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Review Article

Sacred Ecology an Indian Knowledge System: Exploring the Adaptation of Biophilic Landscape for sustainable architecture & construction

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Abstract

Sacred ecology are natural environments which have a profound relation with the ancient communities, their cultural practices, and spiritual beliefs. The beliefs are preserved in the form of grooves which are managed by the community and are regarded sacred and are believed to be abodes of the God and Goddesses. These grooves have ecological values associated with them and have proven to conserve biodiversity, and acts as carbon sink, prevent soil erosion, recharge ground water, and preserve the traditional knowledge. The natural elements of land, water and vegetation are worshipped and hold significant importance in the Indian Knowledge System. The ancient civilizations of Egypt, Mesopotamia, Indus valley, etc. developed around these parameters. The adaptation of these elements is deeply rooted in Art and Architecture. But due to industrialization, cultural shift, deforestation, climate change, and lack of spaces these grooves are facing challenges. The essence of the sacred groove and its emotional value with respect to culture, tradition is lost. The global warming is no more distant and the immediate need to integrate plant not for aesthetics purposes but for human health and wellbeing has become vital. This paper studies the existing literature of the sacred groves and analyses and compare the relationship between the traditional and modern aspects. Also, through

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this paper an attempt has been made to suggest biophilia as the best alternative and its application through case study of School of Architecture building in achieving sustainable goals.

Keywords: Sacred grooves, Indian Knowledge system, Biophilia.

Introduction

Sacred ecology comprehends the human's affinity to nature from time and ever. From ancient times, mountains, rivers, forest, animals, and plants have been revered as sacred entities, often associated with deities, spirits and ancestors.[1] The concept of sacred grooves also known as Vanrai exists in the ancient Vedic knowledge. The grooves are patches of forest land and were believed to be abodes for God and Goddesses in Indian History and have been worshiped for long. These sacred grooves served as living sources of biodiversity, preserving rare plant species, medicinal herbs, and habitats for various animal [2] The philosophy of the sacred grooves protection of forests, tree and wildlife has been emphasized in the Vedic culture and guarding of the ecology and the environment were considered prime. The Essence of Vedic Culture in Hindu Philosophy Forests, Trees and Wildlife Protection Held a Place of Special Respect. [3] The sacred grooves have given a spiritual and cultural perspective to the environment with a greater sense of responsibility of protecting them. The belief that certain plants and animals are associated with Gods and needed to be preserved came as a social responsibility and rendered spiritual and sentimental value. For trees like Peepal and Neem were preserved as they were considered holy. Act of felling down of plants and hunting of animals were strictly prohibited and were punitive. The use of various plant species for healing and well-being has been reflected in Ayurvedic studies. Some spiritual practices, like those at the Manashakti Research Center, believe plants have emotions and that connecting with them through rituals and mantras can bring healing and balance.

Review of Literature

Literature 1: Sacred Groves and Social Ecology: The Sociological Significance Of Flora And Fauna In Indian Cultural Landscapes. (Basu, G., Patra, J., Barman, P., Das, S., Kar, H., & Raha, S. 2025)

The paper exemplifies that the flora and the fauna matter not only for their social and ecological value in the sacred grooves of India but for their symbolic cultural and religious values. The groves represent the responsibility of the environment taken care by local communities in safeguarding religious in the ancient times , these cultural practices possess sustainable conservation goals and respect to society and nature. The paper discloses multiple pressures faced in the contemporary era in keeping the sacred groves alive and preserving them requires recognizing their socio-cultural dimension, not just their ecological value.

Literature 2: Status and socio-ecological dimensions of sacred groves in Northeast India (Upadhyay, K. K., Japang, B., Singh, N. S., & Tripathi, S. K. (2019).

The paper highlights the vital role of the sacred grooves in conserving biodiversity(Upadhyay, K. K., Japang, B., Singh, N. S., & Tripathi, S. K. 2019). The future studies recommend raising awareness—of the cultural

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and ecological value of sacred groves(Upadhyay, K. K., Japang, B., Singh, N. S., & Tripathi, S. K. 2019). The need for evaluation how social change, industrialization and urbanization has affected the survival and the structure od the sacred grooves and suggest ways to deal with the them The paper suggests the evaluation of the relevance of traditional conservation practices in addressing modern environmental challenges such as climate change.

Literature 3: Sacred groves of India: repositories of a rich heritage and tools for biodiversity conservation(Sharma, S., & Kumar, R. (2021).

The paper concludes that Sacred groves preserve rich biodiversity and cultural heritage(Sharma, S., & Kumar, R. (2021). It proposes conservation strategies and awareness needed to protect them. There is an absence of empirical data on the ethnobotanical uses of plant species from sacred groves, which is essential for understanding their value in traditional medicine and biodiversity conservation. The future studies recommend strategies to conserve sacred groves effectively and its impact of modernization on sacred groves' preservation.

Discussion / Analysis

Sacred Grooves in India:

India is reported to have over 14000 sacred grooves but believed to have many more but lack documentation. The grooves are mostly found in states of Maharashtra, Tamil Nadu, Karnataka and Kerala. They locally have different names in different regions of India. The grooves are considered as natural temples by the local communities and are deeply rooted to the spiritual and religious beliefs.

State	Local Names
Himachal Pradesh	Dev Van
Uttar Pradesh	Bugyal, Dev Van
Jharkhand	Sarana, Jahesthan
Sikkim	Gumpa
Assam	Than , Madaica
Arunachal Pradesh	Gumpa
Manipur	Gamkhap, Manhak , Umanglai
Mizoram	Mawmund

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West Bengal	Garamthan, Shitalathan, Harithan, Sabitrithan, Santalburithan, Jahera
Odisha	Jahetra, Thakurama
Meghalaya	Law Kyntang , Law Lyngdoh
Chattisgarh	Sarana, Jahera, Matagudi, Devgudi, Goondevi
Andra Pradesh	Pavitrashetralu
Tamil Nadu	Kovikadu, Sthalavriksha
Kerala	Kavu, Sarpa Kavu
Karnataka	Devarabana,Devarnkadu, Hulidevarakadu, Nagabana, Bhutappanbana Jataka, Panbana, Chowdibana
Rajasthan	Vanis, Kenkris, Orans, Shamlat, Dehs and Devbanis

Significance And Importance

The sacred grooves conserve diversity by protecting wild animal and rare plant species. The act as carbon sinks and maintain environmental balance. They protect endangered species of the flora and fauna which find refuge in these places. The cutting and hunting in the grooves is strictly prohibited and they are protected by the local communities who guard these places for their religious and spiritual identities. The grooves are a home to a wide range of Medicinal plants. The knowledge and science of Ayurveda dates to the Vedic civilization. It is one of the ancient knowledge systems, the mention of which is in the Vedas. These grooves shelter a large number of rare species of plants and animals save guarded them from extinction and hold the innate diversity. The grooves are a resource of water and soil. The plants hold the roots and protect it from erosion, thus maintaining its fertility. They water ponds and streams replenish the water table and recharge the aquifers. The grooves regulate the climate, maintain soil stability and recharge ground water.

Research Methodology

The study was carried out the understand the roots of sacred groves and their social, spiritual, and environmental significance to human well-being through a comprehensive review of literature. The review

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examined the role of sacred groves, its elements, and its evolution with human in parallel to art and architecture. It also explored the reasons behind the decline of sacred groves, highlighting industrialization, urbanization, and demographic changes as major factors in disrupting the ecological balance.

A comparative analysis of the use of vegetation in the past and present provided insight into changing human and nature relationships. The need for strategies to preserve environmental harmony are inevitable in the urban development. The concept of biophilia—the innate human connection with nature—was identified as a guiding approach for restoring this balance. The integration of natural elements of plants, water, etc, into built environments supports mental and physical well-being. it contributes to improved air quality and energy efficiency.

Ritual, Festival and Learnings

Fig. 1 Vat Poornima Pujan

Fig. 2 Tulsi Pujan

Traditional Ecological Knowledge is deeply integrated with the cultural and spiritual identities of indigenous communities.[4] Trees like Banyan, Peepal, and Neem were revered as manifestations of Gods and are worshipped in India by people of Hindu religion. Tulsi plant holds a sacred space in almost every Hindu house, it is believed to have come from heaven and has medicinal values. Ashoka tree is considered sacred by Hindus, associated with Kama Deva, also called God of Love. A lot of rituals and festivals are performed Faround the trees and have religious importance, The Banyan tree, associated with Hindu festivals of Vat Purnima, prayers for longevity and the Peepal tree related to Lord Buddha who attained enlightenment under these trees and has become a symbol of knowledge. The Neem tree and Mango tree are also used in various Indian rituals and are often seen in localities during festivals. The flower offerings of marigold flowers, chrysanthemums, are considered auspicious, Lotus representing purity, hibiscus flower offered to Lord Ganesha, Datura fruit and flower to Lord Shiva. The banana and betel leaves are used for puja and havan. The colors for Holi (festival of colors) were also made from plant paste and powder. Various rituals, festivals, and places of learning happened around trees.

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Fig. 3 Gurukul

Educational Value of the vegetation

Gautam Buddha attained enlightenment under the bodhi trees and trees have become symbolic of knowledge. Gurukuls are associated with trees which are often located in natural environments like forests or mountains, establishing a deep relationship with nature as part of the learning process. Environment has various learning benefits of classroom in nature, hands on learning and environment respect. Gurukul learning offers mental and spiritual well-being, healthy lifestyle, and peaceful atmosphere.

Fig. 4 Ayurvedic

Medicinal Value

The Indigenous knowledge of plants has been mentioned in the Vedas. The sacred grooves are a resource to the Ayurvedic medicines. The medicinal plants have various health benefits like respiratory illness, treatments for female reproductive systems, brain tonic, skin diseases, immunity booster. The Patagarudi (sanskrit name) plant was used in the treatments of Covid 19 found in the grooves. These medicinal plants play an important role in the health and wellbeing of humans. The Scared Groves located at Bambar in Sattari Taluka is the abode of rare medicinal plants. [5]

Discussion / Analysis

Fig. 4 Cultural Landscape . Pravagraj

Cultural Landscape

Cultural landscapes are landscapes that have been affected, influenced, or shaped by human involvement [6]. The cultural landscape include elements of nature and association with people which are interwoven to create works of art, narratives of culture, and expressions of regional identity [7]. The features of the cultural landscape include natural elements water bodies, mountains, forests, open spaces, and an made element of buildings, places of worship, neighborhoods, etc. The early ancient civilization of the Indus valley, Mesopotamia, Egypt established along the banks of the rivers. Maya- The Mesoamerican civilization settled around tropical forest, the Inca on the high Andean mountains. The sacred River Ganga stands as a prominent feature in the evolution of the Varanasi Ghat. Allahabad now named as Prayagraj is significant for the confluence of three sacred rivers: the Ganges, the Yamuna, and Saraswati, a point known as Triveni Sangam. The Kumbh Mela, which is the largest gathering

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of people from the Hindu faith, exemplifies how spiritual and religious beliefs connected to rivers have become an integral part of the cultural landscape.

Adaptation Of Plant into Art and Architecture:

The adaptation of plants has influenced art and architecture for centuries, moving from stylized ornamentation to modern, functional biomimicry. Artists and architects have drawn inspiration from plants' symbolic meanings, organic forms, and adaptive processes to create designs that are both aesthetically pleasing and structurally innovative. The lotus flower motifs are depicted in friezes on the wall and columns of Egyptian temples palaces and tombs. The plant motifs of cypress trees are seen in Persian palaces. The Acanthus leaf is carved in Greek and Roman Corinthian columns. The floral motifs are seen in the Islamic Mosque and Ancient Indian temples holding great significance in the Indian Knowledge System. An example of the floral motifs in Amber Fort in Jaipur has been documented.

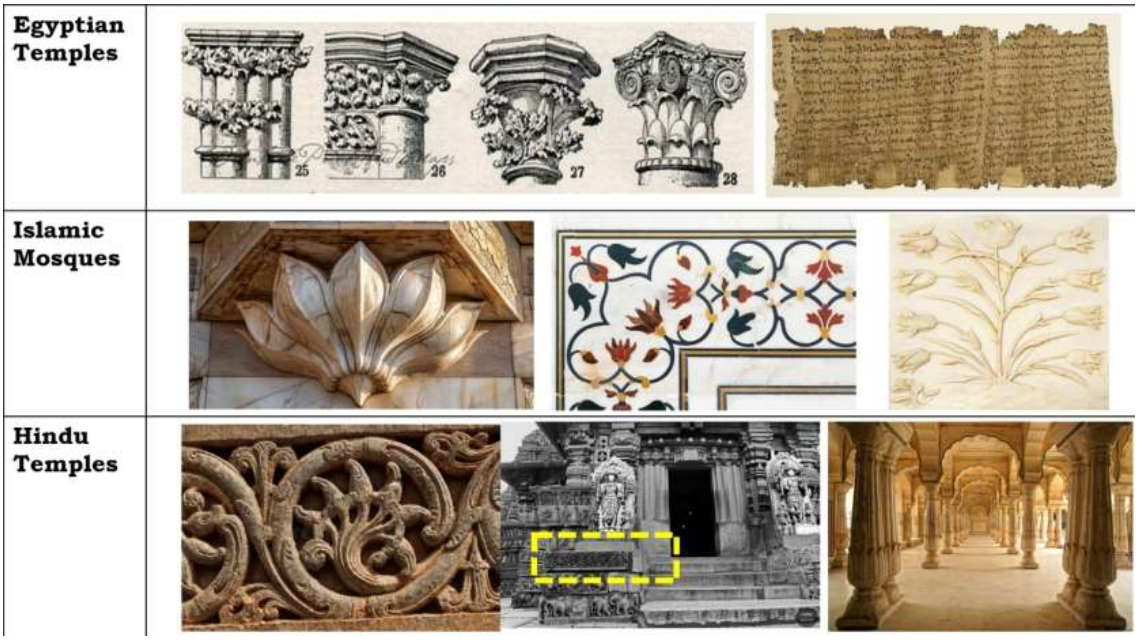

Fig. 5 Adaptation of flowers and leaf motifs in Art and Architecture

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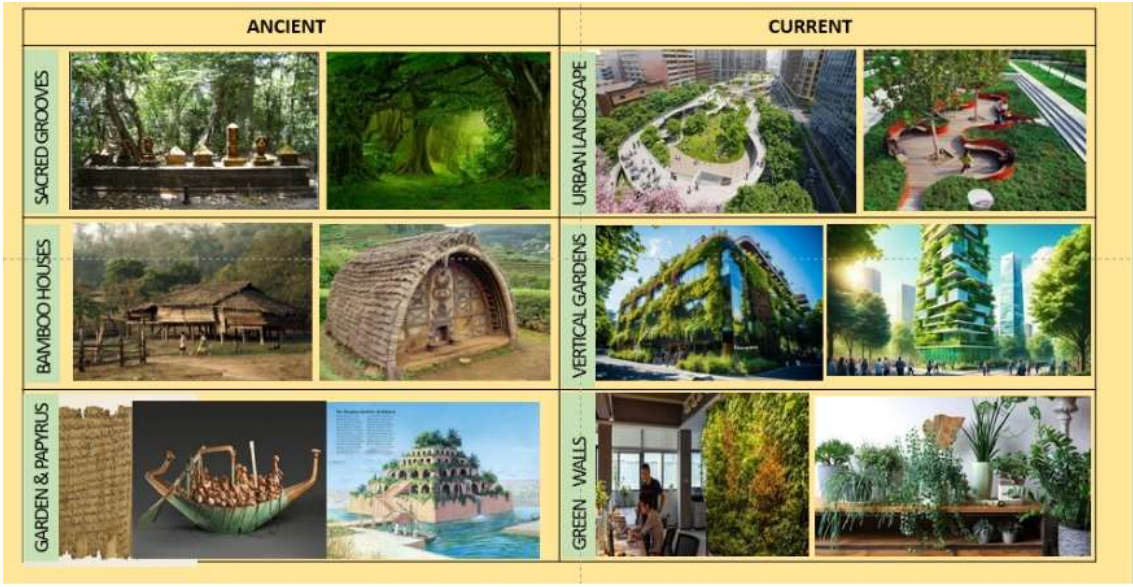
Fig. 6 Use of plants in the ancient and current scenario



Comparative Study of the Vegetation

A comparative study of the vegetation in the ancient and current scenario shows humans affinity to nature. The designer and planners are making possible to integrate nature on a macro and microscale thus addressing the issue in a small way. The various exotic species can help human to benefit by choosing the required plant types. The concept of Biophilia was introduced an expression to maintain environmental balance.

Findings

The sacred grooves are diminishing and losing its importance due to urbanization, demographic shift and industrialization has resulted in deforestation, landslides, vertical growth, a lot of damage and destruction has caused to life and property. Global warming is no longer a distant threat; it demands urgent and collective action from all sectors of society to reduce greenhouse gas emissions, adapt to (Sharma, K. K., Pandey, V. K., Sharma, S., & Singh, R. 2024)current impacts, and move toward a sustainable future. An example of a devastating landslide occurred in Malin village in the western India in 2014 which has resulted in a burial village of 160 deaths was due to clearing of land . The roots hold the soil and prevent soil erosion but deforestation and clearing of land has impacted the stability and fertility of the soil. The huge mangrove plantation in Chennai was pulled down for urban development despite their medicinal value, which could have reduced the impact of the Tsunami which happened in 2004. Nature has played a very important role for human survival. Preserving nature is crucial for a stable future, as environmental degradation threatens human health, economies, and the planet's ability to support life. [8] Understanding the importance of plants a comparative study of its use in the past and currents scenario facilitated to identify possible solution in the integration of plant in the indoors to maintain air quality. A case study was done for the School of Architecture – Ajeenkya University to identify the various issues of temperature, sound, and energy efficiency. The various

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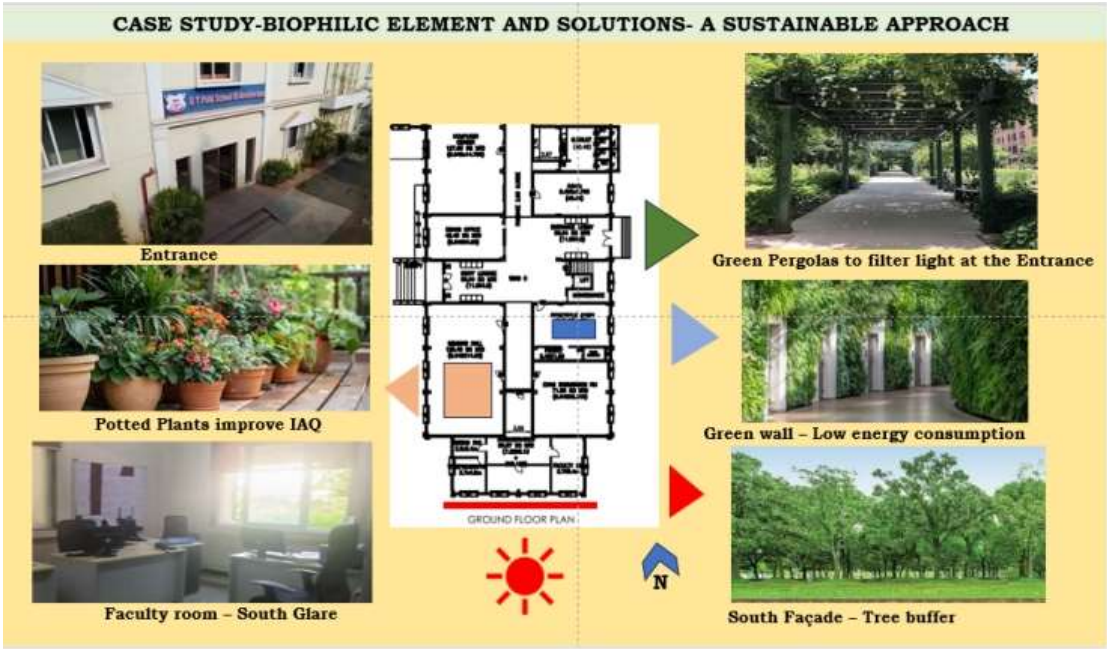
biophilic solutions was suggested to reduce the impact of climate on environment by providing green walls, rain chains, green pergolas, provision of potted plants, reduction of glare.



The entrance porch which invited harsh sun light and rain water to be provided by green pergola will filter light. The glare from the south and sound of vehicle from the internal vehicular road in the faculty room could be reduced by provision green tree buffer. Providing green wall to the principal cabin reduce the use of mechanical cooling system and become more energy efficient. The placement of potted plants in the window sill of the seminar hall where large number of students gather and studio where students spend most of their time will recycle the air improving its quality. Use of rain chain on the external toilet walls will hide the toilet pipes and give an pleasing aesthetic look as the same time could be best used for rain water harvesting. The library to be provided with small waterfall would calm the space and provide relaxation to the mind. A central atrium could accommodate natural landscape reviving the energy and recycle the air by absorbing the CO2.

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Fig. 8 Case study integrating Biophilic elements

Conclusion

The integration of the biophilic elements of water, plants (light, green wall, water fountain, etc..) represent an energy efficient and sustainable approach to the contemporary Architecture and Interior design. Biophilic design are closely associated and draw a direct relationship of human to nature of aesthetic, comfort and significantly maintain environment balance. The provision for natural lighting, proper ventilation, incorporation of plant, water features, use of natural material promote the wellbeing of the users and conserve energy. Such design approaches align with the sustainable goals and global need to lessen the impacts of climate change(Sharma, K. K., Pandey, V. K., Sharma, S., & Singh, R. , 2024), deforestation, and rapid urbanization.

In the context of India, biophilic design also resonates deeply with traditional knowledge systems that have(Alexandros A. Lavdas, Ann Sussman, A. Vernon Woodworth. 2025)long emphasized harmony with nature. Biophilic concepts are the soul of indigenous building techniques, which practiced with the use of locally available materials, courtyards, and verandas. Therefore, adopting biophilia preserves and revitalizes India's cultural and ecological knowledge while simultaneously addressing urgent environmental issues. Future studies recommend on measuring the quantifiable advantages of indoor biophilic elements and focused on energy efficiency, temperature control, and indoor air quality. In the end, adopting biophilia is an essential step toward creating a resilient and ecologically conscious future rather than just an aesthetic decision.

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