



SUSTAINABLE FEATURES OF VERNACULAR ARCHITECTURE : RURAL HOUSING AT KELSHI, MAHARASHTRA AS CASE STUDY

GAURI ASHOK KAMBLE

M. ARCH

D.Y. Patil School of Architecture,
Charholi Pune
(MS) INDIA

DR. PARAG GOVARDHAN NARKHEDE

Ph D (Architecture) Guide & Professor

Head of the Department
BKPS College of Architecture
Pune 30 (MS) INDIA

Abstract

The contributions of sustainability to architectural designs are steadily increasing in parallel with developments in technology. Although sustainability seems to be a new concept in today's architecture, in reality, it is not. This is because, much of sustainable architectural design principles depend on references to vernacular architecture, and there are many examples found in different parts of the world to which architects can refer. When the world seeks for more sustainable buildings, it is acceptable to revisit the past in order to understand sustainable features of vernacular architecture. It is clear that vernacular architecture has a knowledge that matters to be studied and classified from a sustainability point of view. This work aims to demonstrate that vernacular architecture can contribute to improving sustainability in construction. In this sense, the paper evaluates specific vernacular housing in coastal region of

Kelshi in Maharashtra and their response to nature and ecology. In order to explain this response, field work was carried out and the vernacular architectural accumulation of the region was examined on site. The features of the examples have been identified and debated in today's sustainable architectural concept. This work holistically evaluates this architectural manifestation, in the light of current knowledge, in order to find scientific justification for its knowledge to verify and promote its application in the future.

Key words: sustainability, vernacular architecture, rural housing, Coastal region architecture, kelshi.

INTRODUCTION

Vernacular architecture is an architectural style which reflects local traditions. It is designed based on the local needs and availability of construction materials



locally. The term “vernacular” initiated in 1800 as a concept. It originated when the people were forced to use natural resources as a shelter, in response to the climate. It is the simplest form for addressing human needs. It is a type of architecture which is indigenous to a specific time and place and is not copied or replicated from anywhere and uses handmade old construction practices. It puts an emphasis on sustainability, on using materials ensuring the home which stays cooler from inside without the need of power intensive air-conditioning. It includes the basic green architectural principles of energy efficiency and using the materials in the proximity of the site.

The contributions of sustainability to architectural designs are steadily increasing in parallel with developments in technology. Although sustainability seems to be a new concept in today’s architecture, in reality, it is not. This is because, many sustainable architectural design principles depend on references to vernacular architecture, and there are many examples found in different parts of the world to which architects can refer. When the world seeks for more sustainable buildings, it is acceptable to revisit the past in order to understand sustainable features of vernacular architecture. It is clear that vernacular architecture has a knowledge that matters to be studied and classified from a sustainability point of view. In most part of Konkan region, there are many healthy buildings constructed to suit the physical and climatic conditions of the area. Local materials have been expertly

used in constructing the structures which are shaped in respect to nature. Kelshi is a small and a prominent village in coastal region of Konkan. The climate together with the geographical structure of the region enabled the formation of a dense vegetation with natural settings.

In this study, vernacular architectural culture in Kelshi, region is examined in terms of sustainable architectural principles. The goal of the paper is to investigate various ecological lessons of vernacular architectural heritage and determine its potential to be applied in today’s architecture.

Geographical Location and Climatic condition of Kelashi :

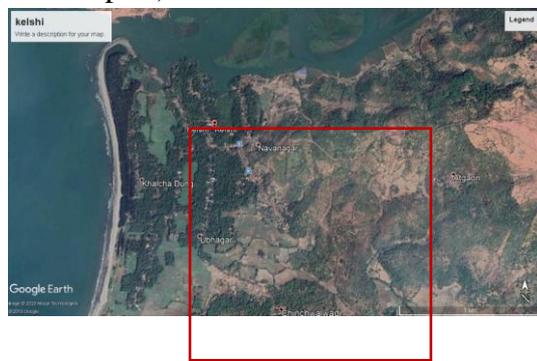
Kelshi Beach is a beautiful beach on the Western Coast of India which is situated near Dapoli. The beach stretches for about 2.5 km just outside the Kelshi village across the Bankot creek. Kelshi is a calm and peaceful beach it is also an tourist attraction. Along the coast of Kelshi are thick woods and groves of Kevda, Cyprus, Coconut and Betel nut. Near by is the uttambar village located.

Apart from the beach, Kelshi is well known as a pilgrim center due to Mahalakshmi Temple and the Yakub baba dargah. Mahalakshmi Temple is located at the base of the Utambar hill. It is an enclosed temple in a stone wall fortification. Temple was built during the regime of Peshwa times. One of the main attractions of Kelshi is a naturally formed

sand dune due to the Tsunami. It is located on the southern side of the Bharja River.

According to 2011 Census of India recorded a total of 3,145 residents in the village. Kelshi's geographical area is 265 hectares.

Kelshi is rural costal area with approximate population of 20,000 (census 2011 report)



PLAN SHOWING GEOGRAPHICAL LOCATION OF KELSHI

1.1 AIM :

Investigate vernacular architectural heritage and determine its potential to be applied in today's architecture to achieve sustainability in construction.

1.2 OBJECTIVE :

Improving sustainability in construction by adopting vernacular architecture.

Economical and sustainable method of construction

Promote local construction material

Reduces embodied energy and carbon footprints

1.3 SCOPE :

Case study of Kelshi

Collection of data

Literature review

Investigating vernacular architecture and its potential to be applied to achieve sustainability

1.4 LIMITATIONS :

Investigate and analyse vernacular architecture (technique, form, materials) of kelshi region to achieve

Sustainability in construction. And not deriving or redesigning of techniques or forms to achieve sustainability.

1.5 METHODOLOGY :

Literature review

Case Study

Measured drawing

Study of vernacular architecture of the region

1.6 EXPECTED OUTCOME :

Guidelines derived from study and interpretation of vernacular architecture to achieve sustainability containing :

Construction technique / Details

Construction materials

Form and shape

1. LITERATURE REVIEW :

Detailed literature is reviewed on the features of sustainability in architectural design together with the features of vernacular architecture.

1.1 Sustainable features in architectural design



Dobson, Andrew. 1996. Environment Sustainability's: An analysis and typology. Environmental Politics

Prior to explaining the principles of sustainable design in architecture, it is proper to explain what sustainability means. An overview of the concepts of sustainability was provided by Andrew Dobson, based on four questions, 1. What to sustain, 2. Why, 3. for Whom, and 4. Substitutability. The word 'Sustainable' "is often used to characterize a technology with a lower environmental impact on a single environmental problem (e.g., climate change, water resource use, etc.), often quantified in terms of reduced resource use or pollution emissions as a fraction or percentage. Sustainability should address the complex interactions among socio-ecological systems. The most famous definition of the concept came from World Commission on Environment and Development that defined Sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainability in design principles includes :

- Begins with the earliest stages of a project and requires commitments between all the stakeholders: clients, designers, engineers, authorities, contractors, owners, users and the community.

- Incorporates all aspects of construction and future use based on full Life Cycle Analysis and Management.
- Optimizes efficiency through design.
- Recognizes that all architecture and planning projects are part of a complex interactive system, linked to their wider natural surroundings, and reflect the heritage, culture, and social values of the daily life of the community.
- Seeks healthy materials for healthy buildings, ecologically and socially respectful land-use, and an aesthetic sensitivity that inspires the community.
- Aims to significantly reduce carbon imprints, hazardous materials and technologies and all other adverse human effects of the built environment on the natural environment

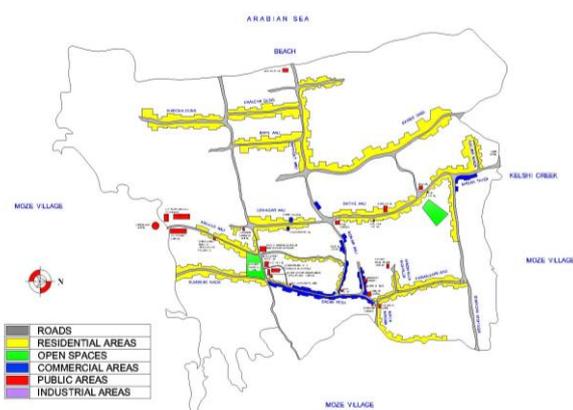
2. Study of rural architecture & planning : case study of Kelshi village in Konkan Maharashtra paper

Prof. Narkhede Parag Govardhan (BKPS College of architecture Pune)
Asst. Prof Sonal Khobragade

The paper deals with the Study of Rural Architecture and Planning of Kelshi Village in Konkan, Maharashtra. The paper discusses the planning, land-use, social and economic structure of the

village, the rural housing, services and amenities. Also, it deals with the study of response to climate and geographical settings and the cultural differences of the village. Kelshi is a rare example of comprehensive rural planning by the local people and efficient administration by Panchayat system.

2.2 CASE STUDY :



Kelashi Beach is a beautiful beach on the Western Coast of India which is situated near Dapoli. The beach stretches for about 2.5 km. Apart from the beach, Kelashi is well known as a pilgrim center due to Mahalakshmi Temple and the Yakub baba dargah. Mahalakshmi Temple is located at the base of the Utambar hill. It is an enclosed temple in a stone wall fortification. Temple was built during the regime of Peshwa times. One of the main attractions of Kelashi is a naturally formed sand dune due to the Tsunami. It is located on the southern side of the Bharja River.

According to 2011 Census of India recorded a total of 3,145 residents in the village.

Kelashi's geographical area is 265 hectares. Kelashi is rural costal area with approximate population of 20,000 (census 2011 report)

LANDUSE PLAN OF KELSHI

2.3 RURAL HOUSING TYPOLOGY AT KELSHI :

The structures in Kelashi Region have been built in such a way as to meet the needs of the local people. When the vernacular constructions of the Kelshi Region are examined, it can clearly be seen that the buildings have been built with the same construction methods for ages.



Fig 1 shows the typical housing view at kelashi

- **Building materials**



Fig 2 showing building materials used for construction

They are built using Laterite stone, timber for the rafter, post etc.; Mangalore tiles as the roofing material while some of them are cement plastered and painted. The houses are mostly single and in rare cases double storied. The geometry of the house in its plan and elevation is rectangular in shape. The planning of houses protects the house from direct sun radiation and also the air which is entering the house from outside is pre-cooled due to the verandah. All the houses have large window openings for cross ventilation and to welcome natural sunlight. The height of the rooms is 3.5m. Houses at Kelashi have more plinth height so that during rainy season the storm water does not enter the house.

Kitchen and padavi (Verandah) plays an important role in the plan of a typical house. Cooking, cleaning, powdering grains, etc. are some of the activities performed by women in these areas. Each house has an open plot on the rare side which is used for farming. Hence, all grains, fruits, vegetables, etc. are stored behind in a store room.

This region receives a very heavy rainfall and so the houses have sloping roofs.

The Kunbi generally lives in a small house with mud and gravel walls and a thatched roof held up by wooden posts let in at the corners and the gables. The rafters are generally bamboos, and the thatch of bundles of rice straw and coarse grass.

Construction materials of Kelshi Region

:

1. Laterite stone



2. Manglore tiles



2. Timber



4. Bamboo

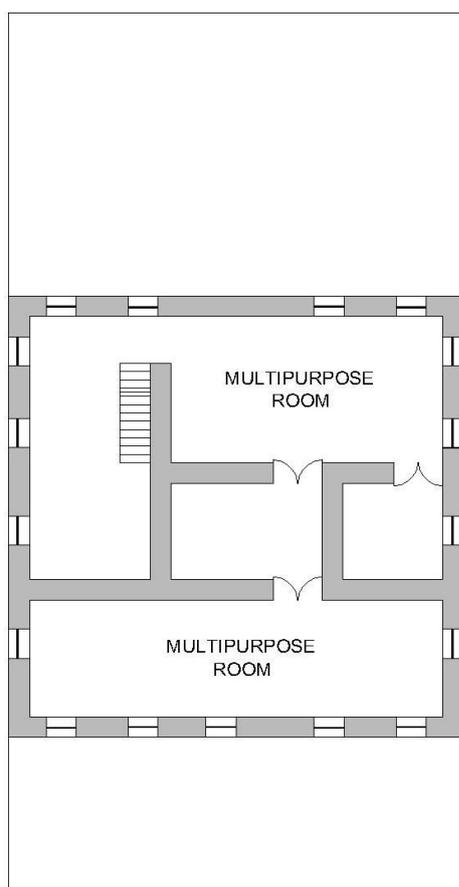


Typical house in Kelashi follows extrovert plan with Majghar (inner room) at the centre. It is rarely planned around a courtyard. Majghar is a multipurpose room meant for private activities and is surrounded by rooms on three sides. It also has an inner core which requires maximum security and insulation from heat which keeps it cool throughout the year.

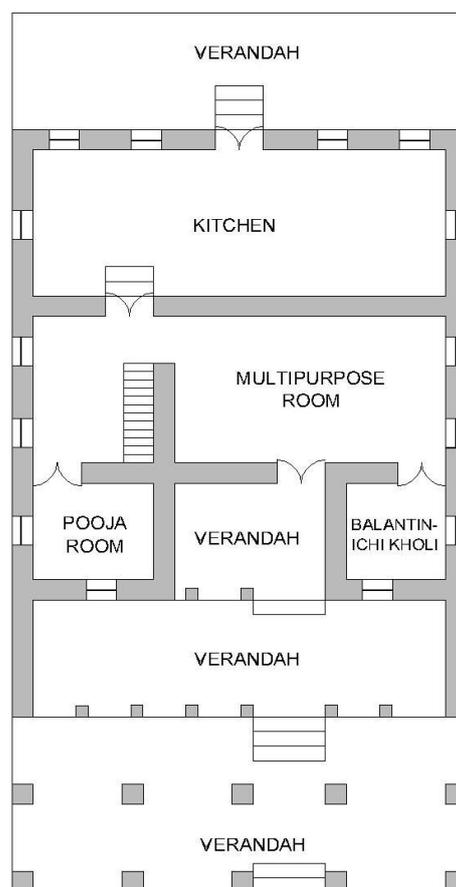
3. Findings and Discussions

Planning of houses in Kelshi :

The findings from the study are discussed to



FIRST FLOOR PLAN



GROUND FLOOR PLAN

Fig 3. Typical Floor plan of Kelshi Village

include the following:

3.1 Sustainable Features of Vernacular Architecture in kelshi :

Vernacular heritage represents a great resource that has significant potential to define sustainable design principles. Vernacular architecture is composed of traditional buildings, which represent a morphological response to both environmental and climatic constraints, as well as to the socio-economic and cultural characteristics of societies. Additionally, the materials and architectural components used are climate responsive and tailored according to distinct locations, and have therefore adapted to seismic, geographic and topographical features, as well as to local climates ... Besides, it is a cost-effective architecture, both in economic and social terms, self-sufficient as regards natural and knowledge resources and with a low environmental impact, and therefore, with a sustainable input.

3.2 Sustainable design culture :

The structures in the Kelshi Region have been very characteristic throughout history, and the structures are built in such a way as to meet the needs of the local people. When the vernacular constructions of the Kelshi Region are examined, it can clearly be seen that the buildings have been built with the same construction methods for ages. The mastery does not only offer solutions for construction problems, but also depicts the proportions of vernacular architecture that reveals the fact that the building culture stems from

the past to present of the region. Figure 4 shows sustainable building culture in the Kelashi Region. This sample clearly depicts the fact that a certain building culture has been formed in the region through the history.



Fig 4 showing typical of house in kelshi

3.3 Sustainable Land Use :

Local builders have made up their own lives against all kinds of prerequisites of nature and all kinds of difficulties brought by the sea. Instead of treating nature as an obstacle “cope with” as modern technology does today, they made use of the best out of nature. Because of the sea and heavy winds flowing towards the village, local folks built their houses in such way where they are easily able to control their territory. The geography forces local folks to build self-sufficient housing units that can meet all their needs. They have efficiently used the natural resources and materials provided by nature and have created their own environments by using local materials that are easily accessible in the nearest environment. In doing so, they evaluated the climatic conditions of the region very well,

mastered techniques to protect them from the harmful effects of nature, tried to prevent heat losses by using local materials and are hiding in nature.



Fig 5. view of houses designed around natural surroundings

3.4 Designing for Durability :

Vernacular buildings incorporated suitable protective measures or design features /solutions to prevent damage to vulnerable parts of the internal and external building elements. With this aim ,the entire kelshi village were established and developed in a way that they could sustain the macro and micro climate of the region.

Kelashi village face heavy monsoon rains which are highly damaging to the buildings. Due, to the destructive effect of heavy rains, all the houses on kelshi has sloping roof.



Fig 6. side view showing sloping roof of the house in kelshi

3.5 Construction Materials and Techniques :

The type of house changes with its location and the economic status of the family. Although the basic plan remains the same it differs in terms of elevation and the type of material used. The houses in Kelshi are basically concentrated around Ubhagar Ali and Sathe Ali.

They are built using Laterite stone, timber for the rafter, post etc. Mangalore tiles as the roofing material while some of them are cement plastered and painted. The houses are mostly single and in rare cases double storied.

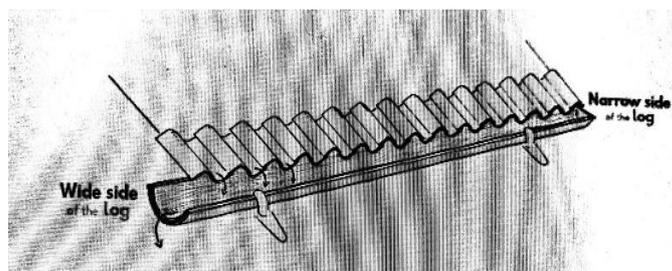


Fig 7. Roof detail

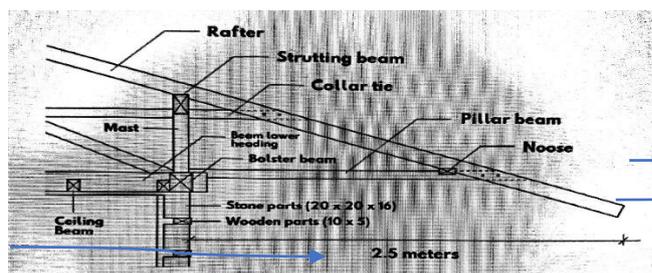


Fig 8. Truss detail

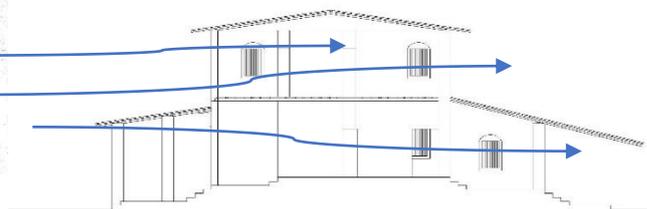


Fig 10. Air circulation and Natural ventilation detail

3.6 Energy Efficiency :

Settlements or houses all built on the terrain having nearby ocean or huge waterbody conforms to the topography in terms of orientation, direction of sun and wind, shape and size of openings.

The geometry of the house in its plan and elevation is rectangular in shape. The planning of houses protects the house from direct sun radiation and also the air which is entering the house from outside is pre-cooled due to the verandah. All the houses have large window openings for cross ventilation and to welcome natural sunlight. The height of the rooms is 3.5m. Houses at Kelshi have more plinth height so that during rainy season the storm water does not enter the house.

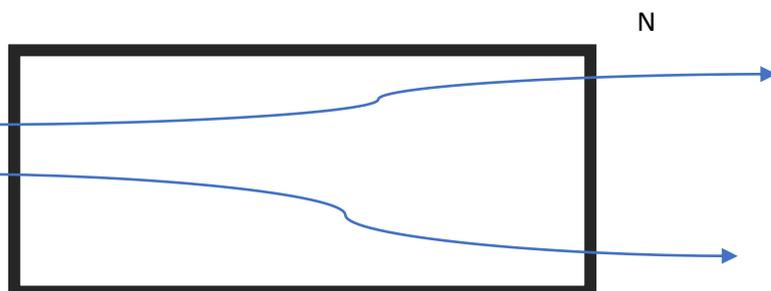


Fig 9. Rectangular form of building

4. Summary of Findings and Discussions :

Settlements of Kelshi Region are in harmony with the topography, and are developed in parallel to it. The examples given in this section are based on the unique features of the nature in which they are situated. The utilization of easily procured local materials supply from nearby environment serve to support and enhance environmental sustainability. The solutions for natural ventilation and heat control have been developed to make use of natural energy, and it also works for protecting energy resources. This paper solely focused on the environmental pillar of

sustainability, with little emphasis on the social and economic aspects. However, the findings have been presented and discussed in such a way that all the three pillars, i.e., environmental, economic and social concepts of the sustainability have been integrated. Though the case under study, i.e., Kelshi village Region, was considered in the context of environmental sustainability, direct and indirect

3.7 Indoor Air Quality :

GAURI ASHOK KAMBLE

DR. PARAG GOVARDHAN NARKHEDE 10P age



relationships of social and economic aspects of sustainability were found in the context of sustainable architectural design. For example, the use of local materials by the indigenes is important in terms of sustaining and supporting the local economy. The sustainable design culture that belongs to the local people are not only respectful to nature, but also gives an idea about the socio-cultural formation of the region. The zeal with which the local community come together to construct houses for themselves is also an important part of sustainable design culture which have affected the socio-cultural formation of the region.

5. CONCLUSION :

This study aimed at investigating the various ecological lessons of vernacular architecture of Kelshi Region of Ratnagiri district heritage and to determine its potential to be applied in today's architecture. It is observed that the basis of sustainability and the main goals of the vernacular architecture are both in the same direction. Social, economic and environmental concerns that are the pillars of sustainability can at the same time be easily understood in the buildings which are designed and built by locals in the Kelshi Region of Ratnagiri. Indeed, Kelshi village settlement observed within the scope of this paper offer lessons regarding the relations they established with nature from the various perspectives, and can be defined as tangible examples of sustainable architecture. It is very clear that the traces of sustainability in vernacular architecture

are consciously considered by locals. People who design their living spaces have focused on sustainable design principles in order to improve their quality of lives only. This situation is more valuable than the sustainability parameters mentioned nowadays which only seeks to bring prestige to the new buildings constructed. The important thing in this period when the limits of consumption are being pushed is an efficient use of the limited sources. Sustainable design in the Kelshi Region is part of the daily lives of the local people. The study presents a major truth that is derived from the examples of vernacular architecture discussed, and this truth needs to be conveyed to the future designers to ensure that more sustainable buildings are erected. Transferring this knowledge and sensitivity from our past to present, and from present to the future generations is a deep respect for nature, environment and people in terms of sustainable architecture.

6. REFERENCES :

1. The Energy-related Impacts of Social Factors of Rural Houses in Southwest China
2. Local Government Climate And Energy Strategy Series
3. Affordable house designs to improve health in rural Africa: a field study from northeastern Tanzania
4. Study Of Rural Architecture And Planning: Case Study Of Kelshi Village In Konkan, Maharashtra Papers