Sacred Groves as Nodes of Linkage Sustainability: Integrating Ecological, Cultural, And Social Dimensions

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INTRODUCTION

Sacred groves are a sub-category of *Sacred Natural sites,* which the International Union for Conservation Nature (IUCN), defined as "*areas of land or water having special spiritual significance to peoples and communities*" (Wild & McLeod, 2008). As mentioned by Dudley and co-workers (2009) and Onyekwelu (2021), the sacred groves are considered as 'tracts of virgin forests harbouring rich biodiversity', are protected by 'indigenous societies based on cultural and religious beliefs', and often associated with deities, spirits, ancestor, or a sanctified historic place (Dudley et al., 2009; Onyekwelu, 2021).

Across the globe, traditional societies have a history of close relationship with nature and environment, where management practices are merged with ecological governance and spiritual significance. For instance, in ecological perspective, sacred groves are found to have higher biodiversity conservation capacity than the surrounding disturbed areas and they are a huge repertoire of forest preservation practices and share characteristics with 'common property resource systems' (Chandrakanth et al., 2004). In cultural view, the traditional practices of sacred groves may differ from place to place or change according to location (Gadgil & Guha, 1993) like the annual ritual with sacrifices of cocks and hens are still practiced in India (author's unpublished data). In social dimensions,these groves are governed by customary laws, taboos, and community-based conservation that often restrict activities such as logging, hunting, or even entry without permission (Ormsby & Bhagwat, 2010).

In this perspective, authors conceptualize sacred groves as nodes of linkage sustainability—places where ecological,cultural, social dimensions of sustainability intersect and reinforce one another (Fig. 1). This framing provides a holistic view that transcends sectoral approaches to conservation. Sacred groves show the classic model of sustainability, how social, cultural, and ecological dimensions can coexist in harmony. In the current global scenario with environmental degradation and modernization, sacred groves show a way of holistic approach towards sustainability.

SACRED GROVES AS NODES OF LINKAGE SUSTAINABILITY

We explain that sacred groves function as nodes of linkage sustainability across the ecological, cultural, and social dimensions (Fig.1). Sacred groves exist at the intersection of ecological, social, and cultural dimensions, and their resilience or sustainability depends on the continued vitality of each dimension. This discussion also explores recent topics on sacred groves, examining each within the context of these interconnected dimensions.

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Fig. 1. Sacred Groves as Nodes of Linkage Sustainability of Ecological, Cultural, and Social Dimensions (created by author and co-author).

Ecological Dimension

Sacred groves act as great natural barriers and refuges for biodiversity. In arid states like Rajasthan, groves play a crucial role in regulating water, preventing flash floods, and improving water availability during droughts. Their locations are often near natural streams, and it underlines their role in conserving riparian ecosystems. These groves, driven by centuries of indigenous knowledge and spiritual connection to the land, thrive without official protection, despite their vulnerability to development pressures (Agarwal, 2016; Bhagyanathan & Dhayanithy, 2025).

In the West Kachchh region of Gujarat, India planting of native species and limiting grazing have already proven effective in restoring sacred groves while supporting local livelihoods (Gupta et al., 2021). Scientific studies also support the ecological value of sacred groves. Research done in India, Kodagu district of Karnataka found that nearly 60% of medicinally valuable plant species were located inside just five sacred groves which are more than in nearby reserved forests (Boraiah et al., 2003). These groves also help reduce soil erosion, as tree roots tightly hold the soil in place, protecting it from wind and water damage. Over time, the protection of these forest patches has preserved remnants of once-vast ecosystems that have vanished elsewhere (Gadgil & Vartak, 1975).

According to Dar et al. (2022), sacred groves are often located far from human settlements and home to a wide variety of tree species. These groves act as carbon sinks apart from the regional biodiversity and help in regulating the climate. While it is often illegal to cut trees in the sacred groves, they have remained resilient and served as reservoirs of carbon sinks by absorbing and storing carbon dioxide from the atmosphere, thus exhibiting carbon sequestration.

The ecological impact is closely related to environmental factorsparticularly the size of the grove and annual rainfall more than just religious values. Research shows that larger groves and wetter regions tend to support more diverse tree species, making their conservation crucial (Kumar et al., 2022).

Sacred groves are intended purely as religious relics, however the ecological significance from various studies and research help in recognizing another important aspect which is as environmental sanctuaries. Their preservation not only strengthens cultural heritage but also supports vital ecosystem services, proving that age-old traditions may still hold the solutions for a more sustainable future.

Cultural Dimension

Across India, sacred groves stand as powerful landmarks of community identity and spiritual connection. These forest patches are deeply woven into local traditions, andoften host rituals and religious ceremonies, with many believed to be inhabited by ancestral spirits or deities (Gadgil & Vartak, 1975; Ramakrishnan et al., 1998). In several places, temples or churches have even been constructed within these groves, underscoring their enduring religious and cultural relevance (Malhotra et al., 2001).

More than just places of worship, sacred groves represent a commitment to the preservation of cultural values. For generations, oral traditions, taboos, and spiritual practices have governed the use and preservation of these forest areas, effectively passing down for generationsin belief-driven conservation (Ramakrishnan et al., 1998). These groves thus act as "living libraries" of biocultural heritage, preserving intangible knowledge systems (Malhotra et al., 2001; Ormsby & Bhagwat, 2010). Sacred groves are seen as shared cultural assets, protected by community consensus and collective reverence.

In Kerala, the groves are representations of the rich cultural heritage and a belief system that has been passed down through generations. The shrinking of these groves not only endangers their biodiversity but also the traditional sociocultural practices. This also shows the interconnectedness of conservation with cultural significance. It is important to document their significance and changes of sacred groves to preserve the ecological and cultural values (Amritesh et al., 2025). Notermans et al. (2016) also noted that transformation in religious rituals which are meant to protect the residents is the main cause for the degradation in the traditional beliefs in sacred groves.

Religion or religious beliefs initially protected these groves but for economic gain people have exploited the area while still providing spiritual significance. This brings froth the complexity of religion and culture with conservation. It can be agreed that sacred groves are more than remnantsof the past and they are essential to the environmental and cultural resilience of the future. Their preservation demands both respect for age-old traditions and adaptive, community-driven solutions.

Social Dimension

Despite their cultural richness, the social dimension of sacred groves isunderexamined. One notable research by Jana et al. (2021) explored how gender and proximity to the sacred groves on perceptions of water value. Their study revealed that women, who often bear the responsibility of collecting water, were willing to pay more (higher WTP) for access, while individuals living farther from the groves demanded greater compensation for its loss (higher WTA). This shows the importance of gender and proximity of forest and water management policies in the local context. Incorporating such local perspectives into water and forest management policies could strengthen participatory conservation efforts and support rural development.

Another frame of reference is that in many tribal and rural societies across India, these groves are deeply intertwined with local belief systems, often revered as the dwelling places of deities or ancestral spirits. Community bonding is reinforced through collective rituals such as annual cleaning, festivals, and gatherings, reflecting the living heritage of human–nature coexistence (Devi et al., 2005). It is widely believed that violating the sanctity of these groves is forbidden by tradition and "*any alteration*

of the forest, such as cutting wood for construction or firewood, hunting animals or other forms of resource extraction will result in negative consequences to the person taking the resources" (Gadgil &Vartak, 1975; Chandrakanth et al., 1990; Barre et al., 2009; Khan et al., 2008; Chandran & Hughes, 1997).

The traditional conservation method of sacred groves which are deeply rooted in cultural and religious practices have effectively preserved biodiversity over years. However, rising societal pressure and increased anthropological activities now pose a threat. Researchers believe that involving local communities in maintaining the cultural practices and improving their socio-economic conditions help the sustainable conservation of sacred groves, thus linking ecological preservation with community well-being (Singh et al., 2017).

Sacred groves represent the vital expressions of traditional ecological importance, cultural heritage andcommunity identity. This interconnectedness among the ecological functions, cultural practices, and social governance exemplifies linkage sustainability, where the vitality of each domain enhances the others.

The Role of Sacred Groves in Meghalaya, India- Indicators and Implications of Sustainability

India is home to one of the highest concentrations of sacred groves globally (Fig. 2). It is estimated that there are over 100,000 or more such sacred groves (Malhotra, 2007) due toits diverse geography and rich ethno-cultural landscape. The sacred groves in various regions embody a wide array of cultural practices (Gadgil & Guha, 1993). They represent a long-standing tradition of community-driven forest management that is deeply intertwined with the cultural and cultural practices (Ormsby & Bhagwat, 2010).

In many places, these groves are managed by local institutions, the villagers nominate a chief or form committee tomanage them. In Meghalaya, sacred grove management typically involves local councils and ceremonial leadership led by priests or the village Chief (Tiwari et al., 1998). These sacred groves are governed through unwritten customary laws, and their disturbance is traditionally believed to invoke spiritual consequences, thereby ensuring conservation without formal enforcement mechanisms. Their preservation emphasizes the close relationship between cultural beliefs and environmental stewardship among indigenous communities in Northeast India (Ramakrishnan, 2001; Upadhaya et al., 2003).

In Meghalaya, sacred groves are conserved under various traditional names such as *Law Kyntang*, *Law Lyngdoh*, and *Law Niam,* particularly among the Khasi and Garo tribes. These forest patches are not only ecologically resilient but also serve as cultural keystones, playing a central role in the traditional knowledge, and collective identity of the community (Tiwari et al., 1998; Kiewtam & Ramakrishnan, 1989).

Numerous studies have indicated a higher species diversity in the sacred groves of Meghalaya than adjoining forests and in some cases, even more species than government-protected areas in similar regions (Ormsby & Bhagwat, 2010). In 1998, Tiwari and co-workers investigated 79 different sizes of sacred groves in Meghalaya, 'ranging from 0.01 to 900 hectares in size', and reported that in sacred groves the number of tree species was much higher than other disturbed forests (Tiwari et al., 1998). Upadhaya and co-workers (2003) also did a similar study in two sacred groves of Meghalaya; they made complementary discoveries that the groves had various

types of tree species and in high diversity. Similarly, during the survey of the botanical literature in Meghalaya that 4% of plant species (approx. 133 species of the total documented plant species) were found only in sacred groves of Meghalaya (Khan et al., 1997). Jamir and Pandey (2003) also measured plant species diversity of three sacred forests in Meghalaya revealing a total of 395 species, 14% of which were endemic.

In the sacred groves of Mawphlang, Meghalaya, several residents have 'recalled events when outsiders tried to harvest trees from the sacred grove but then fell ill'. Hence, the approach for the conservation, management and preservation of the grove was feasible by the belief in the negative repercussions of actions against rules and regulations (Ormsby & Bhagwat, 2010).

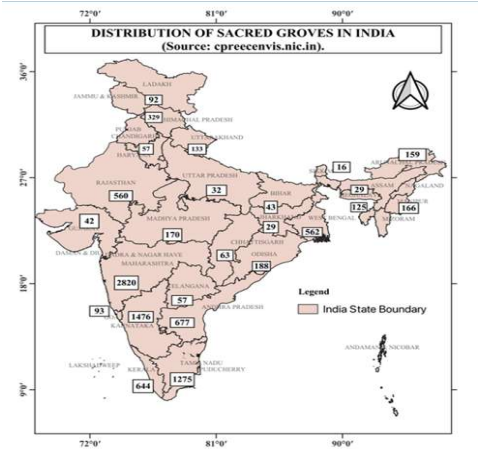

Fig. 2. Distribution of Sacred Groves in India (created by author based on source https ://ecoherit age.cpreec.org/sacred-grove/,https://megbiodiversity.nic.in/). The current reported number of sacred groves in Meghalaya is 125.

CONCLUSION:

Challenges and the Emerging Research Topic

Despite their ecological, social and cultural significance, sacred groves in India are increasingly threatened by land-use changes, deforestation, infrastructure development, religious shifts, and socio-economic transformation (Bhagwat & Rutte, 2006; Ramsankar, 2000). The decline of traditional governance systems and the erosion of customary norms have further exacerbated the degradation of these groves, particularly in areas where formal legal protection is absent (Bhatt et al., 2012). A critical challenge lies in integrating sacred groves into mainstream conservation frameworks while upholding their cultural specificity and community autonomy. Existing legislations such as the Forest Rights Act (2006) and the Biological Diversity Act (2002) offer avenues for recognizing sacred groves as Community-Conserved Areas (CCAs). However, effective implementation requires participatory approaches that empower indigenous and local communities, respect customary laws, and ensure equitable benefits from conservation efforts (Pathak, 2009). Initiatives such as the documentation of traditional ecological knowledge, the revival of cultural festivals, and local stewardship programs can enhance community engagement and foster resilience (Ray &

Ramachandra, 2010). These strategies not only promote ecological sustainability but also revitalize cultural identities and collective memory.

Sacred groves represent a node of linkage sustainability in the ecological, social, and cultural dimensions. As undisturbed forest sites, they provide an example for community-based conservation that challenges anthropocentric and extractive development paradigms (Maffi, 2005). In an era of environment or nature against modern development and human civilization, sacred groves offer a pathway more than environmental services, they serve as ethical and philosophical anchors that promote coexistence, reciprocity, and respect for the natural world. From the viewpoint of the nodes of linkage sustainability, sacred groves provoke ethical reflection on the role of humans in the natural world. Protecting and reviving sacred groves is therefore not just about conserving isolated patches of forest, it is about reaffirming our relationship with nature, informed by traditional wisdom, collective responsibility, and intergenerational justice. By bridging tradition and modernity, sacred groves can inform policies and practices that are both ecologically sound and culturally grounded.

Recognizing sacred groves as nodes of linkage sustainability highlights the need to study not just isolated functions—ecological, social, or cultural but their dynamic interrelationships. Future research should examine how these interdependencies evolve across contexts, particularly under modernization and policy interventions. Although there is a diversity of research on the sacred groves, certain aspects of these sacred groves remain to be clarified, and especially in the context of India, a major focus of the author's research.

In India, the sacred groves are prominent (Fig. 2) and a recent visit by the lead author to North-East India (Meghalaya) revealed a novel observation that the area of the groves is told be sustained unlike other sacred groves in the world. The continued presence of these groves in the local communities not only sparked the interest but also developed as a research topic to clarify the reasons behind from a political ecology perspective. Two major areas of study have emerged for the author's ongoing research: first, identifying the sustainable forest management practices embedded in sacred grove traditions; and second, exploring how these groves have been effectively governed for generations under traditional systems.

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