wall is totally absent and use of RCC is very little. Thatch and other temporary materials also widely found as a construction materials. |
| Sanitation system | Developed sanitary system with pre-cast or cast-in-situ ring slab. CI sheet for wall and roof and in some cases brick wall and RCC roof also found. Separate tube-well inside bathroom is seen in some cases. | Only pre-cast ring slab is used. CI sheet is for both roof and wall is used. |
| Organization of houses | Traditional layout of rural homesteads is practiced. Cluster organization is the common organization of this type of homesteads. | Linear type of organization is found on the embankment. |
| Organization of land | Sufficient land to organize the houses in a traditional way with the common features like courtyard, dheki ghar, granary etc. | Scarcity of land is the premium. Due to the limitations of land area common features and type of organizations of traditional rural homestead are missing in this context. |

| Features | Permanent Homestead | Floating Homestead |
|------------------------|--|---|
| Climatic consideration | Houses are constructed with the consideration of climate. In most of the cases the traditional building orientation is followed. | Due to scarcity of land, traditional building orientation is not possible to follow most of the time. |



Figure 24: Use of boundary fencing to ensure privacy and individual demarcation of homestead.



Figure 25: Use of C.I. sheets as a roofing material in permanent and floating homesteads.

construction materials of these two aspects are analyzed in the context of the field survey.

4.4.1. Roofing Materials

Like all over the Bangladesh bamboo, thatch and C.I. sheets are the common for roofing materials in the survey area also. Among these roofing materials, bamboo and thatch are used but not so common. For its availability and durability against the warm-humid weather and the heavy rain the use of C.I.

Table 2: Comparative use of roofing materials in the Permanent and Floating Homestead.

| Construction materials | Permanent Homestead | Floating Homestead |
|------------------------|---------------------------------------|---------------------------------------|
| Bamboo/ straw | Rarely used. | Partially used in many cases. |
| Corrugated iron sheet | Main roofing material in the context. | Main roofing material in the context. |
| Clay tiles | Not used. | Not used. |
| Cement/ brick | Rarely used. | Not used. |

sheet is increasing rapidly and in by the field survey they are most commonly found. Clay tiles are not shown in this region as a roofing material.

Use of C.I. sheet as roofing materials is very common. This roof might be 'chowchala', 'dochala' or 'ekchala' depends on the affordability of the dwellers. Use of RCC roof which denotes the maximum permanency of the homesteads is rarely found in the survey area (Figure 25).

In the following table (Table 2) the condition of using the different roofing materials used in Bangladesh are shown.

4.4.2. Enclosing Materials

The following types of houses are found in the survey areas of Sirajganj:

Bamboo-walled houses: Some Bamboo-walled houses in the Sirajganj are often found where the bamboo is used for making posts 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.

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. Due to flood-prone and vulnerable to hazards like bank erosion which compel people to build relatively cheaper houses that can be dismantled when threatened by a hazard.

Thatched or straw walled house sometimes use partially when other parts of the homestead are made of C.I. sheet. When quick extension is necessary, such types of materials are also used. Fencing wall or in interior use these type of materials are also used (Figure 26).

CI 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



Figure 26: Thatched walled houses in permanent and floating homesteads.

Table 3: Comparative use of enclosing materials in the Permanent and Floating Homestead.

| Construction materials | Permanent Homestead | Floating Homestead |
|------------------------|---|---|
| Bamboo/ straw | Used in a small amount. | Partially used in many cases. |
| Mud | Not used. | Not used. |
| Corrugated iron sheet | Main enclosing material in the context. | Main enclosing material in the context. |
| Cement/ brick | Used in some cases | Not used. |

in local tradition. It is very common to use C.I. sheets for both walls and roofs. C.I. sheet is widely used in this region for the following reasons:

- Unavailability of other materials (e.g. mud). The earth is not suitable to use for constructing of wall here.
- Due to river erosion mobility is an important criterion for choosing building materials which C.I. sheet has. Walls made by C.I. sheet can be transferred easily for a long distance.
- Mud or timber is not suitable during flood. As flood is a common phenomena for this region people avoid mud or timber as a building material.

C.I. sheet is commonly used for both wall and roof in this region. In most of the cases the raw sheets are used rather than coloring those for decoration and maintenance purpose (Figure 27).

Brick walled houses: In a very small amount this is found some brick walled house with C.I. sheet roof in this region which shows more stability and solvency of the household. House made of brick wall and C.I sheet roof



Figure 27: Use of C.I. sheets as an enclosing material.



Figure 28: House with brick wall and C.I. sheet roof.

represents a certain level of permanency and the financial affordability of the dwellers (Figure 28). Though an RCC roof is more permanent but in the study area such establishment is not so common. These types of houses are not feasible in the floating households.

In the following table (Table 3) the condition of using the different enclosing materials used in Bangladesh are shown.

5. CONCLUSION

It is found that river erosion is another dilemma that influences the livelihood of the rural people. By the river erosion rural settlement obtain a certain degree of transformation. This transformation is not only occurred through the settlement and traditional housing but also a socio-economic transformation also found. Through the river erosion, people lose their agricultural land and faces degradation of their economic status. The main transformation of the housing pattern of the survey area is caused by river erosion. Through this households are transferred into ‘floating’ from their ‘permanent’ status. Land area and its configuration play the main role over the resettlement. Through transformation, the housing pattern and their features are changed along with some local factors (e.g. construction materials, environmental considerations etc.). The housing features and the construction materials are varied with the permanent and floating homesteads. This changing pattern is a continuous process that is rolling on the age of the settlement.

This study will serve its purpose if it can be used as a professional tool and a guiding document for future research and/or development programmes. This field survey was concentrated in a specific location. More regional studies are needed to account for regional differences. Further studies of the same nature will add to the vocabulary of traditional house forms available to professionals engaged in planned interventions in the built environment.

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