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Assam Type Architecture; Problems and Prospects

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Abstract: Sustainability, energy efficiency and green architecture etc. are some terms frequently used due to the growing concerns of the depleting energy resources. Some groups are actively engaged in trying to work towards it, while most others are blissfully ignoring these environmental concerns and going ahead without considering the impact their actions are having on the environment. But to address it to the ever evolving modern lifestyle, which wouldn't prefer using a simple mud house over a well-built concrete structure, is the real concern. The objective of this paper is to focus on the importance of the revival of Assam type Architecture or 'Ikora Style', with adaptation to modern context and technology. The methodology for the paper would be to select an area in Kamrup district and collect the general features of an Assam Type house and its benefits. This will be supported by the study of how it has sustained over the years; and the negative impact its dismissal is creating on the environment. The reason behind its prolonged sustainable existence being it is climate responsive and seismic resistance. An assessment on the prospects and problems with Assam Type Architecture are discussed.

Keywords: Assam type Architecture, Sustainable concepts, Climatic design, Seismic resistance.

1. INTRODUCTION

Earth has been in existence for approximately 4.54 billions of years, whereas humans have been comparatively for a far lesser period – approximately 2 million years. Yet in this extremely short span of time, human beings have left no stone unturned to change the face of the Earth. It is an unarguable fact that half the world environmental crisis is because of the giant leaps that technology has taken and the role of globalization. In earlier times, nature and man lived in harmony until the 1950s. Rapid industrialization began in 20th century and until then it was not so noticeable. But gradually the scale increased and industries like extracting and processing of raw materials like mining, steam power, etc. developed in an escalated rate and now out of the world's total energy consumption 80% is obtained from fossil fuels which are a composite of oil, coal and natural gas. Humans have also used up a lot of metals available. These resources take hundreds of millions of years to form, so they are non-renewable, at least for the current lot of human beings. It will need another start of life on Earth before anyone can use new fossil fuel resources.

Building Industry is one sector which uses 40% of the global energy, 25% of global water, and 40% of global resources and emits approximately 30% of the greenhouse gas emissions (UNEP) This started with the evolution of new building materials the most important one being R.C.C. which has an extremely high embodied energy as compared to any other material. The traditional or vernacular architecture of a place is a reflection of the protective measures for the structures that have been evolved over the years. These have the power to sustain from various kinds of calamities.

But the usages of these methods are nearing obsolete. We, as architects and members of this industry, need to look for alternate methods to leave a less carbon imprint on the Earth. The momentum for revival of lost methods and practices have started, we need to join in.

2. VERNACULAR ARCHITECTURE

Vernacular Architecture, also used synonymously with traditional architecture, is the style of buildings that reflect the local style of a place. It is constructed out of locally available materials. And this kind of construction did not come from architects. It is knowledge of practices passed down over generations in a community.

Over the years, the basic design may evolve adapting to changes and natural conditions. Vernacular practices are an evolution over the years, hence it can be considered as a scientific contribution to building design.

A house located in a hot climate wouldn't have an opening on south wall. Or a house in a high precipitation level place will have a sloping roof to wash away and avoid collection of water from the rains. Hence, a house native to a particular place is climatologically designed, which makes it an energy efficient design from climatology point of view.

The materials used are also locally available materials which reduce or sometimes totally negate the transportation costs, hence making it economical. Another aspect is the seismic factor. The houses in the NE Region of India or Himachal Pradesh, they are built of lightweight

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materials that are flexible enough to sway with the land when the earth shakes.

All the people contributing towards creating built environment should start doing serious environmental impact assessments on the materials and technology in use for the betterment of environment.

3. INTRODUCTION TO THE STUDY

The area studied and discussed is Kamrup district of Assam, which lies in zone 5 of earthquake prone regions of the hot and humid climate.

In Assam, prior to British domain, the Ahom kingdom ruled for 600 years. During their time, they built houses which were very impracticable, expensive and difficult to construct. On the other hand, the common people constructed houses with thatch roof with bamboo wall plastered with mixtures of mud and cow dung, suitable for the tropical, humid climate of the region.

When the British took over, they studied the local environment and understood the benefits of 'common people' house. So during British colonial architecture, they have constructed comfortable and beautiful buildings made of local materials and named it as Assam type house. So in Assam, the style of most of the official buildings, educational institutions, residential houses are of Assam type houses.

But gradually these houses leave their place for R.C.C houses. Most of the beautiful houses, once a sign of aristocracy, dismantled to build concrete buildings for multi-dimensional purposes. During the globalization era, this process became more distinct because as a result of globalization, there is a boom in construction industry. In the name of development, in Guwahati city and most of the towns like Jorhat, Dibrugarh, Tinisukia etc. the residential flats, business complex etc. are sprawling up here and there without any proper guidelines.

In architecture, the initial step to sustainability is to reduce dependency on energy consuming installations and hence designing such a structure must be responsive to the climate and topography. Built spaces should be considered as living spaces which have the capability to feel and react. People in different parts of the world are engaged in finding out a solution for sustainability, energy saving, green architecture etc. In India too, there is a growing concern for the sustainable development in construction. As a result, people are working towards a better future, though at a minimum level. So the need for vernacular architecture is again recognised.

This paper will discuss different vernacular housing typologies of Assam. The paper will try to find out problems and prospect of Assam type house and to what extent this vernacular technique can be blended with modern techniques is the key focus of the study.

4. METHODOLOGY

SL. NO.	CONTENT
1	BACKGROUND STUDY OF EXISTING OR SIMILAR STUDIES
2	DESKTOP DATA COLLECTION
3	ON SITE DATA COLLECTION
4	OBERVATIONS
5	ANALYSIS
6	CONCLUSION

5. AREA FOR STUDY

Kamrup rural has been taken into consideration for live case studies. Out of a survey of 15 households, the ones with major difference have been documented for the purpose of this study.

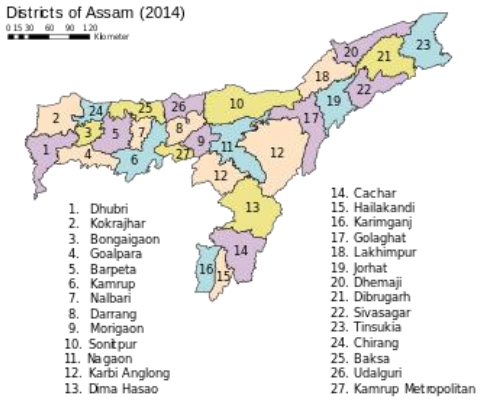

Fig 1. Map showing districts of Assam

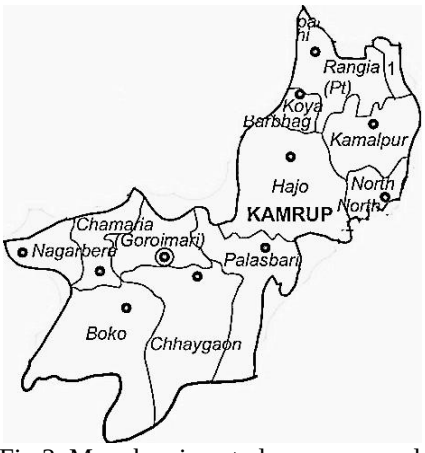

Fig 2. Map showing study area covered
(Source: www.wikipedia.org)

6. CASE STUDIES

6.1 HOUSE 1

Occupants: This house belonged to a family of 6 people.

Materials used: For ceiling, a frame of Sal wood is made and battens (Battam) are laid down, which forms the inner part. The foundation is stepped foundation. The thickness of the foundation decreases upwards gradually from 20", 10" and 5" and then the half height wall is of 3" thickness.

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The roof in the central part of the house is of 4.5m and above the verandas are is of 3m height. So the interiors remain cooler than the outside and open spaces are given more area than enclosed spaces. The overhang reduces the direct heat from entering inside.

The mud plaster needs regular maintenance. The original reinforcing was Ikora Reed, which is now replaced gradually with bamboo strips. The kitchen had openings on the upper side of the wall covered with grilles and perforated metal, which takes out all the heat from the inside of kitchen. Toilets are located outside the main house, which is a typical feature of Assam type houses.
Age of the house: 50 years

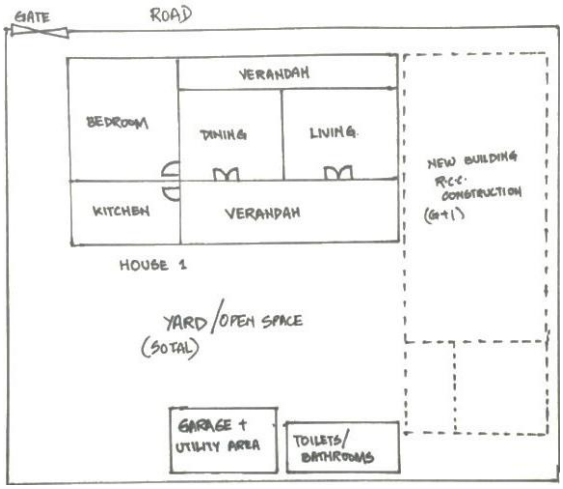

Fig 3. Layout of Spaces in House 1


Fig 4. View of House 1

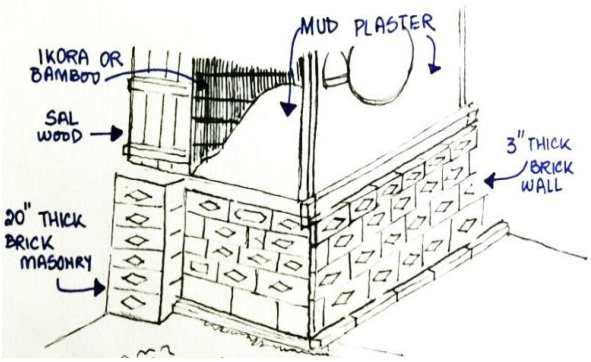

Fig 5. View of House 1 showing materials

6.6 HOUSE 2
Occupants: Joint family. Number of members in this house are 9. The post of the house is of Sal wood. The Sal wood used in this house is Hajo Sal Said to be the best wood for construction purpose. The house had mud floors. The walls are made of ikora, plastered with mud. The doors and windows are of wooden. There is high ventilation in the house. The only change made in the house on the roof. Previously the roof was of thatch roof. But at present the roof is now tin sheets.

There is 3-4°C difference in temperature from outside temperature. In summer, it is very pleasant to live in this type of house, considering Assam lies in warm and humid zone.
Age: 65 years

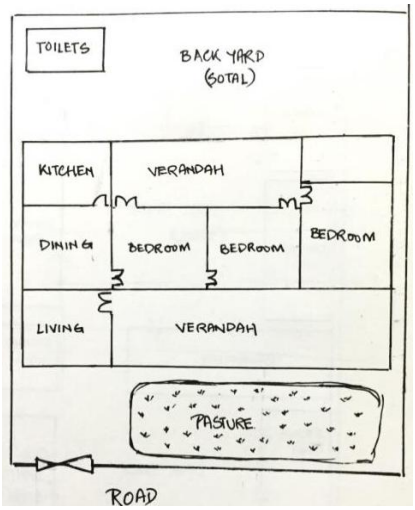

Fig.6 Layout of Spaces in House 2


Fig.7 View of Veranda; Hajo Sal wood columns, mud flooring

6.2 HOUSE 3
Occupants: This house belonged to a family of 2 brothers whose source of livelihood is cattle rearing. The spaces were typically laid out and areas were arranged on the periphery of the open yard ("Sotal"). This is also an inward facing house from the road.

Materials Used: The shed is made of a split bamboo frame holding matted bamboo made specifically in Karbi Anglong area. The wall of the house has three different

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parts with an R.C.C. foundation. The bottommost being a half heighted 3" brick wall above which is a light permitting spliced bamboo worked wall, known as Torja and the topmost part being a lesser light permitting Torja. Roof is of thatch. Repairing is needed for every 6-7 years. The cow shed also is of thatch covered roof and the house has tin roofing.
Age: 12 years

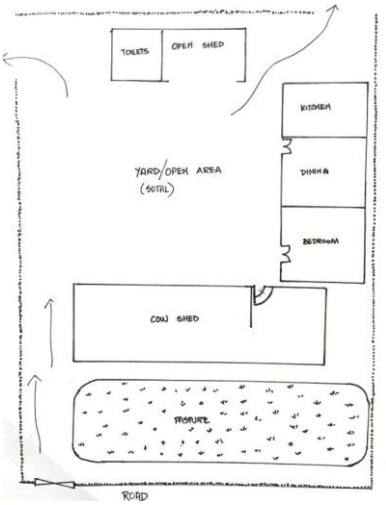

Fig 8 Layout of Spaces in House 3


Fig 9 Posts to support spliced Bamboo wall

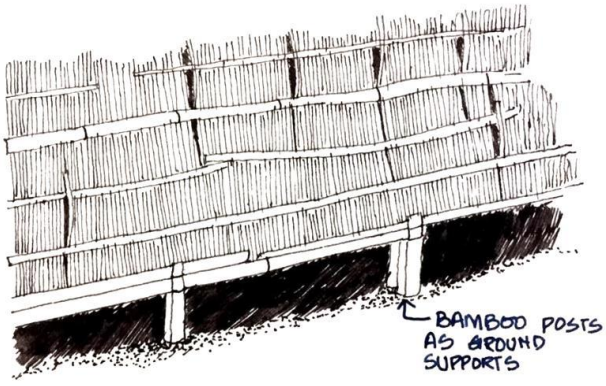

Fig 10 View of House 3


Fig 11 Matted Bamboo made in Karbi Anglong

6.3 HOUSE 4
Occupants: This is a joint family house, with 16 members. This is a larger scale area. The plot being divided into two parts: one in the front and one at the back.
This is another type of kutccha house with the only difference is that instead of bamboo or thatch, aluminium sheets are used on the roof. As thatch is not available easily and aluminium sheets are more durable, so people have adopted to this alternative. The living area building is fairly new, so it is a cement construction. The other buildings are made of typical vernacular style materials. The doors, windows and other wood work are done of Ahu wood. AWooden post and framing is done, where bamboo is used as filling and mud is plastered over it. At some places, the mud has disappeared and the bamboo can be seen. The floors are also of mud. These houses, except for the living room building, are made of Torja.


Fig 12 blocks arranged around the open area


Fig 13 View of block beside entrance

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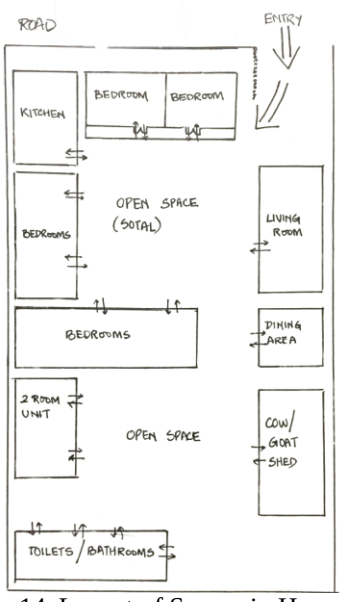

Fig 14 Layout of Spaces in House 4

For protection against dampness, bottom of the walls and posts are painted with Indoplast (oil based paint). The arrangement is again inward oriented from the road and spaces are arranged a long the periphery of the site.

6.4 HOUSE 5

Occupants: A family of 4. Has a similar kind of layout to the previous houses. The boundary was not very prominent on the outer side of the property. It is an introverted layout from the road.

Materials: Foundation is brick stepped foundation. Half brick wall. Upper half of wall is bamboo strips plastered with mud and painted with lime. For the doors and windows, Ahu wood is used. The roof is of double roof. The inner layer consists of Ahu wood frame holding matted bamboo strips. The veranda has asbestos sheet roofing while the higher roof was of thatch. The upper part of the shorter walls had bamboo strips jaali, called Jelenga, which is for ventilation.

Age: 23-25 years

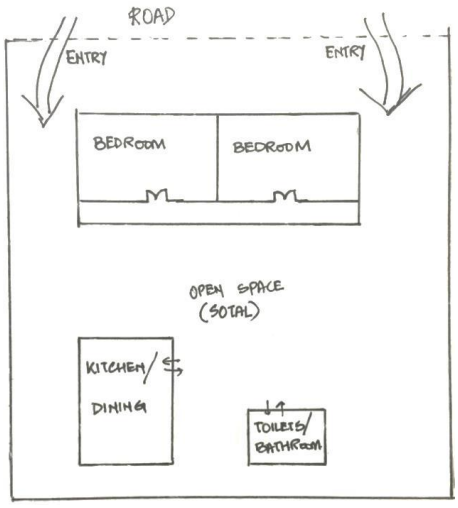

Fig 15 Layout of Spaces in House 5


Fig 16 View of House 5

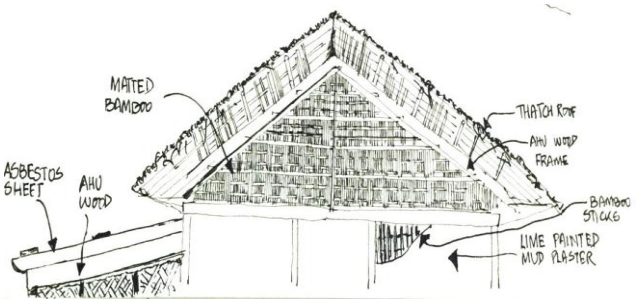

Fig 17 Elevation at Roof Level

6.5 HOUSE 6

Occupants: A family of 4. It is accessed by a pathway from the main road. It is a slight transformation of the Assam type house in terms of materials.

Materials: Foundation is R.C.C. Boundary is marked by Dhansa Tree stems. The wall construction is fully brick wall with cemented floors. The roof sees a changing pattern from thatch to asbestos. The wood used is Sal wood.

Age: 25 years

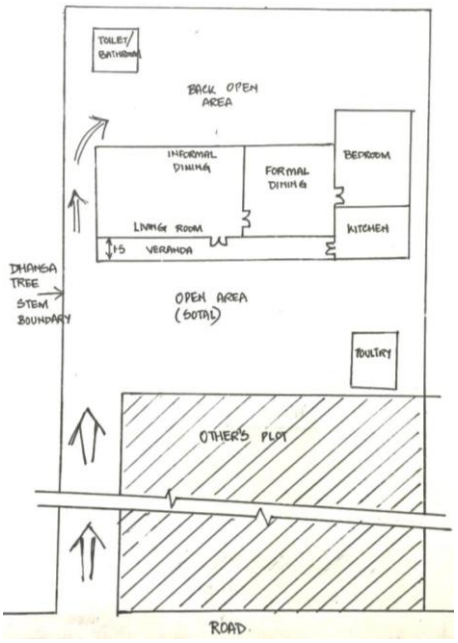

Fig 18 Layout of Spaces in House 6

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Fig 19 House 6

Fig 20 Dhansa Stems used for Boundary

7. DESKTOP STUDY

The Chang House:
The house is on stilts with a big hall and a central kitchen for a large joint family. A lower part of the house is used to provide shelter to animals that every household rears. In river side villages where people live in flood plains, animals were provided shelter on the raised home along with people. On the other hand these houses were also made to provide protection from wild animals. Apart from the main house there is a traditional granary on raised platform. It is said by the elders of the Mishing tribes that the present river banks of Brahmaputra were tall grassland and also had very thick vegetation of reeds leading to favourite game area for wild elephants. They say that elephants do not attack houses on stilts and therefore not destroy even the granaries; the grains are also protected from moisture, rodents and floods.

Fig 21 View of House on stilts

(Source: NIC, Dhemaji Distritu Unit)

The major components of these houses are bamboo, cane and palm leaves for roofing. Bamboo is widely used for pillar, linter, floor, roof, door etc. Bamboos are aptly called the poor man's timber and are found in great abundance in the North Eastern region of India. Their strength, straightness and lightness combined with extraordinary hardness, range in sizes, abundance, easy propagation and the short period in which they attain maturity make them suitable for the purpose. (NIC, Dhemaji District Unit)

8. OBSERVATIONS

The houses are all inward oriented from the main entrance. Hence it has a sense of privacy.
The spaces are all aligned around a central open space known as 'Sotal'
More emphasis is on having spacious open areas than closed rooms. The rooms are of smaller sizes compared the plot sizes.
Individual units rather than one whole continued building. This is seismically very effective.
Lightweight materials are used for construction in Assam type construction, unlike in R.C.C. construction. Again, it is a seismic efficient practice.
Toilets are located at the back of the plot away from the main areas.
Tree stems are used in some cases to demarcate spaces.
Gradually, Ikora has been replaced with bamboo and then brick construction.
It is seen only in the rural areas or old constructions. New constructions do not employ much of these methods.
Double roofing layer and the central roof area is of more height. The outer layer was generally covered with thatch, but due to maintenance issues, asbestos sheets were used and now even those are replaced by tin sheets. The inner layer is of a wooden framework, filled with wooden battens or matted bamboo. So it acts as a double insulation layer.

Ventilators are located at a very high level, which is to exhaust the warm air to maintain favourable indoor conditions.

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The thermal condition inside Assam type houses is very comfortable in summers. A temperature difference of 3-4°C is clearly felt between outdoor and indoor temperatures. Hence reducing or even eliminating the need for external mechanisms to keep interiors cool as compared to R.C.C. structures.

9. IMPORTANCE OF LOCAL MATERIALS

The first and foremost issue that comes with this region is the high danger zone 5 which is why here seismic resistance buildings should be designed. In the wake of recent Nepal ,7.9 Richter (2015) and Manipur, 6.8 Richter (2016) earthquakes, members of the building industry has questioned the sustenance of concrete structures as they are more prone to cause injury than the local materials.

Fig 22 Nepal Earthquake aftermath

(Source: Cafe Dissensus Magazine)

Fig 23 Manipur Earthquake aftermath

(Source: NDTV)

The weight of the indigenous structures are very light due to which even if collapsed, injury rate won't be too high as compared to concrete structures. To make a building earthquake resistant technologies are available, but nature is a force where unpredictability is a dominant trait. No building can assure of a 100% safety and also the quality of buildings due to mass demand and profit inflation factors are of low quality and could not withstand the test of Nature and plummets with exponential intensity when an earthquake strikes.

The construction involves lot of resource consumption and very high embodied energy is involved with R.C.C. constructions as opposed to using local type of constructions.

10. PROBLEMS AND PROSPECTS

10.1 Problems

This kind of housing which was used earlier was not only for residential but office purposes also. But now it is restricted only in rural-urban fringes or rural areas. These buildings can at most go up to two storeys. With rapid urbanisation, the multi-storeyed building has taken over low rise buildings.

Assam type house, in its vernacular form cannot meet the demand of growing population.

Some materials like timber take longer time to replenish. It is not available in an abundant way as it was before and definitely not as much to meet the demands of the growing population. So the use of wood will be restricted.

Due to space constraints, the demand of Assam type houses is less than R.C.C. houses. It is susceptible to fire and termites as compared to R.C.C. structures. The kutccha Assam type house which has mud flooring causes unfavourable conditions during rainy season due to dampness.

10.2 Prospects

The major cause of destruction during an earthquake is the rigidity of the buildings. As mentioned earlier, since the materials used in Assam vernacular style are light weight, hence they have a flexibility to sway with the motion and have lesser chance of damage, which lessens the chance of casualty and injury. Bu it cannot be directly applied in an urban context, so needs to be explored and adopted to modern context with technological inclusions.

The major material used was Ikora (Reed) but over the years it has become scarce and Bamboo has replaced it, which is actually a good transformation. Assam is rich in Bamboo production. It is a renewable material which doesn't have any negative implication on the environment. It can re grow at a fast pace. Bamboo is durable and light weight. So it becomes an important material that can be used extensively.

The "Chang house" (house on stilts) is a good solution for flood prone areas. Originally used for barns, but residences also can be built on stilts. That can be adopted at an urban context to address flooding problems by combining with advanced technology.

11. CONCLUSION

The vernacular practices are mainly prevalent in the rural areas or rural-urban areas. To bring back the old methods, we need some merger with modern technology, as it is not possible to follow direct suit of a rural setting and plant it in an urban setting. In this context, integration of modern technologies with the traditional wisdom can bring

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sustainable and positive results. So towards a sustainable environment, it is very important to look at the past, where without very advanced mechanisms; people did just fine without leaving huge negative footprints. Through various studies and observations, it has been seen that Assam type buildings are durable, seismic resistant and climatologically efficient. So all the stake holders of this industry including policy makers, architects, engineers and researchers, etc. should work towards the revival of Assam type Architecture by devising new methods to adopt it in modern context.

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