

Sustainable Built Environment: Learning from Vernacular Settlement – A Case of Manapad, in the Coastal Stretch of Tuticorin

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Abstract

Objectives: This paper aims to illustrate the identification of sustainable principles like climate responsiveness, indigenous technologies, locally available materials etc. that will provide important insights for the people involved in the development of sustainable built environments. **Methods/Analysis:** For the purpose, a case study of Manapad, located in the coastal stretch of Tuticorin, South India, which has a unique sustainable and cultural significance, is studied. The various principles of vernacular design and technologies that lead to sustainable performances are analyzed. The case study is studied at settlement level, street level, and individual dwelling and elements. Related literature reviews, field visits, documentation, sketches and photographs are used to analyze the case example. **Findings:** It is found out that vernacular architecture is more sustainable than the present built forms. Thus the principles that are adopted in vernacular architecture are analyzed in detail, so that they can be incorporated in the present architecture. The sustainable features in the case example that leads to sustainability like spatial organization, spatial flexibility, and spatial adaptability are identified and critically analyzed. Climate responsiveness, material usage, density and sense of space and cultural adaptability are identified as reasons behind its sustainable nature. **Novelty/Improvement:** This paper deals about the intangible aspects that are indirectly associated with sustainability like culture etc. Hence this paper brings in a new dimension on how to create sustainable built environments.

Keywords: Climate , Culture , Indigenous Technologies, Materials, Vernacular, Sustainable

1. Introduction

Vernacular architecture is the architecture of the locale. It is built by the local community and reflects the needs, function, their culture, geographical location, historical context etc¹. Hence it is generally accepted that traditional or vernacular architecture is well adapted to the dominant climate of that region². Vernacular architecture has evolved through trial and error methods, because of the limitations of resources and known construction techniques. Vernacular architecture thus evolved with ways that were most efficient out of necessity³. As a result, sophisticated and innovative building forms and designs evolved that

are culturally adaptive and became environmentally sustainable⁴. This is the reason behind the success of its continuity. Vernacular architecture can hence be seen as the essence of sustainability with its inherent characteristics⁵. Vernacular settlements are thus also considered as the predecessors of sustainable built environments.

2. Case Study: Manapad

2.1 Description of Case Study

For the purpose of exploring and understanding the suitable design principles of a built environment, a coastal

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village ‘Manapad’, near Tuticorin, Tamil Nadu, India, shown in Figure 1, is identified and critically studied. Located in the coastal stretch, Manapad is a fine example of sustainable communities that adapted to the hot and humid climate of the region and made use of only the local resources for their buildings. It is about 58 kms. South of Tuticorin, and totally depends upon the sea for its living. The topography of the area, also promotes this fact.



Figure 1. Maps showing the location of the village.

The coastal stretch of Manapad, extends to about 3.15km, and has a total area of 260 acres. It is a Christian populated area with a total population of about 6000 inhabitants. It is close to Tiruchendur, one of the famous Hindu religious towns in South India and Kayalpatnam or Korkai, a Muslim town and an ancient silk route port.

The growth of the village is explained through Figure 2, originated from the shoreline as they depended fully on sea for their occupation. The growth further extended towards the western part of the village, connecting the neighboring places. The village is said to consist of three main clusters.

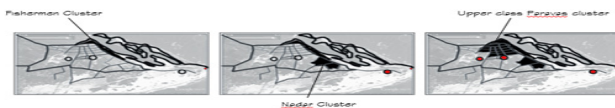


Figure 2. Maps showing the growth of the village.

2.1.1 Fishermen Cluster:

Fishing is the primary occupation and people who depended on fishing, formed the first cluster. The settlement grew in an organic way along the coastline in clusters. Occupation related structures, shown in Figure 3, like auction sheds, fishing nets stitching sheds etc. were placed near their dwelling units.

2.1.2 Nadar Cluster

The next settlement was a community settlement and also grew in an organic way, towards the western part of

the village, and were occupied by the Nadar community people and followed supporting activities for fishing like boat building, basket weaving etc.



Figure 3. Fishing sheds and other occupation related structures.

2.1.3 Paravas Cluster

The third settlement was also another community settlement and was planned in a proper grid iron pattern, with the churches on one side and with the backwaters on the other side. This settlement was inhabited by the upper class people, whose main occupation is trading with Ceylon (Srilanka).

There are four types of roads as shown in Figure 4 They are:

1. The main streets are the traditional streets which facilitated chariot movement during church festivals and hence were wide.
2. The next category of roads marks the boundary of the place and are now used for vehicular usage.
3. The third category of roads are slightly lesser in width and connects the clusters with the primary or main streets.
4. The final category of roads are lanes, which are very small and facilitates internal movement within the cluster.

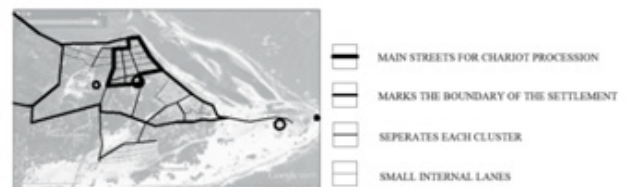


Figure 4. Map showing the hierarchy of road networks.

The houses in Manapad are all more than 100 years old. The architectural style of the houses are of Ceylon-Portuguese style. It has an extroverted planning with lots of open and semi-open spaces as shown in Figure 5, like Balcoes, verandas, and Balconies etc. which faces the street and sea. Balcoes are nothing but covered porches which are commonly found in the facades of traditional Portuguese houses of Portugal, Ceylon and (Goa) India. The balcoes were the places where men and women could sit together and chat with neighbours or just enjoy the evening breeze. The façade of most houses are symmetrical with tripartite divisions.



Figure 5. Balcony and Balcoes spaces for good air circulation and scenic views.

2.2 Sustainable Concepts

2.2.1 Climate Responsive

The settlement is divided based on the topography of the land and is visually represented in Figure 6.



Figure 6. View of arrangement of houses from the sea.

The single storied houses are placed near the coastal stretch where the land is slightly at a low level and the houses that are more than one floor are placed on the elevated land as shown in Figure 7. Thus good air movement can be achieved throughout the settlement.

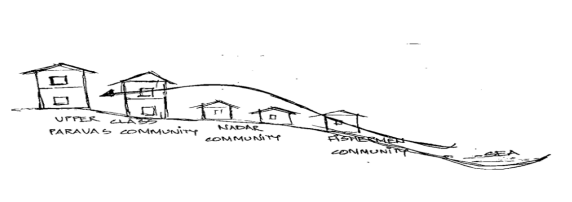


Figure 7. Logical arrangement of houses according to the site topography and building heights.

The dwellings reflect occupant's activities in their lives while adapting to the warm and humid climate. The settlement is densely vegetated, as shown in Figure 8 and hence it is protected from sun. The settlement is designed in clusters in the Fishermen community area and Nadar community area and in a proper grid iron pattern in the upper class Paravara community. The places which are designed in clusters, have lots of open spaces in between. These open spaces provide air flow movement, within the settlement in all directions. In areas where the houses are designed in a grid iron pattern, the houses have an extroverted planning with lots of open spaces around each dwelling unit, even though they are compounded individually. The houses also have lots of open and semi-open spaces like courtyards, balconies, balcoes etc., that facilitate good air movement within the building. The balcoes and balcony have wooden partition for privacy purpose, which have small perforations. These perforations filter sand and other dust particles and allow air movement within the place. Large ornamental arched windows with louvered shutters, facilitate good air movement as well as visual connection between the house and the surrounding environment. The houses have high ceiling about 12' high and hence hot air can escape from the openings provided near the roof.



Figure 8. Vegetation at settlement level, street level and individual built form level.

2.2.2 Material Usage

All the houses in the village have sloped roof with burnt clay tiles and have become a typical character of Manapad. This gives a good view when viewed from the

sea. The houses are built using Noraikal, which is a type of coral stones (having high lime content). Lime plastered walls which are about 1'6" thick and hence increases time lag for thermal conductivity. Locally available timber are employed for construction and other ornamentation work as they were available in abundance. Rooms have false ceiling made of wood and this further helps in reducing the heat entering the building. The air gap in between the two ceilings facilitate this character. The color of paints used in the building exterior are light in colour and hence reflect heat and radiation.

2.2.3 Density and Sense of Space

Vernacular settlements are characterized by their compactness of form and efficient utilization of land and building ecology which has many environmental, economic and social advantages compared to the dispersed form of settlements of our modern cities. Energy consumed is decreased to a maximum extent because of this factor. Transportation within the village becomes easy, service lines are laid at a smaller distance and hence reduce laying cost and the maintenance also becomes easy. These settlements are extremely dense townscapes that are firmly unified buildings, showing a high degree of complexity, cohesiveness and social bonding. This results in a rich townscape endowed with much aesthetic appeal and distinguished cultural history. They are cloaked in their simplicity that drive the design and create a place which breeds spontaneity. Traditional vernacular architecture conceived the building as a living architectural entity in its own right, shaped according to the distinct needs of social and cultural requirements⁶. Manapad houses are no different as shown in Figure 9, and share all the qualities and hence are sustainable.

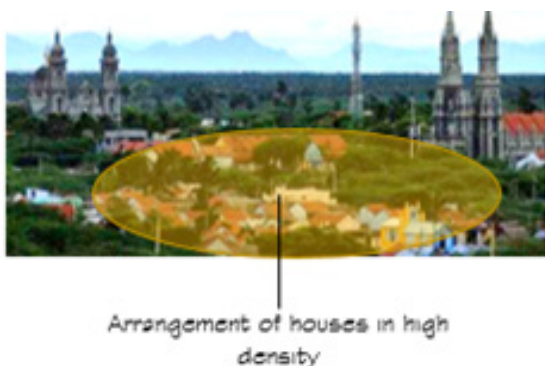


Figure 9. Density of space creating a unified nature in Manapad.

2.3 Culturally Adaptive

Flexible and adaptable design is another hallmark of the vernacular mode of building, which ultimately leads to sustainability. Housing that provides freedom of choice and is easily adaptive to changing needs and desires of the families over time are sustainable⁴. Manapad has a very unique culture, because of the Portuguese invasion during the 14th century and trade links with Ceylon (present Sri Lanka). The village remained intact until 1540's and later on Indo-Portuguese style of Architecture came into existence. It thus has a cultural mix of India, Portugal and that of Ceylon and this uniqueness is revealed in their architecture. The culture of Manapad, has gone through many changes in its religion, occupation etc. The village predominantly have two different types of class stratification other than stratification through caste, the high income class people and lower class people. The lower class people are not much influenced by the foreign culture and are settled in clusters with lots of open spaces in between the dwelling units. The boundary of the dwelling units extend even till their streets. The open spaces in between the clusters are used for various purposes, as social gathering spaces and for other activities like drying clothes and as play area. These spaces are also used for occupation related works too, like drying of fishing nets etc. This also promotes the bonding between the inmates of that cluster. The other class of people are people belonging to the high income group. These people adapted European outlook but did not cut themselves completely from the cultural roots of India. This resulted in a unique culture which can be seen even through their external appearances like dressing style, food, their language (Tamil accent) etc. Privacy is one of the main character that can be seen in traditional houses but their houses had an extroverted plan, with lots of semi-open and open spaces facing the streets and sea to provide good views.

These groups also have open spaces, as shown in Figure 10, but are completely bounded by a compound wall. Every house has its own open space as courtyards, front yards and backyards and are used for various purposes by various people during various times of a day. The front yard is used by the visitors and the owners of the house. The courtyards are used only by the inmates and the backyard is used by the servants. They tend to live a luxurious life, and that nature is reflected even in their built forms. They build massive houses, with detailed and rich ornamentations. They still have strong ties with

Ceylon through trade and still some of their relatives stay and also own property in Ceylon. Hence import of materials is very easy. They tend to show off their status, power or wealth and strictly adhere to demarcation of classes. Women are treated equal to men and hence there are no segregation of male-female spaces. The spaces in between the dwelling units and the surrounding open spaces are vibrant and used for multi activities like social gathering spaces, play areas etc. They had a close bonding between the people of their community and the spaces related to their occupation. Thus the same architecture accommodated people from different cultures with minimal changes being done to it. This flexible and adaptable nature of vernacular architecture is one of the main reasons for its sustainability till the present day.



Figure 10. Open and semi-open spaces, but still being enclosed by wooden screens.

3. Conclusion

Human settlements are always sustainable in nature throughout the history. Only after this period, the art of living in harmony with nature and making use of locally available materials started diminishing. This led to the increase in the use of energy resources. Vernacular architecture brings out the full spirit of the place, by bringing

in a genuine and symbiotic relationship between the environment, the built form and its inmates. We should thus represent the ecologically sensitive issues of a region, climate and culture to achieve a sustainable human settlement. If an intimate knowledge of a particular place is understood, then a sustainable built environment can easily be designed².

4. References

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