A study on the traditional housing technology of Bangladesh

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Across history of human civilization, ecological factors motivated people of different periods in shaping their settlement strategy. From the very commencement of people’s settlement-practice, housing practice became the symbol of protection and safety for human existence. Whenever people think of housing construction, ecological factors have been given the principal contemplation to cope with the hostile natural calamities and unusual environmental behaviour. People around the world still maintain and practice this trend historical, pragmatic and situational in housing construction. Indigenous people across the world have hereditarily been exercising this sort of housing technology for years that includes ecological and environmental reflection. However, even modern architectural design embodies the discourse of ‘environmentally-sound’ in construction process. With the increased economic dimension of human life, economic factors are also reflected in the domain of housing technology that includes cost-effectiveness and sustainability, etc. The paper explores one of such traditional housing technologies, mud-made housing technology bring widely practiced in different parts of Bangladesh. It explores the state and architecture, ecological and economic reasoning of the mud-made housing technology of Bangladesh.

Keywords: Traditional housing technology, Mud-made housing, Bangladesh

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Climatologic and economic reasoning have always been a foremost apprehension in any housing technology being practiced specifically among those groups of people who have been living in close association with the nature for years. In order to adjust with the environmental behaviour, the people have generated traditional paradigm of well-protected, sustainable, and ecologically-sound housing technology which has markedly been ignored in deeper understanding of human existence. However, evolving history of human settlement practice reveals that ecological factors have long been incorporated in human survival and living technology with great consideration. During the period of natural calamities and environmental disorder, it has significantly been observed that there is always a trend of low causality among the traditional house-dwellers. The people have their own ways to sustain during the frequent natural calamities. They have their own technology regarding how they can save their lives, livings, and properties. The people developed such a unique housing technology that keeps them least-affected and relatively safe against mightiest disasters. Disappointingly, no serious and systematic study has yet been conducted to unearth this technology, and document the skill, knowledge, as well as traditional environmental-wisdom of conventional housing practice specifically in South Asian sub-continent. Therefore, there is a serious dearth of ethnographic data regarding eco-adaptive, environmentally sound and self-sustaining traditional housing technology in this region. Since the skill of construction workers, technology of housing construction and the knowledge about construction materials are not recorded, it is imperative to urgently document this hidden transcript of knowledge before it disappears. Because, rapid growth of science and technological development has hardly left any space for traditional knowledge though it is highly significant and experimented paradigm that exists over years from generations to generations. It is now under serious threat for being disappeared though Traditional Ecological Knowledge is a complementary to modern science1-4. The paper concentrates on this conceptual, theoretical, and scholastic framework.

Methodology
The paper is an outcome of an ethnographic research conducted on mud-made housing technology of Bangladesh. Ghonapara of Cox’s Bazar, one of the districts of Bangladesh, has been selected as a research area for the study, where most houses (98%)
are in uniquely mud-made setting. It is located at
a little hill area at one side near Cox’s Bazar sadar
upazila (central sub-district). For their dwelling
pattern and traditional cultural practices, Ghonapara
is considered as an ideal research area for formulating
the discourse to find out the Traditional Ecological
Knowledge (TEK) about the mud-made housing
technology in Bangladesh. Primary data have been
collected from the traditional house-dwellers as well
as those who are professionally skilled in the
construction of mud-made housing technology.
Physical measurement has also been taken on
sufficient houses, which have been built following the
process of mud-made technology in order to assess
the uniqueness and significance of the same. Key
informants are approached to gain adequate ideas
about effectiveness of the houses both from the
ecological and economic perspective. The method
of focus group discussion (FGD) has been used to
understand the interpretation of ecological factors and
economic feasibilities taken consideration into
account in housing construction. Besides, field data
have been collected using structured and unstructured
interview techniques, in-depth observation, purposive
conversation, etc. Secondary sources notably district
records, population survey, published literature on
calamity and causality, etc. are also scanned, to some
extent, to examine the causality and sustainability of
the houses during different calamities. Field data for
the study has been analysed from a qualitative
perspective and from anthropological point of view.
Nevertheless, scientific explanation has been required
to establish proper assessment of the knowledge
regarding mud-made housing construction
technologies in Bangladesh.

Traditional Ecological Knowledge

Local people scattered living throughout the world,
occupying different agro-ecological zones have
generated sets of knowledge associated with the
management of their environment and ecological set
up as part of their survival strategies. TEK encompasses
spiritual relationships, relationships with
the natural environment and the use of natural
resources, relationships between people, etc. It is
reflected in language, social organization, values
institutions, and laws. While TEK tends to be
associated with the diversity of knowledge,
innovations and practices that indigenous
communities hold about the biophysical, socio-
economic, and cultural-historical aspects of their local
environment, it is also often defined in opposition to
modern, scientific conceptions of knowledge. In
Western academic discourse, traditional systems of
knowledge are characterized as mixtures of
knowledge, practice, and belief. TEK is a body of
knowledge and beliefs transmitted through oral
tradition and first-hand observation. It includes a
system of classification, a set of empirical
observations about the local environment and a
system of self-management that governs resource use.
Ecological aspects are closely tied to social and
spiritual aspects of the knowledge system. The
quantity and quality of TEK varies among community
members, depending upon gender, age, social status,
intellectual capability and profession (hunter, spiritual
leader, healer, etc.). With its roots firmly in the past,
TEK is both cumulative and dynamic, building upon
the experience of earlier generations and adapting to
the new technological and socioeconomic changes of
the present. TEK is an attribute of societies with
historical continuity in resource use practices; by and
large, these are non-industrial or less technologically
advanced societies, many of them indigenous or
tribal. The unique, traditional, local knowledge
existing within and developed around the specific
conditions of men and women indigenous to a
particular geographic area. TEK is a body of
knowledge built by a group of people through
generations living in close contact with nature. It
includes a system of classification, a set of empirical
observations about the local environment, and a
system of self-management that governs resource
use. The local knowledge is a kind of knowledge that
is unique to a given culture or society. Indigenous
knowledge contrasts with the international knowledge
system generated by universities, research institutions,
and private firms. It is the basis for local-level
decision-making in agriculture, health care, food
preparation, education, natural-resource management,
and a host of other activities in rural communities.

Traditional housing technology

For thousand of years, people around the world
have been using knowledge of their local environment
to sustain themselves and to maintain their cultural
identity. Theory of natural selection reveals the
climatic significance and ecological dimension of
human existence. Scholars of different ages,
therefore, strongly opined that climate has been an
influential factor upon human beings. More recently,
interest centered on human energy in relation to environment\textsuperscript{11}. The climate condition made the people to think about human shelter that provided to sense of housing construction\textsuperscript{12}. Admittedly, environment and ecological factor have always been given major consideration in the housing construction across the world from the remote past to near present. Environmental factors significantly regulated the evolving technologies of human shelter in the forms of housing practice\textsuperscript{13}. This type of housing construction, where environmental and climatologic factors have meaningfully been considered is still widely practiced in different parts of the world. Mud-made houses are one of the ideal examples of housing system where environmental and ecological dynamics are incorporated with intensive and pragmatic interest. Basically, this type of housing technology is found in Asian sub-specifically in a few parts of India, South part of Pakistan and North, South & Southeast part of Bangladesh. Bangladesh is an ideal example for mud-made housing practice. A few districts of Bangladesh—Rajshahi, Potuakhali, Khulna, Dinajpur, Bugra, Cox’s Bazar, and Chittagong (Fig.1) are the areas, where mud-made housing system is widely practiced. There is a serious deaft of information about tradition housing technology of the common people, particularly in Bangladesh\textsuperscript{14,15}.

People practice their own way of traditional housing technology, which has been protecting them from all sorts of hostility of the nature and environment over decades. Since, it has the scientific value, attention has been paid in documenting such kind of knowledge. The people living in Ghonapara have been building and constructing their houses for unknown past, which is tremendously environmentally and ecologically safe and sound. For several hundred years, the noted group of people from generation to generation have been maintaining and practicing their housing system without encountering any mentionable obstacles to substantial extent. The mud-made housing system has the specific and distinctive design and characteristics. All mud-made houses are one story and can be categorized into three ways based on materials they use along with mud in constructing their houses. Specially, the materials used to construct the windows, doors and roof of the mud-made houses are the determining factors for diversification of house-names. Villagers identify the mud-made house based on materials used in support with mud in three typologies: houses constructed with the wooden materials are called gacher-ghor (ghor =house and gacher ghor is house made of wood); houses constructed with tin materials are called tiner ghor; houses constructed with bamboo materials are called basher ghor (bash =bamboo). In Ghonapara, most of the houses are basher-ghor. But, a few gacher-ghor are also found in the southern part of research area. Based on roof, there are four types of houses. These are also termed on the basis of materials used for making roof such as: roof of house made of kورد (straw) is called narar-chani (chani =roof); roof of house made of tin is called tiner-chani; roof of house made of golpata (big and round leaves of specific kind of three) is called patar-chani; roof of house made of chon (grass of big size usually grown in the hill area) is called choner-chani. The mud-made houses do not have any primordial interior design and fixed set of cluster. Internal segmentation of the houses is generally distributed according to the need of family-members and to the wish of house lord. Nevertheless, every part of the house is identified with distinctive names based on its function and position. There is no certain measurement system of different parts of house such as doors, windows, ventilation, rooms, kitchen and so on. Floor is

![Fig.1 Map of study area](image-url)
constructed with the same material, mud, but now a
day the rich people are becoming interested in making
the floor with brick and cement.

The principal element of this sort of housing
construction is mud for which its name is mud-made
house. It is locally termed as gudam ghor or matir
ghor (house made of mud). All types of mud cannot
be used for this housing construction except atel mati
(one kind soft mud), which is found only in and
around hilly areas and fertile agricultural land. This
type of mud is mechanised for making soft to be used
for mud-made housing construction. Wood is an
essential element in mud-made housing construction.
Generally, wood is used for making doors, windows,
ventilation, frame for roof and pillar inside the wall.
Since the wood is very expensive and costly, people
hardly use wood for their house-construction. The
people of Ghonapara rather frequently use bamboo.
Bamboo is commonly used in mud-made housing
construction, as it is available near the area the
villagers live in. It is used as a substitute for wood
because bamboo is less costly. It is generally used for
making doors, windows, ventilation, frame for roof
and pillar inside the wall made of mud. Tin is
commonly used for making roof. The roof of this type
of housing system is not generally flat but two-stairs
and down towards front and beck. Tins are also used
for making doors and widows, where generally
frames are made of wood. People also use the
substitute materials of tin—khord, gholpata and chon,
etc. for mud-made housing construction. Khord is one
kind of straw, which is easily available is widely used.
Whenever crops are harvested, there is about one feet
of stalk of grain left in the crops-land. It becomes
straw later on. People then again cut this stalk of grain
rounding the ground. It is used to construct the roof
of mud-made houses. Notably, whenever the stalk of
grain is dried, it becomes khord. People accustomed
with mud-made housing system generally use khord
for their roof. Another element of making roof is
golpata, (one kind of big and round leaves), which is
frequently used in mud-made housing construction.
Chon is just like a big size of grass, generally grown
in the hills. Bundles of chon are used to make roof in
a unique setting and flattered design. As it has great
demand for making roof, some people cultivate chon
in hill area for commercial purpose. Bamboo stick is
an important element for building mud-made houses.
It is usually made by breaking the bamboo in two or
three parts, which becomes strong and thin in nature.
Bamboo stick is generally used as an element inside
pillar and wall of mud-made house that makes it
strong and muscular. Sometimes, jute stick, thin
bamboo, and iron rod are used instead of bamboo
stick that supposes to make the wall stronger and
more sustainable.

Construction technology of mud-made houses is a
long process that is a little bit related to the brick built
housing construction. First, mud, the key element, has
to be made suitable, soft enough to bend to use in
building the houses. Sufficient amount of mud has to
be collected and stored in a hole dug near the house.
Then, it has to be made absolutely dust by mixing
different straws, small leaves, roots of tree and tear-
cloth, etc. It has to be kept stored for a few days to
make norom (soft) so that it can be bent. After then,
it is used in housing construction. Foundation has to be
made digging four or five feet deep down measuring
the size and height of the house. Then, norom mud is
used to make foundation and construct up to dui hat
uchu (two-hand-size height or 1 m) wall from the
land. This wall is kept for drying for few days. Once it
becomes dry and strong, more walls have to be
constructed and kept it for more three days for drying.
In this process, the wall of the house as per design is
constructed. After completing the wall, the frame for
roof is designed and then, roof is made. In the process
of wall-construction, adequate space for proposed
windows and doors are kept as per design using
strong wood or divided-bamboo in big size (Fig. 3).
Then, door and windows are constructed. After
completing the whole construction process, walls are
well burnished with the liquid-mud. It becomes the
wall like the brick-built-wall with burnish of cement
(Fig. 2).

Ecological factors have always been taken
consideration for ensuring the safe & sound shelter
among the tradition dwellers from early stage of
human housing technology and settlement practice to
date. Climatologic consideration in housing
technology has strongly been evident among
indigenous group, which is transmitted from tree
dwelling to towns\(^3\). The mud-made house is an ideal
example of practicing traditional housing system,
where ecological and environmental consideration is
taken account into construction technology. As the
people have been living in the coastal belt and tropical
area not only in Ghonapara but also all over
Bangladesh, they have to face the frequent natural
calamities and environmental behaviour. For, they
have to responsive to the eventual hazards and adverse ecological factors at the time of housing construction. Therefore, they have constituted a unique paradigm of housing technology. Their housing technology is generated considering environmental behaviour and ecological factors as well as economic dimension.

Ghonapara, a village of Cox’s Bazar, is basically a flood zone and an area of landslide. Therefore, it is required to be aware of frequent flood, in the construction technology of their houses. The mud-made housing is constructed to meet the need of such geo-climatic aspects of life. The house is always built with at least 50 cm thick wall that can easily protect the houses from any forceful flood and landslide. The wall made of mud is too strong in nature for floodwater to break it down easily. It is notable that other parts of house made of non-mud materials may be affected by the forceful flood and floodwater but the parts made of mud are comparatively less effected and well-protected. The inhabitants of Ghonapara have become habituated with this type of housing technology.

Cyclone and the tidal bore are also taken into account the construction technology of the mud-made houses. The people, who have been living in the coastal belt and near the Bay of Bengal for years, have been quite familiar with the recurrent cyclone and frequent tidal bore. The mud-made houses are constructed to sustain itself against the numerous cyclone and other natural calamities in this region. The experience of facing the cyclone is remarkably meaningful and significant. The heavy wind of cyclone can never blow away the mud-made houses, whereas the non-mud-made houses can easily be done so. In the last few cyclone times, the causality of the mud-made houses and non-mud-made houses are comparable to 20% and 80%, respectively. The mud-made housing system is effectively eco-adaptive. The people have been experiencing this indigenous wisdom for years during the monsoon and kalboishakh (monsoon cyclone). The villagers of Ghonapara are of opinions that during the cyclone, mud-made houses are comparatively safe and well-protected shelter against unexpected dangers and accidents.

Light and wind (Alo-batas) is another factor that is generally considered in all types of housing technology. Sufficient light and necessary fresh wind are important for keeping house moderately cold in summer and hot in winter season (Fig.4). During the summer, the wall made of mud keeps the house cold enough more than other traditional houses without any material and artificial mechanism; during the winter, the wall of mud-made house keeps inside warm enough in comparison to other houses made of non-mud materials. Gorome tanda kintu shite gorom (cold in summer but hot in winter) is the significant notion of mud-maid housing technology generally practiced in Bangladesh. The wall absorbs heat at daytime and keeps warm inside the house during the winter season; in the summer the wall absorbs the cold at night and keeps inside cold at daytime. The wall made of mud does not allow the temperature to enter inside the house that is extremely hot or cold.

Earthquake is being frequently observed in Bangladesh. Specially, Chittagong is marked as the central-point of earthquake where Ghonapara, the present research area, is located. The impact and affect of earthquake is generally accounted upon what damages take place in housing sector notable in construction technology. The mud-made houses are definitely less affective than other type of houses.
made of traditional materials in response to the earthquake. The building and construction technology of mud-made housing is self-sustainable and well-protected against any force of natural calamities. When a strong earthquake can absolutely damage the brick-built houses, it causes little upon mud-made housing due to its traditional way self-sustainability.

All types of housing technology include the economic contemplation in its construction process along with its ecological consideration. Economic consideration is virtually dependent on the availability of construction materials, prices of materials, construction cost, and beautification of the houses. In early days, ecological consideration had taken into the prime concern to make them environmental friendly. No artificial materials had been used in housing technology. Nevertheless, with the advancement of society, technology, and human aesthetic mental faculty, people tend to construct their houses considering the economic determinants along with the ecological consideration. Economic consideration, documented from Ghonapara, consists of consideration of sustainability; cost effectiveness, and availability of construction materials. People generally use the materials for their housing construction keeping sustainability in their mind. The mud-made housing system is an ideal example for sustainability. Other traditional construction materials like bamboo, straw, wood, tin, brick, etc. are less sustainable than mud. Concept of sustainability, in fact, is the economic dimension of housing technology that is observed among the people of Ghonapara. Mud-made house commonly known as kom korocher bari, which literary means the construction of house with cheap cost is a popular notion and strategy among the people of rural Bangladesh. Besides, effectiveness is given contemplation in formulating the housing technology. Combination of construction cost and its cost-effectiveness is examined and analyzed in the experience of different natural hazards and causality. Mud-made houses cost minimum and unbelievable amount of money in comparison to other housing expenditure (Table 1). As the core construction materials, mud is available around the Ghonapara, it does not cost any single amount of money. People collect the adequate mud from near the hills without any investment. Koroch kom kintu tike beshi (less expensive but more sustainable) is the popular notion of the consideration of cost-effectiveness in mud-made housing technology. Availability of construction materials is another important economic dimension of mud-made housing technology. People generally use the materials in their housing technology with what are available in and around their locality. The indigenous people all over the world use the materials, available around their settlement for their housing technologies. Everything is hater kache (near hand) in mud-made housing system, widely practiced in Ghonapara.

### Table 1: Construction cost in building houses in Ghonapara

<table>
<thead>
<tr>
<th>Components</th>
<th>Mud-made houses</th>
<th>Non-mud made houses (bamboo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mud</td>
<td>Free</td>
<td>Free or 500 BDT (6$)</td>
</tr>
<tr>
<td>Khord</td>
<td>Free or 500 BDT (6$)</td>
<td>----</td>
</tr>
<tr>
<td>Tin</td>
<td>2000 BDT (20$)</td>
<td>2000 BDT (20$)</td>
</tr>
<tr>
<td>Wood</td>
<td>1000 BDT (12$)</td>
<td>2000 BDT (20$)</td>
</tr>
<tr>
<td>Chon</td>
<td>1000 BDT (12$)</td>
<td>----</td>
</tr>
<tr>
<td>Bamboo</td>
<td>500 BDT (6$)</td>
<td>10000 BDT (120$)</td>
</tr>
<tr>
<td>Cements and breaks</td>
<td>----</td>
<td>5000 BDT (56$)</td>
</tr>
<tr>
<td>Iron rod</td>
<td>----</td>
<td>2000 BDT (20$)</td>
</tr>
<tr>
<td>Labour</td>
<td>Free</td>
<td>----</td>
</tr>
<tr>
<td>Total (approximately)</td>
<td>5000 BDT (56 $)</td>
<td>----</td>
</tr>
</tbody>
</table>

**Conclusion**

The paper highlights the mud-made housing technology of Bangladesh. It specially focuses on the climatologic factors and economic reasoning usually taken consideration into account the mud-made housing construction. The paper explores the traditional housing technology, local’s interpretation of the frequent natural calamities, environmental behaviour, and economic determinants associated with the mud-made housing construction, etc. It also examines the importance of practicing this type of housing technology that meaningfully includes both ecological and economical considerations. Besides, it analyses the causality and sustainability that has been in practice for hundreds of years without creating substantial obstacles. The paper reveals that mud-made housing technology is not only significant from ecological and economical perspective but also from social, cultural, and environmental context of human existence. The mud-made housing technology constitutes a sustainable paradigm in association with the traditional ecological knowledge and local’s interpretation of natural calamities, which has highly scientific value and applied significance. Now, it is strongly recommended that such kind of knowledge and popular-paradigm should urgently be documented before it disappears.
References