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STUDY OF TRADITIONAL GOAN HOUSES FOR SUSTAINABLE BUILT ENVIRONMENT

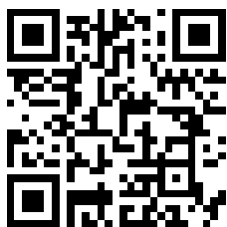
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Abstract: Indian traditional architecture has remained a testimony to the ancient wisdom which we had inherited from our ancestors. Traditional architecture has been referred as school of sustainability. Be it be the socio-cultural aspects or environment and ecology by age. The respect to nature in terms of climatic responsiveness and optimal use of building material from locale co-existed in traditional architecture. The elements of environment like water, air, solar system, forest resources etc. They are valuable & big assets for human welfare. Since Technology & industrial development began, man started to use & over exploitation of Resources. Most of the building materials we use are made from natural resources. Today building industry is mainly responsible for spoiling the Earth atmosphere. And such an overutilization increases the demand of resources & man will face the ecological crisis & Can degrade the natural resources & thereby nature. So we have to maintain the ecosystem balanced. That means the conservation of all natural resources can sustain the life on Earth. The design of Traditional Goan Houses demonstrate the maximum use of natural materials, Use of natural light, use of natural air & its circulation etc. so as to get maximum benefits to users even on micro climate level. The design arrangements & natural materials, responds positively in all seasons & keep the houses cheerful & comfortable, throughout the year. This study aims to analyze traditional Goan houses, and to reveal their sustainable characteristics. In the scope of the work, the traditional Goan houses are examined in terms of sustainable design principles. Before explaining more about the obtained solutions within traditional Goan houses, in order to present a better understanding to the work, the following part of the study continues with the explanations of the general information about Old Goa, and main characteristics of the traditional Goan houses.

Keywords: Depletion, natural resources, economic pursuits, environment friendly, Respect for nature, local ecology, traditional materials.



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INTRODUCTION

At the beginning of a new millennium, the global community faces many challenges. Housing a rapidly world population and dealing with the depletion of natural resources are major among them. Site development and construction in early stages influence indigenous ecological characteristics. The arrival of construction equipment and personnel onto a building site and process of construction itself disrupt the local ecology. Similarly the process of extracting, refining and transporting all the resources used in building operation and maintenance also has negative impacts on environments. Resources are the backbone of every economy. In using resources and transporting them, capital stocks are built up which adds to the wealth of present and future generation

GOA REGION- POLITICAL, GEOGRAPHICAL & SOCIO-CULTURAL

Goa encompasses an area of 3,702 km² (1,429 sq mi). It lies between the latitudes 14°53'54" N and 15°40'00" N and longitudes 73°40'33" E and 74°20'13" E. Goa's main rivers are Mandovi, Zuari, Terekhol, Chapora, Kushavati river & Sal. The Mormugao harbor on the mouth of the River Zuari is one of the best natural harbors in South Asia. Goa features a tropical monsoon climate under the Köppen climate classification. Goa, being in the tropical zone and near the Arabian Sea, has a hot and humid climate for most of the year. The state is divided into two districts: North Goa and South Goa. Each district is governed by a district collector. Panaji is the headquarters of North Goa district and is also the capital of Goa. Goa's major cities include Vasco da Gama, Margao, Panaji, Mapusa and Ponda. Goa's gross state domestic product for 2007 is estimated at \$3 billion in current prices. Goa is one of India's richest states with the highest GDP per capita. According to the 2011 census, in a population of 1,458,545 people, 66% were Hindu, 26.5% were Christian, and 8.3% were Muslim. In many parts of Goa, mansions & houses constructed in the Indo-Portuguese style architecture still stand, though in some villages, most of them are in a dilapidated condition.

However, 450 years of Portuguese colonial rule, during which different cultural and religious traditions met, reshaped the socio-cultural landscape of Goa; its history and culture became distinctive from other Indian regions. The houses are usually large & have spacious rooms with large windows for ventilation. The Catholic houses have the elaborate entrance, openness & courtyard – a combination of Indian Tradition with new European influence both in structure & lifestyle within. The Hindu houses in the Goa are plain, closed structures which conceal dignified tradition of the inhabitants. The rooms with small windows opening out on to the street, converge on to the courtyard with chowk, which is the centre of family activity. It is a

protective & private space. The Christian courtyard houses in Goa comes from the Hindu courtyard house. In both there is a strong engagement with nature. It is argued that because of this distinct past, Goa acquired a distinct Indo-Portuguese personality (Souza 33).

RESOURCES AND BUILDING MATERIAL:-

Resources – Are type of material and form of energy that we use for living our life, for making it easy and comfortable, can be called as a resource. Or a resource can be defined as a form of energy and/or matter that is essential for the functioning of organisms and ecosystems. However it is necessary that the said material(s) or energy is technologically available and economically viable. Some of the resources with some process/es can be used as building materials. A building material is any material which is used for constructing structure for the building. Many naturally occurring substances, such as clay, sand, gravel, wood logs and rocks, even twigs and leaves have been used to construct buildings. Apart from naturally occurring materials, many manmade synthetic and composite products are also being extensively used. Building materials may be categorized in two ways. The first classification is based on the source of availability of the material namely Natural and Manufactured. In the other classification building materials are divided into two groups: Traditional and Modern building materials. The application of both the building materials is extensive. The Traditional building materials are generally the naturally occurring substances. They are divided into two categories namely Inorganic materials which include unfired clay, Stone, Lime and Hemp-lime concrete & Organic materials like Wood, Straw boards, Bamboo & so on.

All man's needs are met by making use of soil, air, water, plants and animal. Air, Water and food are our basic needs. We cannot live without them. Plants are useful to men in many ways. Mainly, they provide us food, clothes, and shelter. In other words, soil, air, water, plants and animals together provide for all our needs. We get soil, air, water, plants and animals from nature. That is why, we call them natural resources.

We can't produce certain natural resources. Their production in nature is also uncertain. What care should be taken in using such resources? The best thing to do is to use the available resources sparingly, prevent their wastage and recycle them. We must learn to appreciate the difference between need and luxury and be wise enough in keeping their use to a minimum. We must always remember that "NATURE PROVIDES FOR ALL OUR NEEDS BUT NOT FOR OUR GREED".

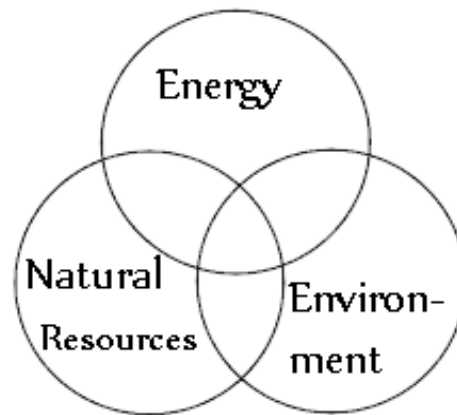
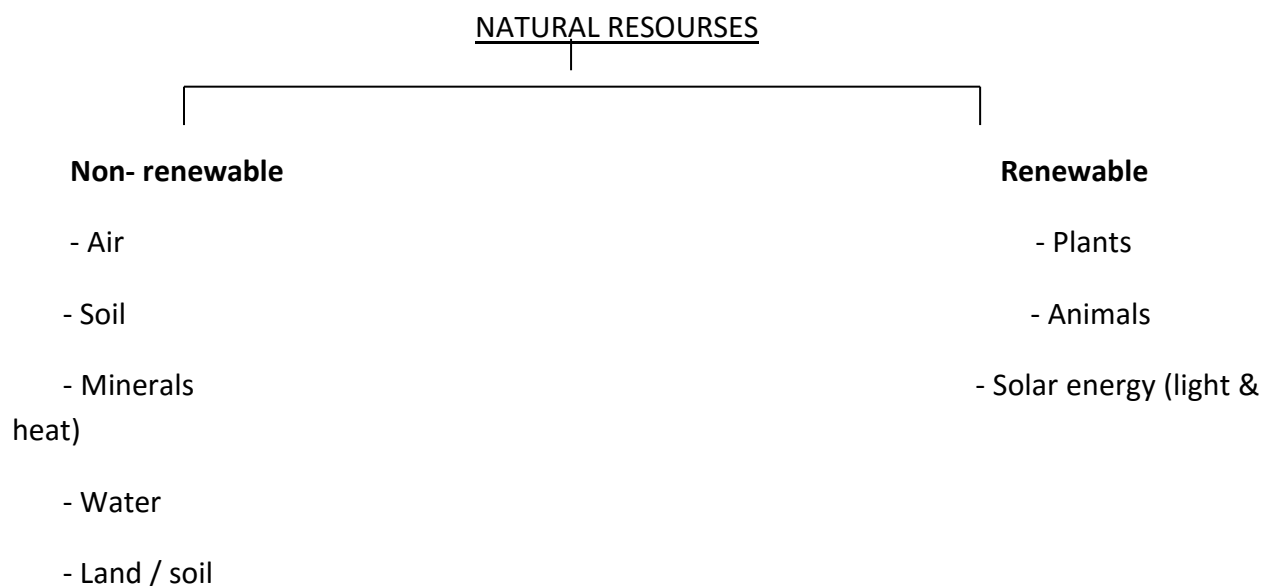


Fig. relationship diagram



All natural resources can be classified into two groups.

RESOURCES AND BUILT ENVIRONMENT

Goa the most beautiful state of India blessed by its unique natural scenic and golden beaches is well known for music, art and its own architectural style of houses. Goans are cherished with their ancestor houses in the villages.

Natural environment provides us with the basic environments from which we create our communities the various environments in which we live, work and play. The environments

include land, water and landscape, as well as vegetation and wildlife that inhabit them. In addition to their ecological values, these resources support community and economic pursuits that shape the quality of life experienced in Goa. The city of old Goa is famous as the Vatican of East, for its group of beautiful Baroque churches built in locally available brick-red Laterite. The Basilicas of Bom Jesus of the late 16th century is one of the best examples of fine ashlar built in Goan Laterite. (Rajagopalan, 1987). The houses that fall within the scope of this article belong to the 18th 19th & 20th centuries.

So the use of our Traditional resources and Building materials plays important role in saving some resources. Some of the old resources/ Materials are reinterpreted and discussed here. The materials used in Goan houses mostly are natural in form and recyclable and reusable, so protection of resources would be possible.

So the aim of the paper is to study the Natural resources used for planning and construction of Goan houses. With keeping in view following objectives -

- 1) Study of elements of livable environment found at Goa.
- 2) Explore the different traditional building materials used for Goan houses.

Though all forms of traditional/vernacular architecture may not be ecofriendly / sustainable yet researchers worldwide have proved that most of the old buildings. Knowingly or unknowingly were sustainable having zero / less impact on the environment. Traditional/Vernacular architecture tends to evolve over time to reflect the environmental, cultural and historical context in which it existed.

Houses that the Goans lived in before the Portuguese arrived were designed with a comprehensive knowledge of Nature's ways as people relied heavily on natural resources for most of their needs. Food, medicine and building materials were all obtained directly from the area that surrounded the village and therefore the salient feature of a house at that time was that, it was built with a deep and profound understanding and respect for nature.

Goa's climate has always been hot & humid with temperatures as high as 32 degrees Celsius & humidity averaging at 76% heavy rains lash this small state from June to September. The main factors that were taken into account while designing the Goan house were the high temp. High humidity, glare & solar radiation. In houses built in 20th century Goa there seems to have been no conflict between these factors. A combination of good ventilation in the rooms reduced both temp., & humidity which made for comfortable living without the aid of electric

fans. Before the intrusion of cement concrete blocks Goa's builders and planners relied heavily on natural resources that were environment-friendly and locally available.

The local environment & the construction materials it can provide, governs many aspects of vernacular architecture. Areas rich in trees will develop a wooden vernacular, while areas without much wood may use mud or stone. In the Far East it is common to use bamboo, as it is both plentiful and versatile. Vernacular, almost by definition, is sustainable and will not exhaust the local resources. If it is not sustainable, it is not suitable for local context and can't be vernacular. Vernacular buildings are essentially functional design & used local bldg. techniques & materials. They are picturesquely sited, highly decorative & clearly related to the world of nature & their sitting within the landscape.

The Goan houses of the past used environment friendly building materials. These wooden roofs, thick mud & Laterite walls, cow dung & mud plaster for flooring & clay tiles held very little heat & cooled the whole house. Compare this with the choice of building materials today- concrete, aluminum & steel – that store heat and radiate slowly into the house.

MAJOR FINDINGS:-

1) Natural resources (materials) as building materials.

- 1) Wood – for roof, doors, windows, furniture, false ceiling.
- 2) Mud – for walls, floorings.
- 3) Local Laterite stones – for walls, compound walls, flooring...
- 4) Clay tiles – for flooring, roofing.
- 5) Vegetable and natural dyes – for coloring.
- 6) Oyster shells (mother of pearl shell) – for windows shutters.
- 7) Thick grass, bamboo and palm frond mats – for window shades and awnings.
- 8) Basalt or granite – flooring, Walls.

2) Resources for conducive environment:-

1. Air movement–

Houses were randomly arranged, this because the velocities of the passing wind to be considerably reduced while allowing for air circulation.

2. Tall fruit trees –

Tall fruit tree like the coconut, mango & jackfruit were often planted in front garden to provide shade as well as allow the passage of wind abundant oxygen.

3. Breeze from the sea –

Another factor that contributed to the comfort of houses was the high plinth with the comfort of houses captured the breeze from the sea & also protected the house from the raising damp during & after monsoon as well as offered house – owners the added benefit of a vantage point.

4. Grass, bamboo & palm frond mats_–

Shady & cool living spaces are of paramount importance in a tropical & humid climate. In each of these spaces, devices that filter direct sunlight while allowing air circulation were essential. These devices in Goa have always been palm frond matting fashioned into window shades & awnings. They used palm frond matting on the sides of the balcao & the veranda

5. Landscape

The front landscape (garden) acts as a buffer the house & the road & because of plants / trees / shrubs in the garden, the lower half of the house is partially concealed behind all this foliage. The garden helps in affording a certain degree of privacy in balco or veranda. Fruit trees – guavas, papayas, chiku, jackfruit & mango were planted in gardens in backyards.

6. Laterite

Laterite is still a sensible material to use- as it does not uses any industrial processing, does not need to be transported great distance, is labour intensive in its extraction and encourages the local economy.

7. Comfort enhancing resources

The long veranda around the façade is designed to keep out the rain. A veranda stretches around the whole of façade, the veranda both very wide and very long was a favorite spot for relaxing and also served to aerate the house. The wide shaded verandas girdling the central

court yard. The vasary(veranda) was parallel to the façade and opening onto the interior patio linked the social and domestic parts of the houses.

8. Other resources available in Goa region

- 1) Land Resources – Soil and topography, scenic terrain.
- 2) Cultural Resources – Historic Sites, Museums, Cemetery.
- 3) Community Resources – recreational based resources, Schools, Public Schools, Libraries, Travel Linkages, and Churches.
- 4) Vegetation and Wildlife Resources – Woodland, lagoons, old tress, trees of special importance, fruit trees, paddy fields.

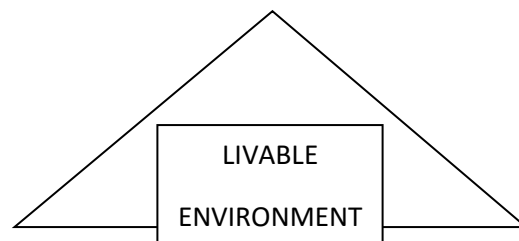
Water Resources – Sea shore / beach, used by human and wildlife communities, habitat for aquatic species. Also for supporting recreation and tourism.

Natural Environment

Ecology

Recourses

Climate



Human Environment

Individual

Psychological

Social

Cultural

Built Environment

Urban Planning

Buildings

Interior Spaces

Landscape

Fig. livable environment components

CONCLUSIONS

- 1) After study of all features or characteristics of Goan Houses, it is found that most of the Natural materials used are relatively temporary nature and bio-degradable compared to basalt, granite and modern materials.
- 2) The most prominent Contemporary building techniques in Goan Houses incorporated the use of Laterite stone, timber, bamboo, vegetable dyes, lime, coconut, palm and soil, etc. which are eco-friendly materials.
- 3) The contemporary Architecture thus, explored building materials and energy efficient technologies close to the human comfort levels and transformed human requirements into built form. Thus, making houses perhaps the most environment friendly and climatically adopted houses in the region.
- 4) The Goan houses were built with local materials and local expertise. Rammed earth, Laterite red stone, basalt, lime mortar, load bearing construction, arches, wood, Mangalore or clay tiles, natural colors or lime wash, china mosaic were used to ensure the survival of Traditional Building skills and Craftsmanship.
- 5) This study is to assist architects and designers in selecting suitable solutions in terms of building materials. In addition to studying different building materials from various sources and their characteristics, it is necessary to adapt to traditional materials in modern, innovative application and create a good solution in terms of building materials for coastal area specifically.

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