Sustainable Approach towards Site Planning while using Cultural Landscape

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Abstract:

Every site has different characteristics and is unique in its own way. Climate, vegetation, topography, cultural landscape and surrounding features vary across each site. Preserving the natural elements on site is a sustainable approach while developing a site. Identifying the local context and character of a region gives a basic idea of improving the conditions and finding out design options. Site planning being an important aspect in design of a Forest Resort has various opportunities to use the cultural landscape in various methods. A Forest Resort is an eco-sensitive area which needs to be designed carefully to preserve the natural landscape. The interface between natural and built forms requires an integrative and creative approach to the site design process. The aim of this research is to study the cultural landscape of the site and provide sustainable site planning with minimum impact on the environment. The methodology includes case study analysis, literature studies, secondary data and design of proposed site near Koyna Wildlife Sanctuary at Satara. The paper shows how to deal with site conditions and provide sustainable site planning along with necessary recommendations.

Keywords: conservation, cultural landscape, sustainability, forest resort

I. Introduction:

To understand the site context, it requires complete study of all aspects such as climate and energy, regional context, microclimate, hydrology, vegetation and soil, historical and cultural landscape features. [2] This could assess the potential function of the site planning and provide design solutions within existing parameters. However there are some strategies that provide sustainable solutions although they depend on the site features. Architectural site design is a matter of creating comfortable spaces for the well-being of users and a sense of attachment to the

cultural landscape. Many architects and builders transform the site completely while destroying the existing features. [1] Encouraging use of the cultural landscape is very essential nowadays. Awareness and benefits of this approach are unknown to many, thus an effort to improve sustainable design.

In this research study, a proposed Forest Resort project for the final year thesis has been studied and designed. The paper investigates various aspects of sustainable site planning to conserve cultural landscape. The proposed site is situated at Munawale, Satara District Maharashtra State. The world heritage site Kaas Pathar and Koyna Wildlife sanctuary is located near the site. In 1992 the World Heritage Convention became the first international legal instrument to recognize and protect cultural landscapes. Kaas Pathar is a very good example of conservative cultural landscapes. The area nearby also has similar characteristics and natural features. Hence it is important to conserve the cultural landscape in such areas. Developing a site to conserve cultural landscape is not only to obtain good views and highlight features but also to perceive a system of enhancing the surrounding environment. [6] To obtain a sustainable site along with conserving cultural landscape, the following is to be considered briefly;

- Building plan should elongate along East – West direction
- Provision of less impervious surfaces on site
- Preserve natural features on site
- Stormwater Management
- Study of Native landscape and grading slopes.

II. Importance of Protecting Cultural landscape:

Cultural landscape is declining day by day due to construction, development, pollution, depletion of natural resources and many more. Many plant and tree species are getting extinct and endangered. Deforestation is the major problem that destroys the forest areas and thus affects the surrounding climate. Degrading fertile soil by land pollution and construction reduces soil capacities and makes it infertile. In such soil we cannot grow plantations, as a result impervious paving surfaces are constructed. This is the current situation happening in cities and villages.

Tourism development in natural conservation areas may destroy the cultural landscape. It is essential to reduce damage and develop the site with sustainable techniques to maintain the cultural landscapes and promote it to future generations. If the natural places also get destroyed due to tourism development, we will be left with very less forests and natural greenery.

The proposed Forest resort studied in this paper is located near very important conservative areas. Firstly, Kaas pathar – It is located within 2km from the site and is a part of a UNESCO World Natural Heritage Sites. Kaas Plateau consists of a variety of biodiversity - plants and flowers that are rear and beautiful. The whole site consists of 850 flowering species (*Orchids, Drosera, Indica*) and approximately 10 square meters in area, thus it is an important cultural landscape. The site lies on the Western Ghats consisting of basalt rock and altitude of 1200m. As per the study done in literature, there are many threats to the ecosystem of this area- cattle grazing, field burning, road development, heavy trampling, sudden growth of tourism, microhabitat damage and solid waste management. Out of the entire, most serious problem is that some invasive weeds are introduced through foreign soils. This may be due to attracting tourists but it is an act of degrading existing flora. Hence we can understand that conserving the natural landscape in such an area while designing a tourism resort is very important to architects.

Secondly, Koyna Wildlife Sanctuary is located about 1km from the proposed site and an important bird species area. Birds get affected by development, radiation from towers, pollution and many more. The Forest also consists of dominant biodiversity (*anjani, jambhul, hirda, awala, pisa, katak, chandala, umbra)* that are plants, climbers and endangered trees (dhup,longan and elaeocarpus) The wild animals are also at threat due to development, land deals and other activities. The sanctuary has 10 tourist resorts and windmills, and many trees are cut down. It is important to preserve the existing trees in the vicinity.

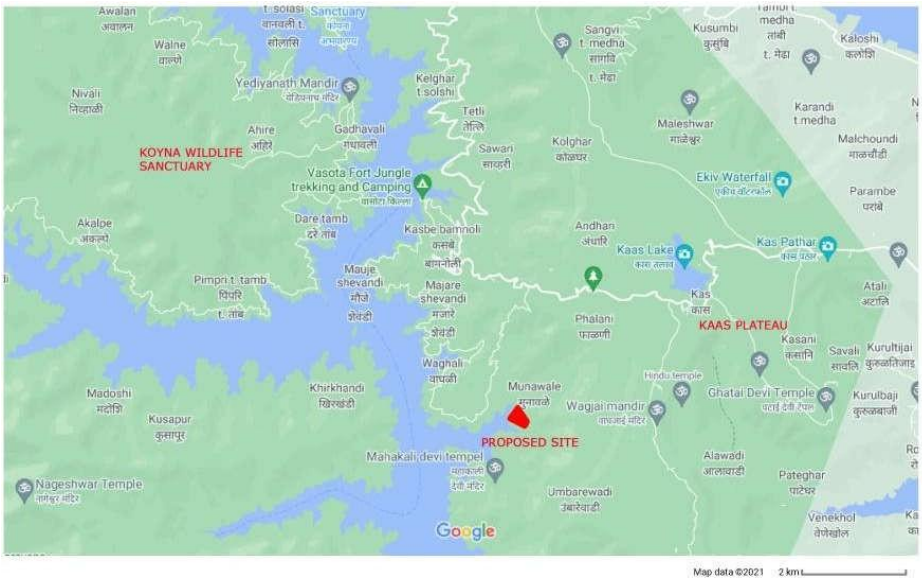

Figure 1: Location of proposed site, Kaas plateau and Koyna Wildlife Sanctuary

III. Literature review:

A paper by Martins A. Nuno title 'ESpecial issue on Sustainable Architecture and Design' demonstrates revitalization of cultural landscapes and its transformations in comparison with heritage parks. Cultural sustainability and sustainable design is the focus of the paper. In the methodology, the concept and evolution of cultural landscapes is studied. The characteristics of Heritage Park are studied and a case study of Mondego River Heritage Park is taken for findings and analysis. It concludes that heritage parks work on sustainable practices and maintain the cultural landscape creating balance between culture and nature. The evolution of landscape and heritage is of great importance and the study of the combination of cultural landscapes and heritage parks makes a remarkable and worthy research study.

A paper by Rukayyatu B. Tukur titled 'Sustainable Site Planning and the Architects' Role' demonstrates the design process and role in which architects develop the site with a sustainable approach. Site planning is an important factor while designing in collaboration with the built environment. Various stakeholders should come together and actively participate in the design and construction process. It is the architect's duty to convince and make stakeholders aware about the importance of sustainable planning.

IV. Case Study:

1. Gorukana Eco-resort

This project is located at the Biligiri Rangana hills (B R Hills) upon the northernmost tip of the Nilgiris, connecting the Eastern & Western Ghats, Karnataka state. It comprises a resort having Ayurveda center, tourism and Lake Forest views. The site area is spread around 7 acres and the site offers an establishment of biodiversity conservation, a responsibility extended to the native Soliga tribe and the delicate ecosystem shared by a plethora of life forms. The Soligas or 'Children of the Bamboo' were traditionally semi-nomadic people.

Concept of Design

The main objective of the project is to preserve the existing site features and attempt towards developing the local context of the area. The challenge of this project was to create an architectural landmark and an attempt towards empowering the local natives of the region. Carefully understanding the importance of the built form and natural landscape has been incorporated by co-relating its existence with the surroundings. As the tribe living near the site is related to bamboo, the materials used in the resort are sustainable materials inspired by the locals. Tree houses are built to stay connected with the native landscape. Protection and restoration of biodiversity is done by minimum modification of the site. The runoff goes into the river as the slope is towards the river. The guest rooms are elevated at a certain height undisturbed the land and providing protection to visitors. Very less impervious surfaces are designed, thus the site planning has a sustainable approach.

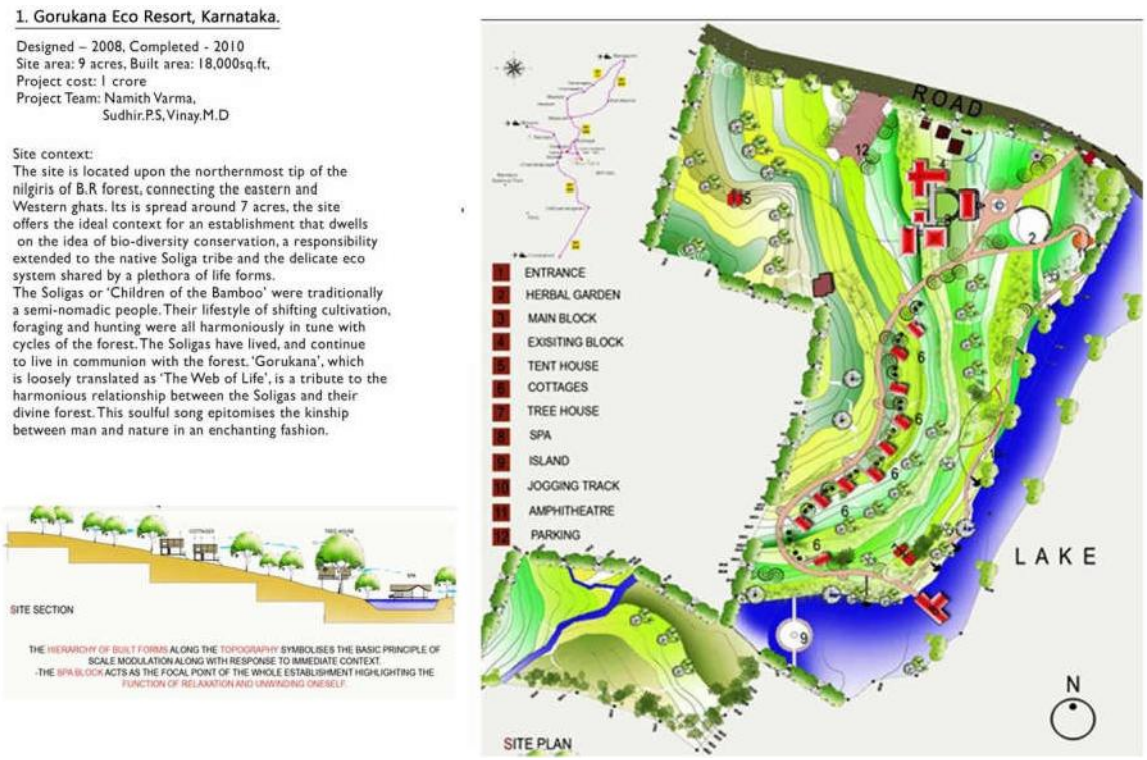

Figure 2: Gorukana resort site planning

Material Utility: The use of locally available materials and expertise in the construction right from the stone, wood to the finer furnishings and ornamentation have helped in minimizing the impact of construction on the untouched topography. Steel frames have been used as structural elements. Stone masonry, Thatch roofing, bamboo walls, timber and stone cladding have been used in the project.

V. Proposed Site development:

Figure 3: Site planning of Proposed Forest Resort with sustainable approach

The figure above is the site planning of a proposed forest resort at Munawale, Satara District, Maharashtra state. The highest contour of the site is 705m located at North-east and the lowest contour on site is 660m thus an elevation difference of 45 m exists. In such a sloping site, architects need to deal with the slope and grade. As this area is a mountainous region, the ecosystem is of great importance to maintain. Located near the river basin the soil is fertile and suitable for irrigation. The site information is studied and collected from sites related to irrigation department of Satara district as follows:

- Soil type: Deep laterite soil is found mainly along the banks of Koyana River. Deep laterite soil is highly fertile and good for cultivation. This soil is formed due to iron oxidation.

- Humidity: The air is found to be highly humid during the rainy season which is generally more than 75%. The region lies under high rainfall zone.
- Wind: Mountainous Regions generally have strong winds due to their elevations. As this site lies in the Sahyadri Mountains of Maharashtra, the winds are strong during the rainy season. The wind direction is southwest or south and during summer, it is north and northeast.
- Temperature: The mean minimum temperature is 11.6^{o} C whereas the mean maximum is 37.5^{o} C.
- Strata information: Soft Rock – Alluvium occurs as narrow starches along banks and flood plains however they have limited aquifer extent. The ground water occurs in phreatic condition in floodplain alluvium deposits near the river banks.
- Rainfall: This area lies on the Sub – mountain zone of Satara district. Rainfall varies from 1500mm to 2500mm. Thus rainfall is considered as high.

From the above data it is understood that the site has many scope and limitations and has to be dealt with high rainfall. The site has a very steep slope, the difference between highest contour and lowest contour on site is 40m. The following design strategies used in the proposed project are::

1. Split level Building design locating along the contour slope

Building on such sloping sites requires a good design that adjusts to the topography. Excessive cutting of land to gain flat land is not advisable, it destroys the natural landscape. Split level planning and study of the slope is necessary. Split level planning has many advantages, it gives views to each block. Thus the challenge of an architect is to design the buildings with equal cutting and filling of land

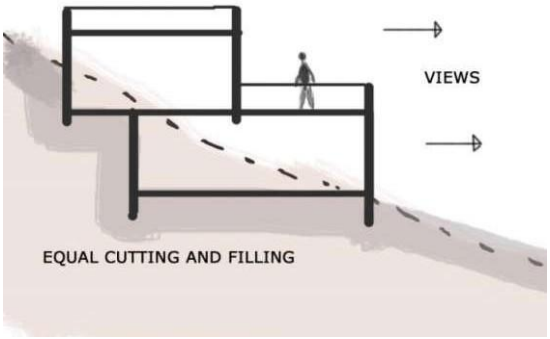

Figure 4: Equal cutting and filling

2. Stormwater and Runoff Management

Impervious surfaces prevent water from percolating in the ground thus groundwater level does not increase. As most of the flow of water runs on land it may cause soil erosion, destruction of vegetation and damage to structures. During rainfall, storm water is a major challenge as the water flow is high, so we should allow water to percolate in the ground and rest of the water should be directed to any natural stream nearby or a detention pond can be created on site. The size of the detention pond is calculated by the amount of rainfall and area of site. It also acts as water storage for multipurpose use. Forest resorts which may not receive much water supply from the mains can utilize this storm water by storing it. Places like parking and pathways are usually paved with concrete blocks. Grass and previous material between the gaps of two pavers helps in water percolation and thus lesser impervious surface. Alternative materials can also be used for pathways like stone, pebbles, etc.

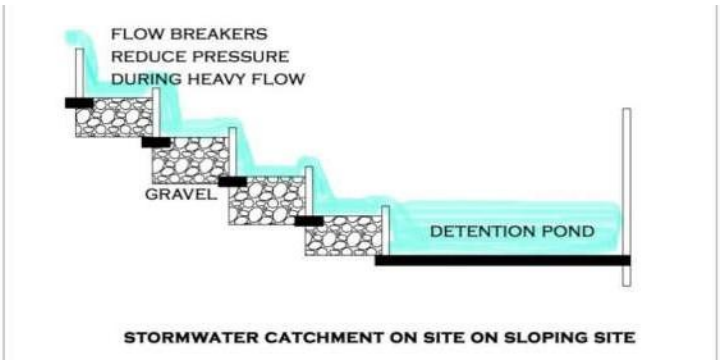

Figure 5: Detention pond section along the slope for storm water collection

3. Maintaining soil and vegetation

The more the plantation, the more the plants' roots hold the soil in place. Thus vegetation provides better hold of soil in place and also gives many benefits. Forest resorts are located near biodiversity of plants and animals, to maintain the natural systems, it is important to preserve the existing native trees and design accordingly. Passive rainwater harvesting can be done by using existing trees or planned trees at open spaces. Depressed vegetation lots with micro basins collect runoff from surrounding impervious surfaces. Curb cuts allow water to enter and the depressions collect water and allow it to percolate also.

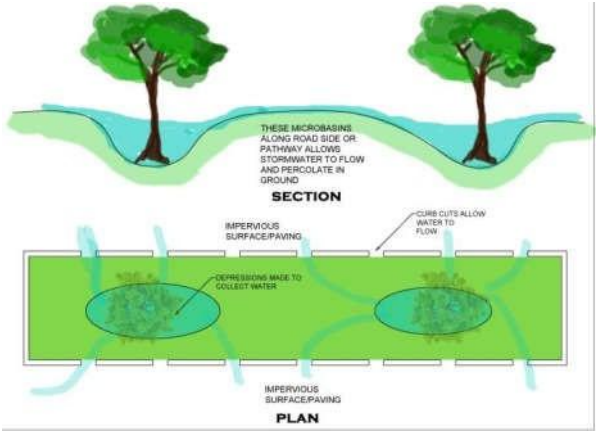

Figure 6: Plan and section for Designed plantation or existing trees near paved areas.

In fact more trees should be planted wherever necessary, fruit and flowering trees regulate the cycle of nature. A project is not only for the people or buildings but also should contribute to the surrounding and ecosystem. This maintains the connection between natural and built forms. [6] Study of the native plant and tree species is important as only those are to be planted suitable to the context. Foreign species may not sustain in the context. Maintenance of the natural and designed landscape is essential by regular cleaning, pesticiding and maintaining topiaries. As the soil in the site is good for irrigation, fruit and vegetable gardens are also designed. Utilizing the existing vegetation is the best use of the cultural landscape and helps maintain it for many years.

4. Biofiltration areas

Bio-swales are small channels which are vegetated and it filters the storm water this is known as bio-infiltration. Use of natural elements for filtration of water is the best use of cultural landscape. If required, drainage pipes and gravel reservoirs can be constructed beneath the bioswale to store water. In this project the stormwater is collected and also used as an aesthetic landscape feature for visitors having a natural feel of water. This reduces the extra cost to construct artificial water features.

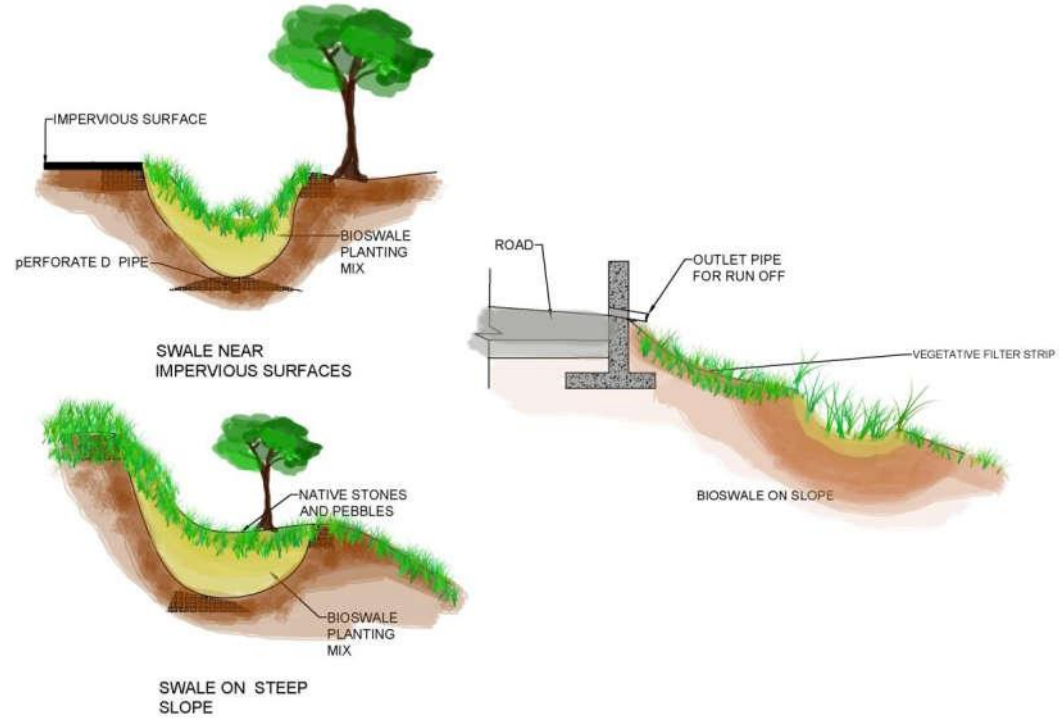

Figure 7: Site sectional details showing bioswales

5. Protection and restoring biodiversity

The biodiversity of the region declines when pollution, depletion of resources and land happens. The native animal species and plants lose survival due to this. Reducing energy consumption will reduce pollution in the context, in the site solar panels are used for electricity installed at ground facing south direction. Stormwater is collected to fulfill water supply. Precast construction is proposed wherever possible so that there will not be emissions while constructing on site. The existing dense trees are kept as it is because the native species lose their habitat. Fruit and vegetable gardens regulate and maintain the land as well as decrease frequent transportation for

raw material. Overall the project should keep existing features and utilize the site opportunities to protect and restore the biodiversity.

VI. Conclusion:

This project is designed by studying various literatures and case study is to understand the importance of site planning and cultural landscape. The site properties show greater importance to water management and preserving natural features while adopting energy efficient methods. Site can be developed accordingly without disturbing the cultural landscape. This research is related to preserving cultural landscape and focusing site development and its importance. Designers and Architects have responsibilities towards protecting the cultural landscape.

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