VERNACULAR ARCHITECTURE OF SOUTH KANARA AND SUSTAINABILITY

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Abstract : Environmental sustainability is more directly related to architecture. Architectural sustainability is mainly achieving comfort indoors and effective energy usage as far as residential architecture is considered. Vernacular buildings are the perfect examples of architecture evolving according to human needs. These built forms, which are region -specific, are a product of centuries of experimentation, shaped by social, cultural, religious and technological influences. The vernacular architecture of a region not only has a heritage value, which is reason enough for their study, but has tremendous potential for influencing the current architectural trends in that region. This paper deals with the passive design strategies of Vernacular architecture of south kanara and its contribution towards sustainability.

IndexTerms - Vernacular, sustainability, built forms and comfort**.**

1. INTRODUCTION

Buildings are major consumers of energy as far as their construction, operation and maintenance are concerned. There is an ample scope for saving energy in all the three phases. It is estimated that almost 50% of the global energy demand comes from the building sector. The indoor environments are critical from the point of view of human comfort and health.

In vernacular architecture, sustainability is manifested in the design of buildings, use of materials, response to environment and social concerns. There are indeed many lessons to be learnt from vernacular architecture. The vernacular house often represented the result of many years or even centuries of optimization in relation to the resources of materials and labour, the activities carried out within and around the dwelling, the social organization of the household, and the climate. Gradually, as new materials and techniques of construction developed, vernacular built forms evolved to provide a harmonious balance among buildings, climate and people's lifestyle.

However, at present man has forgotten how to design with nature and tends to ignore the climate while he has become preoccupied with forms currently fashionable. The modern dwellings look much the same world over because it has been designed largely to separate conditions inside from the outdoors as much as possible, relying on mechanical devices and systems. With the increase in standard of living, the consumption of energy in buildings is rising. On the other hand, aspects of sustainability are absent from almost all modern buildings in the region for many reasons: rapid development, use of foreign materials, design methods and construction systems. The reason we must take care in interpreting the lessons from vernacular house is that vernacular buildings of earlier times had many built-in architectural features for achieving comfort. They are shaped and planned to take maximum advantage of the climate and surroundings. The conditions in which and for which it developed, have changed. The activities within the dwelling have changed and the materials available for building have changed [1].

Sustainable design and construction strategies are of great importance now. Sustainability was already a driving force in the past, manifesting its validity through the different forms and techniques used.

1.1 Vernacular Architecture

The objective of vernacular architecture is based on local needs, local building materials, and reflecting the local traditions. This type of architecture is normally not built by formally trained architect but more rely on design skills and tradition of local builders. The elements used in these type of architecture are based on functional need most of times , taking care of climate , building material, social and cultural need of people as well economics . The technology involved in this type of architecture is very appropriate to the local needs.

1.2 Climate of South Kanara

South Kanara region lies between Arabian Sea on the one side and the Western Ghats on the other. It is a geographically isolated region prone to heavy rains, next only to Cherrapunji. The average rainfall amounts to over 3500mm per annum. The climate in the region is classified as warm humid where the day time temperatures range between 32 and 38 degree Celsius for most part of the year and the monsoon months, from June to October bring torrential rains from south west. Providing relief from oppressive and sticky heat is critical in summer months.

The westerly sun is very scorchy and piercing due to almost pollutant free clear environment lust evergreen forest around. The predominant wind direction is South West. The unique problem in this region is to control the effect of the sun and the driving rains from the same direction and the same time effectively allowing good ventilation. This is a tricky situation.

1.3 Design in warm humid climate

The Architect has to consider the following aspects while building in warm humid climate-

1. Provide maximum ventilation with free air movement by large openings
2. Provide maximum shading from direct and diffused solar radiation
3. Avoid heat storage
4. Use ventilated double roofs
5. Use vegetation to moderate solar impact.

2. SUSTAINABILITY

A remarkable feature of vernacular houses of this region (Mangalore and Udupi region formerly referred to as South kanara region) is their excellent adaptation to the typical climatic conditions of the region. Thermal comfort is achieved in these houses by proper layout, design, detailing and selection of appropriate materials. The thick walls of mud provide insulation from external solar heat.

3. ARCHITECTURE OF SOUTH KANARA

3.1 Spatial Configuration

These houses are set usually in the middle of their agricultural fields. The house is usually enclosed by a high compound wall. All the living areas are arranged around a central courtyard. The type of community, life style, size of family, and available space were some of the factors which determined the size and character of this open space. Some of the large houses have more than one court.

Figure – 1 Ariel view of a Vernacular residence

The backyard of the house too formed an irregular court, much larger in area compared to the front formal courts. The rear court was used as an extended wing of their main activity of occupation viz farming. Structures like cow shed, stores, servants, quarters, toilets, rice mill etc. partly acted as outer boundaries of this court. High mud walls enclosed the irregular court in the remaining portions.

Figure – 2 View from courtyard

Figure – 3 View of the interior

3.2 Construction Techniques and Materials

Sustainability and energy efficiency are greatly affected by the material choice of the building envelope. The interiors are comfortable because of the appropriate selection of the materials for construction.

The main building material in the region is wood, Mangalore tiles and laterite stone. Mud and wood are the materials used for superstructure in the majority of the buildings. The mud walls are supported on granite foundation. The walls are very thick ranging from 30 cms to 40 cms in the ground floor. In vernacular structures the use of the material is more important rather than the age of the building. The table 1 gives the materials and their thickness used for different building components of vernacular construction.

Table – 1 Materials used for construction and thickness in Vernacular construction

Building component	Thickness	Material used
Roof		Mangalore tiled roofing with rafters and battens of wood.
Wall	30 cm	Mud walls with lime plaster / cement plaster
Floor	-	Red oxide flooring

The sketch below gives the typical section of a vernacular house which shows the detail of mud wall constructed over granite foundation and large overhangs to protect the structural wall from rain and sun.

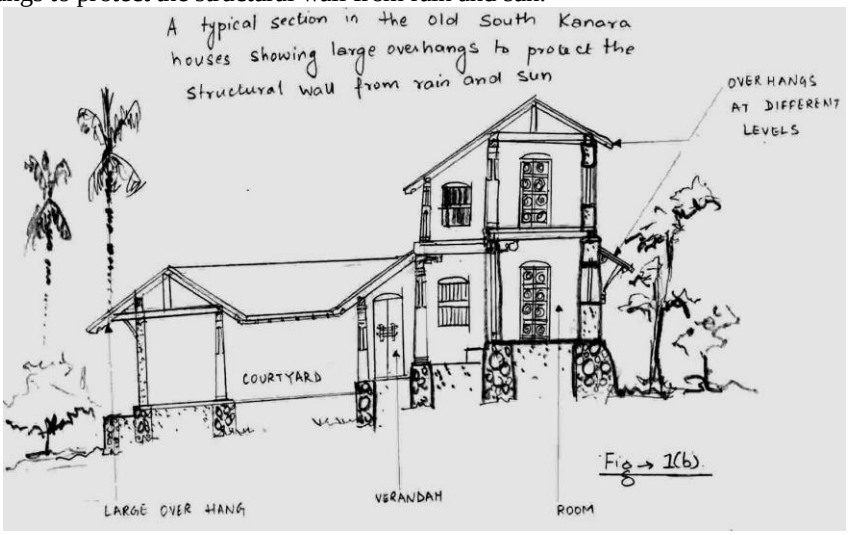

Figure – 4 Typical section

3.3 Building Form

Most of the buildings being only two storeys high, it has been possible to give adequate protection from rain, since the wind velocity is less at lower levels [2]. South kananra region has warm humid climate, the most preferred house plan is one with courtyard with single row of rooms with connecting corridors which facilitates good cross ventilation. By arranging the room around the courtyard shady areas can be obtained in the courtyard. There is high compound wall s surrounding the houses which are more than 3 meters high.

3.4 Fenestration Design

Fenestrations are provided with wooden square mullions placed close to each other to cut down the solar radiation entering into the interiors and the square mullions are perpendicular to the frame to facilitate the entry of wind. Windows are provided with wooden shutters. The overhangs of the roofs protect the windows, which do not have chajjas, as a rule.

3.5 Stack effect

Traditional Architects were obliged to rely on natural ventilation to render the indoors of the building more comfortable. Stack effect was especially experienced in large volumes i.e., near the staircase. The traditional principles employed greatly increases the wind movement in indoor spaces.

3.6 Roof design

Since more than 50% of the heat gain is through the roofing extra precaution was taken to select appropriate materials for construction. Mangalore tiled roofing with rafters and battens of wood were provided. South kanara roofs have a pitch of usually 23 to 30 degrees. Usually in the front elevation they have hipped profile. Usually double tiling was done to provide better insulation. The bedrooms were provided with wooden false ceiling. The use of double roofs is an efficient way of reducing heat gain.

The roof overhangs are long enough to offer adequate protection to the low external walls. The large overhangs protect the openings and walls from rain as well. The lush vegetation also reduces the intensity of rain beat. Protection from the beating rains in the four monsoon months is an important aspect of building design in this region. Steep, sloping roofs ensure quick drainage of rainwater

3.7 Vegetation

The growing of coconut trees and plants in the surrounding area of the houses generally helps in providing shade to some of the walls and roof portions and reduces incidence of solar radiation, ground reflection and glare. The high canopy of the coconut tree facilitates unobstructed wind moment close to the ground.

4. CONCLUSION

Vernacular architecture gives solutions that are in perfect harmony with nature. Control of the indoor environment is always an important aspect. Traditional methods of construction are ecologically responsive and energy efficient. Appropriate use of materials and adoption of suitable traditional architecture is required for a sustainable and energy efficient construction.

The study of passive design strategies with local vernacular architecture and lessons about climate responsive planning and techniques can be helpful to generate an approach towards energy reduction and climate responsive building design in coastal Karnataka.

4.1 Implications and influences

The vernacular architecture of a region not only has a heritage value, which is reason enough for their study, but has tremendous potential for influencing the current architectural trends in that region. Consideration and development of the above passive strategies allow contemporary architects and designers to build contemporary architecture in a more sustainable, comfortable and self-sufficient way.

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