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"DO MAHELA"
An *'Enlightenment'* about Two Storied Mud Architecture Chanduria, Tanore, Rajshahi, Bangladesh

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Abstract:
Facing the devastating flood of monsoon in every year is a common phenomenon for Bangladesh, the large deltaic and riverine country. The process of eradication and rejuvenation is a part of the struggle for existence for the people. They are hard labored, avid, creative, modest and calm. The 'fertile land' is the grace from the God which is rich for agriculture. The spirit of the people comes from that land even if the massive calamities occur repeatedly. The vernacular organization as well as the indigenous architecture is prolific where land, water and people are harmonious in creating the indigenous form of architecture. This paper works as an enlightenment about the two storied mud architecture in north region of Bangladesh, named "Do Mahela", and its materials' inherency, the constructional course of action and schemes, the planning and organizational features, climatic control, spatial environment for both the outdoor and indoor spaces and above all livability and sustainability of the architecture as well as the house form. Documentation and illustrations are other significant elements of the paper. The people of present days are getting away from their traditional and socio-cultural continuity. Rising of modernity and urbanization has declined the rich vigor of the vernacular architecture into a faded and rusted era. It is evident that the innate indigenous architecture of our country would be the rare treasury for us and we are loosing it as we are not yet responsive. We have to awake, revive and reinforce our rich indigenous rural architecture.

Key wards: Mud architecture, Vernacular organization, Indigenous architecture, Livability and Sustainability.

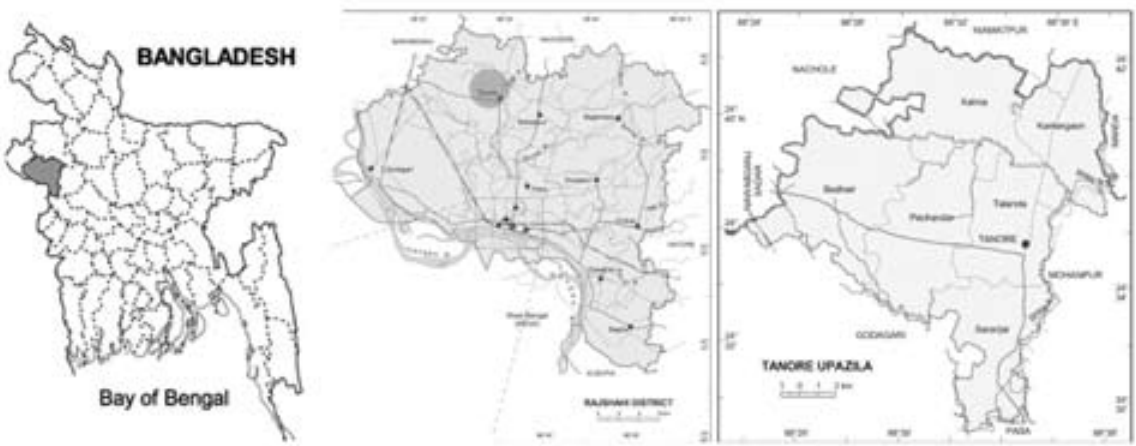
1. Introduction:

Bangladesh is a riverine country and this great deltaic alluvial land is composed of hundreds of rivers. During the monsoons people of this country struggle with unprecedented flood. On the other side, this flood creates new horizon of hopes and aspirations by siltation.

Historically, Bangladesh was divided into six distinguished divisional States. Among those, the northern part, which is known as North Bengal, was famous as the ancient capital of Gaur (Sanday J.; Ahmed. N., 1984) named Pundrabardhana or Pundranagar in around 1500-2000 years ago. This area was significant for Buddhist epoch; in later period Hindu, Muslim and British colonies together evolved a traditional and cultural value of this region which itself was very wealthy. As the Gaur or north Bengal is relatively elevated in comparison to the other parts of Bangladesh, so flood is less in this particular region. River Padma is one of the widest river in the country that flows all it's way through the North Bengal, and at the southern end it meets the Bay of Bengal.

Mud architecture of the North Bengal is the synchronized expression of this land, water, geography, climate and people where the nature and life together have created an unparallel relation, which had developed a vernacular style. In this region, the soil is comparatively stable and strong, so construction of two storied mud structure is a common phenomenon. 'Tanore' upzilla which is 20 km away from Rajshahi city is famous for the construction of this generic type of mud structure. This area generally has high land and composed of agriculture (especially paddy) based villages, where paddy field can be seen up to the horizon all over the season. Therefore, people of the area is generally well off to maintain their family. The economic strength of this area is high and the rural governance is structured in a sound

manner so that the people put trust on the administration. A survey revealed that here the community had been mostly developed through marital relationship among the nearest relatives. Thus the kinship has a strong impact on the societal development of this area. The most interesting thing of this area is the traditional attachment of the people with their ancestor's values and prevailing myths. This familial integrity has special impact on the construction technique of the famous two story mud structures of Tanore upazilla.



(a) (b) (c)

Figure: 01: The site and its contextual setting (a) Rajshahi District in key plan, (b) location of Tanore in Rajshahi District & (c) Tanor Upazilla.

2. The Construction Techniques and Course of Actions:

The process of construction of DO MAHELA is unique. At first they prepare the ground by excavating earth with the alignment of built up area. The excavation level is about -2.5 feet down. This excavated earth is kept and is used later on for the wall construction. Foundations of the DO MAHELA starts form the plane of the excavation. The thickness of the foundation is about 72 inch at the base and it is truncated at the top into 48 inches thus the whole foundation becomes tapered. This heavy ring of the tapered foundation is continued around the entire building which is named as KANTHI. It is actually the main underground foundation work. For the construction, earth is prepared with mixing of straw, dry leaves, paddy chip with dust and jute and then the mix of mud is well rammed to get strength and well bonding. These structures remain durable for more than 200 years. And researchers discovered the existance of a house in the study area that was built 150 years before and found still surviving with the eminent glory. The outer massive walls of the house rest on the gigantic KANTHI which acts as the base of the main structure and above the KANTHI the walls are shortened by 6 inches on both-sides. The outer wall diminishes upward, and stops at the height of about 22 feet, where the thickness is about 12 inches. The wall is constructed vertically about 4 feet hight at a time to avoid the lateral pressure on it. The slab construction is also pretty innovative like other vernacular structures.

The massive walls are the main supporting component of 1st floor where the main elements of the floor are TEER (rafter), bamboo joist, and the thick tiled mud covering of the floor. First the TEER, which is made of wooden plank. is laid along the shorter direction of the walls, then the bamboos are placed at opposite direction and tied with ropes for strong bonding and slurry of mud is used as adhesive, Finally thick mud tiles are embedded on the floor. The main roof at the second floor level is always built with the wooden members or sometimes with the regular sized bamboos. The ground floor height is kept at 10 feet approximately, and the first floor is kept at 9 feet 8-10 inch. Wooden frameworks are carefully joined to each other and set on the top of the wall. Huge concentrated straw and slender bamboo frames are girded on it at the main roof or CHALA. A triangular shape positive space evolves right under the pitch roof which is used for storage of all kinds of seasonal granary. Both the inner and outer sides of walls are finished with the fine process of hand touched plaster coating called NUREE. The NUREE is the preparation of paste containing a high quality processed mud with vegetable color like kiln burnt red, natural adhesive and a perfect mix of water. Different relief patterns are carved on the mud walls. Window and other openings are arranged by like lintel made of wooden plank or TOCKTA, or sometime with bamboos which is less durable. The doors are of average 5 feet 6 inches to 5 feet 8 inches in height. The reasons for shorter height of doors are the actions of lateral loads and the structure itself.

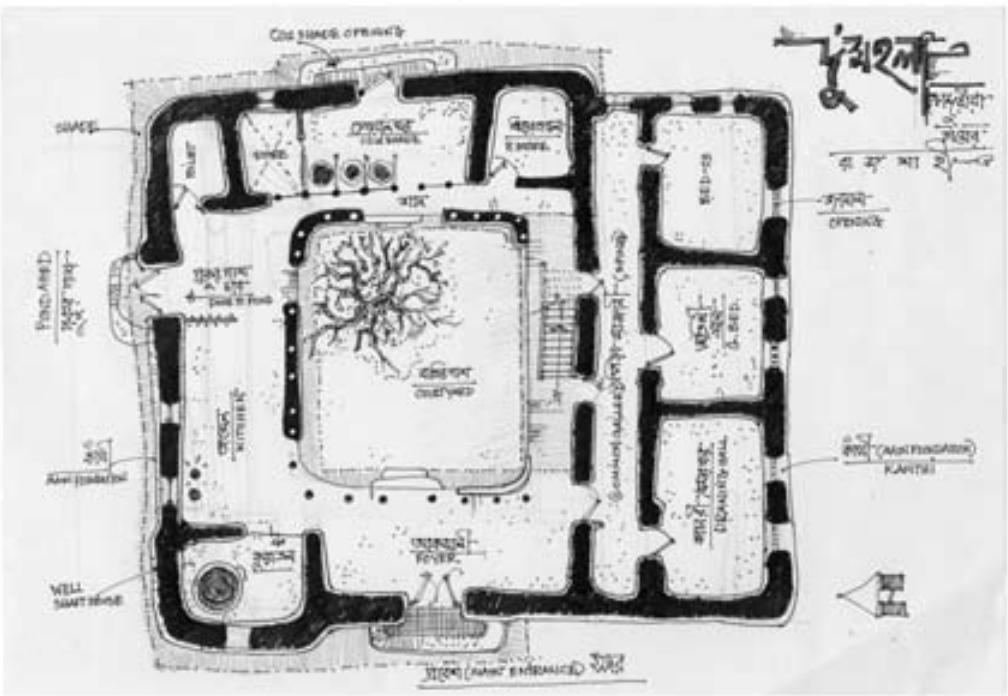
Figure: 02: (a) *DO-MAHELA* & neighborhood, (b) view to courtyard, (c) court facing two-storied façade and cantilever *PIRA SAJANNI*, (d) cantilever balcony and other details, (e) *AKSAALI* and spatial relation, (f) hanging bird next, (g) hanging veranda, (h) space beside kitchen & (i) *JAHAJI DHAP* or single-flight wooden stair

3. Planning Organization:

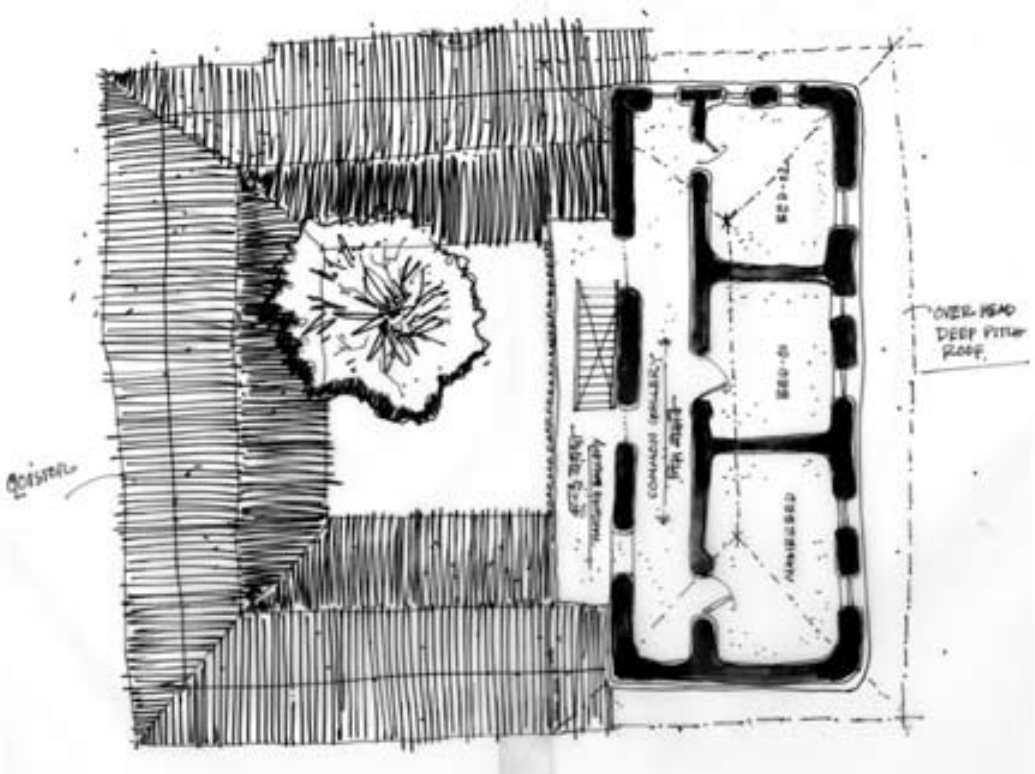
The Plan of DO MOHALA has a regular geometry, which is approximately squarish, where the organization of the houses is focused on the courtyard or BAHIR PASH. All functions are accommodated around the courtyard. The served and the service spaces are separated distinctly and rationally. In most of the cases, it is visible that west side is dedicated to the services such as well, kitchen, store, cow shade and toilets. The formal elements of the house and their corresponding functions are as follows:

- **a.** *AKSAALI- Pre Function Space or Foyer*
- **b.** *BAHIR PASH- Courtyard*
- **c.** *KUA TOLA - Well Shaft House*
- **d.** *HESHEL - The Main Kitchen*
- **e.** *Dining*
- **f.** *GOOLA GHAR - Granary and Store*
- **g.** *CHOWKI - Bath Space*
- **h.** *DHAAP - Wooden Single Flight Stair at the Verandah*
- **i.** *PIRA SAJANEE - A Common Gallery and cantilevered Verandah*

j. SHEETHEN - Series of Bed Rooms
k. BAHIR GHAR- Outside Living Area



(a)



(b)

Figure: 03: (a) Ground floor plan of DO-MAHELA, & (b) First floor plan
The formal elements of the spatial organization are elaborated below:

a. ***AKSAALI_ Pre Function Space or Foyer:*** The entrance space grand in scale, which is used for the accommodation and meeting with the strangers and guests. Floor layed with best quality mud mixing with reddish color in general. Wall is plastered with mud (NUREE). The size of the space is about 15 to 18 feet in length and 6 to 10 feet in width.

b. ***BAHIR PASH _ Courtyard:*** Basically it is a courtyard which acts as the nucleolus of the house - DO MAHELA and spirit of interaction. This space is also used for types of house-hold works and activities. This space is important to keep climatic comfort in the surrounding built form around the courtyard. The length and width of the Bahir Pash is about 20 to 30 feet and 25 to 30 feet. Traditionally people of Bangladesh are used to interact in outdoor space and this courtyard acts as inspiration of all activities.

c. ***KUA TOLA _ Well Shaft House:*** For the daily utility and house hold works water is the essential element for each living being. Well house has many diversified usages; like bathing of domestic animals, washing of all kind of house hold goods and bathing of family members etc. all takes place at the spot. It is located generally at one corner. For better use this space is aligned with the kitchen, store, dining and cow shade.

d. ***HESHEL_ the Main Kitchen:*** This is the space for cooking, dining and storing which is generally 7 to 10 feet in one side and 10 to 14 feet in other side.

e. ***Dining:*** A small square space is extended close to heshel and dedicated to dinning. Traditional ritual is to sit on the floor of dining for taking feast.

f. ***GOOLA GHAR _ Granary and Store:*** Storage space for the seasonal granary is Goola Ghar. This store is engaged with paddy and others corns all the year round.

g. ***CHOWKI - Shower Space:*** A small cubicle space for taking bath.

h. ***DHAAP - Wooden Single Flight Stair at the Verandah:*** A decorative stair is used for vertical circulation, which is generally secured with a double shuttered door. Width of this stair is around 3 feet.

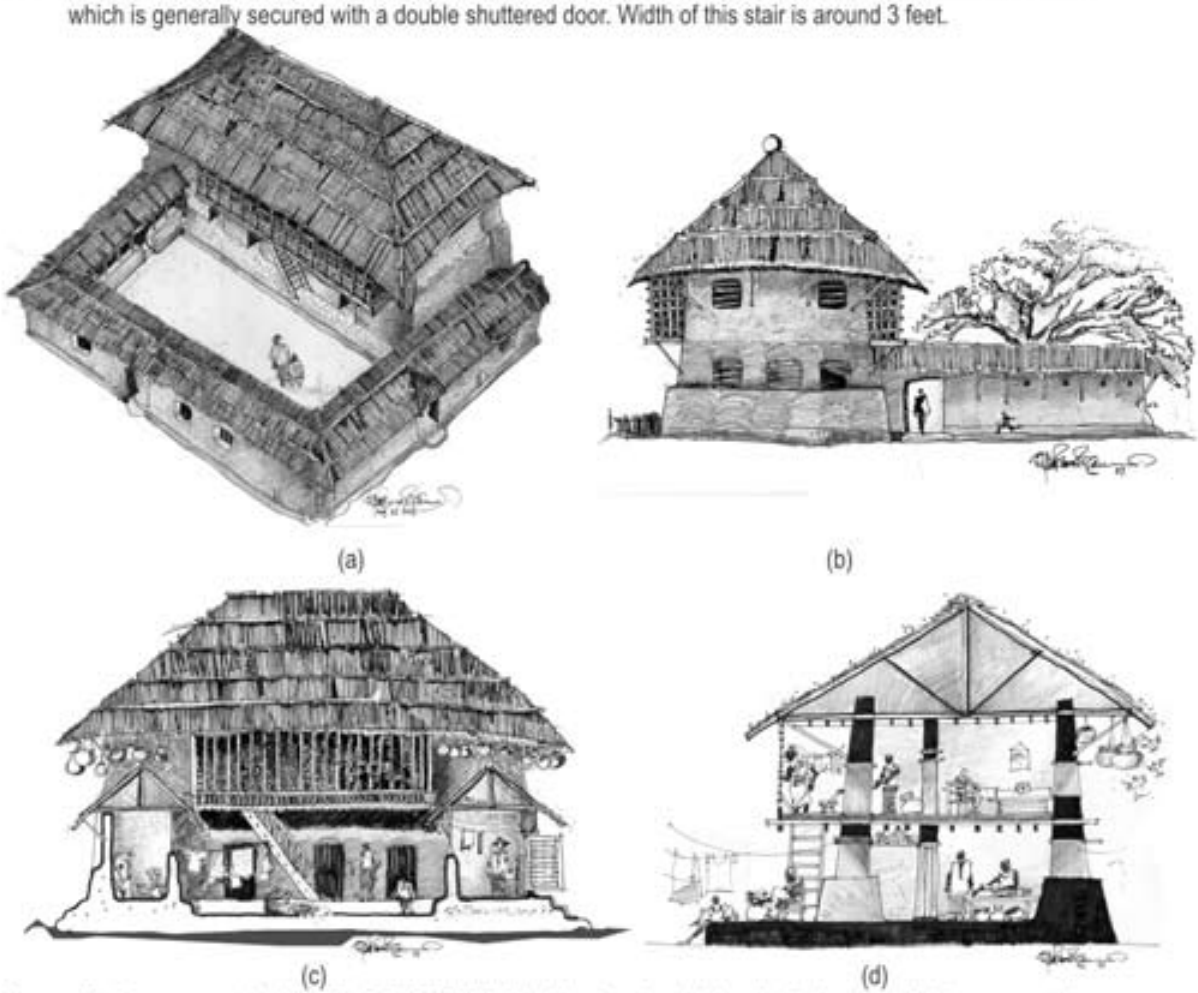


Figure 04: (a) axonometric view of a DO MAHELA, (b) side elevation, (c) longitudinal section & (d) cross section

i. ***PIRA SAJANEE - A Common Gallery and Cantilevered Verandah:*** It is the platform in-between the verandah and the rooms. The space is actually addition of one sort of preparatory stage or common gallery. PIRA SAJANEE means ornamental and ceremonial stage or platform where different types of activities are held. This space works as the air tunnel or circulation among other spaces. The spatial quality of the PIRA SAJANEE is different and dramatizes by play of light and shade.

j. ***SHEETHAN - Strings of Bed Rooms:*** Conventionally the beds rooms are arranged at the north south direction for proper cross ventilation and adequate lighting. More over PIRA SAJANEE works as the spout of an air tunnel to conduct air circulation to each compartment of bed room.

k. ***BAHIR GHAR - Outside Living Area:*** The front house is known as the BAHIR GHAR or Drawing hall. Which is a very common feature of vernacular architecture in this region, This space is also used as sleeping space for guests.

4. A Critical analysis of DO MAHELA

Beyond the construction techniques and the planning organization, this two story mud houses has immense quality which needs to be focused with critical view. The following part of the discussion focuses the special attributes of this indigenous house form of northern region of Bangladesh.

4.1 Inherent Use of the Space

The architecture of 'DO MAHELA' is unique in nature which has developed on the basis of local context and family needs. The use of materials and techniques in this building system has been developed through a continuous process of thousands of years. The building organization and pattern of spaces are the expression of local culture and interaction patterns of the local people. The spatial relationship and the sequence of enclosures (from private spaces to courtyard and courtyard to the community spaces) have been inherited by the inhabitants. Thus here the spaces are inherent and synchronized with land, water, people above all for nature. It has an indigenous meaning. This vernacular development is sustainable in every means of socio-economic-cultural aspects.

4.2 Climatic Control

Courtyard house is an excellent organization to ensure comfort in this hot dry region where the mean average temperature is 35 degree Celsius. So the courtyard plays the most effective role in keeping the house cool and well lit. The massive thick walls work as superb insulators to maintain the thermal comfort at indoor spaces. The heat dissipation is also very convenient for the thick mud walls. So the result is during the summer the interior remains cool and courtyard is comfortable for its daily activities. On the other hand, during the winter interior remains wormer than of the outdoor environment, and the courtyard becomes lively with the glow of shiny sun beam in the winter mornings. During the rainy seasons the projected eves of the house form help to protect from the driving rain and the sharp pitched roof help the rain water to run quickly.

4.3 Context Specific Sustainable Architecture

It has been observed that the sustainable approach in this from of architecture encompasses several characteristics, however each aspect like environmental sustainability, socio-economic sustainability, etc. are essentially context specific. These aspects are either related to the resources that are locally available, or to the customs and needs of the local people. This building technology as well as the house form under consideration is well suited with the cultural, social and physical factors of the region. Thus one can classify it as architecture with appropriate local technology as well as a sustainable architecture in the local context. Here sustainability is essentially context specific. When considering what techniques and approaches may potentially produce popularly accessible and sustainable architecture that responds to the characteristics above. However, the following criteria can form a basis for assessment of Sustainable architecture (Norton, 1999) -

Sustainable Architecture can be defined as that architecture which,

- makes substantial use of locally available materials and local means of transport;
- uses resources that are available in sufficient quantity to satisfy a general demand and not damage the environment;
- does not depend on equipment that is not easily available;
- uses skills that can be realistically developed in the community;
- can be afforded within the local socio-economic context;
- produces a durable result;
- responds to and resists the effects of the local climate;
- provides flexibility to adapt to local habits and needs;

can be replicated by the local population.

DO MAHELA gives the sense of sustainable development; the buildings are vibrant to the people as per their need, desire and aspiration. It creates dialog with land, people and nature.

4.4 Value and Validity of DOMAHELA:

The design and organization, materials and methods of construction of the traditional rural house form - DOMAHELA - have clearly established its local character. The indigenous materials, methods and organization have the potential for improvements to meet the growing needs of the people. It seems that these offer the only viable choice for development of the rural habitats of Bangladesh from the viewpoints of both cost and performance Using uncommon material like wood, concrete, steel, and glass for building construction can waste both money and resources in local areas of Bangladesh where mud is available. Because mud is cheap, accessible, and ecologically sound, it is well known that efforts are underway throughout Africa to overcome negative perceptions of this traditional building material. The use of machinery and the addition of concrete as a binding agent have given new life into the timeless technologies of adobe brick and jalis. Mud bricks can be produced quickly and at cheap rate, and can be made almost as strong as concrete blocks. It has been proofed that the actual cost of the traditional house even with modifications, approximately equaled the cost of the constructional improvements to one pucca house. (Muktadir 1985).

The house form of DOMAHELA is introvert in layout as like as the urban house form to some extent. It consists of combined cloister around a courtyard which exists as an extension of the indoor living areas of the residence. The courtyard maintains a direct and convenient functional relationship with the build form around as well as it ensures privacy from the visitors and passerby. It also responds to some other out-door activities like paddy thrashing,, cloth drying, outdoor cooking, and so on which are the common characteristics in the daily life of an agricultural community of rural Bangladesh. To perform these functions conveniently the compound of DO MAHELA makes a sense of security around the court-yard.

5. Conclusion:

The DO MAHELA is derived from the lives of people and elements of the nature. A house is lively with some natural observable facts, sustaining towards the statement of future, not to look behind, or to stop, but to the solution of sustainable architecture. The existence of DO MAHELA, now a days, are found in a limited number and a few are surviving because people of the region are being changed by the rapid grasp of urbanization. The regionalism and the innate indigenous architecture of our country is becoming a rare treasure for us, as we are loosing our treasury and strength of "indigenous" meaning, towards which we are not yet responsive. It certainly is about time we understand the value of our cultural continuity which can act as a major catalyst for sustainable built environment. We must look back towards our precious past positively and develop an attitude to identify the simple, sustainable and contextual answers." DO MAHELA" definitely deserves a pivotal position in that respect.

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