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A literary analogy of the contributions of “Cultural Services” to the ecosystem services provided by the Sacred Groves

Amit Pandey *

Department of Policy and Management Studies, Ecology and Economics of Sacred Forests, TERI-SAS, New Delhi, India.

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Abstract

Background: Millennium Ecosystem Assessment categorizes the ecosystem services into four types i.e. Supporting, Provisioning, Regulatory and Cultural ecosystem services. The MA defines cultural services in terms of the “nonmaterial benefits people obtain from ecosystems,” and specifically lists “cultural diversity, spiritual and religious values, knowledge systems, educational values, inspiration, aesthetic values, social relations, sense of place, cultural heritage values, recreation and ecotourism”.

Objectives: To review literature that discusses the contribution of cultural values towards a more holistic valuation of ecosystem services.

Methods: The available literature from 1976 to 2022 without language restriction has been covered with the help of secondary data analysis. Secondary information related to sacred groves in general and from regions of India has been collected from various sources including published research articles, technical reports, books and supporting documents from different stakeholders like research organization, NGOs, Forest Department, other Govt. Departments, etc in the national domain.

Results: The critical review of the available information led to the gap analysis that no study on the region-wise structure and model of the sacred groves has been done in Indian origin. Conservation of various natural forests existing as sacred groves have been an imperative concept of community based conservation since the time immemorial.

Conclusion: Cultural heritage is usually defined as the legacy of biophysical features, physical artifacts, and intangible attributes of a group that are inherited from past generations, maintained in the present, and bestowed for the benefit of future generations.

Keywords: Cultural Ecosystem Service; Sacred Groves; Conservation; Region-wise diversification

1. Introduction

Sacred groves are forests revered for their age-old association with a reigning deity, connotations, mystic events, traditional and ritualistic values and are a place where local dwellers feel peace and entrench various intangible values (peace, blessings, prayers, introspection). India, with its diversity of cultures and traditions, has over 100 000 sacred forests. Many of these groves are forest fragments in agricultural landscapes. In most cases, community members are at least aware of these fragments, if not actively involved in their protection and management. The cultural significance of sacred forests has been documented in number of studies which have suggested that they are important refuges for

* Corresponding author: Amit Pandey

Department of Policy and Management Studies, Ecology and Economics of Sacred Forests,, TERI-SAS, New Delhi, India .

conservation of biological diversity, including medicinal plants, within highly anthropogenic landscapes. An extensive review of sacred forests in the arid deserts of the world has been documented where the authors have reviewed the existentiality of sacred forests, sacred elements of those forests along with their existence [1]. Whilst sacred groves have been successful conservation areas, current threats to these forests are numerous, ranging from pressures for use of timber and other forest products to clearing for agriculture or general changes in cultural traditions, also over grazing on the fringes of the sacred groves is becoming a major rationale behind the decline in the area of these forests. A variety of arrangements exist for ownership and management of sacred forests, making it necessary to identify solutions on a case-by-case basis. Support for the continued practice of the tradition of sacred forest protection is needed in order to provide a culturally sensitive model for community-based natural resource management. On the motivation of this vexation, Pandey et al., 2021; has worked on the most probable conservation and management option of sacred forests of Kachchh, Gujarat, India on the basis of stakeholder perception analysis [2]. In addition to this, the conservation of sacred groves over the years has also been reported to be imperative for restoration of a degraded land [3].

Although readily acknowledged, cultural ecosystem services (ES) are still poorly defined or not fully integrated into the ES framework due to its intangible nature. In response to the ES approach, a sizable corpus of models, procedures, and data pertinent to cultural services have been established within the social and behavioral sciences. There are prospects for operationally defining cultural services in terms of socio-ecological models, consistent with the larger set of ES, according to a study of work in the fields of landscape aesthetics, cultural heritage, outdoor leisure, and spiritual value. These models explicitly connect ecological structures and functions with cultural values and advantages, facilitating dialogue between scientists and stakeholders and enabling economic, multi-criteria, deliberative evaluation and other techniques that can help to clarify tradeoffs and synergies involving cultural ES [4]. Some cultural values may have little dependence on ecosystems (e.g., those associated with historic buildings, paintings, and religious relics), cultural services, like all other ES, must demonstrate a significant relationship between ecosystem structures and functions specified in the biophysical domain and the satisfaction of human needs and wants specified in the medical/psychological/ social domain [2]. The importance of cultural services has consistently been recognized, but in the rare instances in which there is any further consideration, they are often characterized as being “intangible,” “subjective,” and difficult to quantify in biophysical or monetary terms, thus retarding their integration into the ES framework. As per the definition given by MA it is the regulatory ecosystem services that fits aptly into the defined criteria of the ecosystem services wherein a sacred grove associated with a water body is worshipped conserved by the nearby villagers as it might be the last refugia of the water availability in the village and also is a major source of water for the local people. As an ecological significance the sacred water body helps in recharging the underground water aquifers and help in the proper moisture content in the soil thereby maintaining the fertility of the soil. This further leads to a healthy vegetation and ecosystem balance [5].

Cultural services are also difficult to be evaluated in monetary terms and hence become a critical task for the analyst to give some value to these services. Discussed below are the various scientific foundations for integrating the cultural services:

1.1. Landscape Aesthetics

The MA refers to the “beauty or aesthetic value in various aspects of ecosystems, as reflected in the support for parks, ‘scenic drives,’ and the selection of housing locations.” Cultural services are the product of deep invigoration between human societies and the ecosystem that makes it clearly fit into the ES framework. Examples of landscape aesthetics would include, sites managed with small scale traditional believes will include features like , huge trees, hedgerows and terraces that affect ecosystem resilience and productivity as well as scenic beauty. Various ecological models have been used to evaluate the ecosystem services on the basis of site characteristics and aesthetic value by the perception analysis of the stakeholders relevant to the site characters. The ranking done by the stakeholders on different themes have made the analyst potent of assigning a monetary value to a landscape cultural service with a map created with the help of the stakeholder interview.

1.2. Cultural Heritage

The MA acknowledges that “many societies place high value on the maintenance of either historically important landscapes (‘cultural landscapes’) or culturally significant species.” “Cultural heritage is usually defined as the legacy of biophysical features, physical artifacts, and intangible attributes of a group or society that are inherited from past generations, maintained in the present, and bestowed for the benefit of future generations”. Both tangible and intangible characteristics of a natural heritage is based on the visualization of the biophysical attributes associated with the heritage for example farmland, cultivation etc. Also, it includes the heritage single specie association in terms of myths, legends and religious practices associated with the natural heritage. Hence cultural heritage are the models that

addresses the importance of heritage in order to maintain an ecosystem linked with the cultural services attached to a natural heritage.

1.3. Recreation and Tourism

Many Sacred Natural Sites are managed only on the basis of the value that it provides in the form of some recreation to its visitors; thus, recreation and tourism represent a major opportunity for managing the interaction between ecosystems and people, including the development of a constituency that appreciates and supports protection of ecosystems. Recreational activities, such as walking, camping, nature study and expeditions offer an opportunity for many people to experience the benefits of ES directly. The recreation value of the site though can be evaluated in many ways but the major reasons lie in the way the site is constructed in terms of its recreation characteristics.

2. Material and methods

Databases like ENVIS Center, CPR Environmental Education Center, JNTBGRI (Jawaharlal Nehru Tropical Botanic Garden and Research Institute) have been firmly followed to gather the information on the cultural significance of sacred groves and also to identify the entire article potent for making the review experimentally plausible and informative in providing a complete analogy to the concept of sacred groves. Bibliographies of other publications relevant to the study were also screened with a focus on the review discipline. Many authors included in the review article were contacted in order to confirm about the standard of information in the article and also to get their sumptuous suggestions on other pieces of literature related to the article and if any information has been missed.

3. Results and discussion

The present literary analogy has focused on an integrated approach in understanding contribution of cultural services to ecosystem services. In achieving this goal, I have analyzed sacred groves of four different regions of India i.e. Western Ghats, Himalayan region, Thar Desert and North-East region, presented in table 1. Towards this objective, I define model of sacred groves, ecological and biological extent of these groves, government intervention in management of groves and the anthropogenic pressures to the sacred groves. This would be influential and substantial in defining different policy scenarios required for an integrated valuation of ecosystem services and trade off.

Table 1 Region wise characteristics of the sacred groves

| Name of the Sacred Grove | State | Features of the sacred groves | Author, Year |
|--------------------------|-----------|--|------------------------|
| Western Ghats | | | |
| "kaval kadus" | Kerela | <p>Model of SG:</p> <ul style="list-style-type: none"> • Each <i>kavu</i> has a presiding deity in the form of a <i>Naga</i> (Nagaraja, Nagayakshi, Nagakannya etc.), Lord Sastha (Ayyappa), Bhagavathi, or some ancestral spirits. In Southern Kerala, most of the sacred groves are dedicated to <i>Naga</i> (<i>Sarpa</i> God) and many are associated with Siva and Bhagavathi temples. • Combinations of ponds/water bodies and sacred groves constitute a unique network of ecological landscape systems that intervene with life and culture of the people. <p>Ecological and Biological extent of the SG:</p> <ul style="list-style-type: none"> • As an ecosystem, they help in soil and water conservation, besides preserving the biological wealth. • <i>Kavus</i> also act as centers of biological control in agriculture due to the existence of complicated food web, regulated by balanced predator-prey organisms such as snake-rat, owlrat, insects, etc. This, in turn, helps to increase the production in agriculture. • The sacred forests are southern montane forests. The characteristics of the species dwelling in the region are different. • Tree canopy of the grove is represented by species like <i>Artocarpus hirsutus</i>, <i>Vateria indica</i>, <i>Hopea</i> sp., etc, which are endemic to Western Ghats (http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?317887) <p>Government Intervention towards the conservation of the SG:</p> <ul style="list-style-type: none"> • Over the past two centuries, the local people have lost their customary rights of forest management, due to government regulations. Hence, many sacred groves have been destroyed due to commercial forestry operations. • The communist government in 1957 and the actual implementation such as re-distribution of surplus land caused a large scale fragmentation of the land. Many SGs owing upper castes were forced to distribute their land and the peasants receiving it cleared such lands for commercial farming (Notermans, 2016). <p>Anthropogenic pressures to the SGs:</p> <ul style="list-style-type: none"> • In many sacred groves, anthropogenic activities like removal of biomass, firewood and cattle grazing was permitted and continuation of these practices over generations has resulted in the dwindling of the groves and adversely affecting the functioning of these ecosystems. | Referenc e no: 6 |
| "Devakad" | Karnataka | Model of the SG: | Referenc e no: 7, 8 |

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| | | <ul style="list-style-type: none"> • Kodagu District has 1214 sacred groves covering an area of 2500 ha representing around 2% of the land area of the district—essentially, there is one sacred grove for every 300 ha of land and, as such, this density of sacred groves could be one of the highest in the world. • “Devakad” is associated with the temple inside the grove premises contained with a nearby water body that serves the people of the village near the sacred grove. <p>Ecological and Biological extent of the SG:</p> <ul style="list-style-type: none"> • The sacred groves are mostly managed with the stakeholders who do on key issues ranging from restoration of natural degraded forests, joint forest management of community forests, promoting sustainable production of plantation crops like coffee, mitigation of man–animal conflict and improving the livelihood of local communities. • Higher basal area was more contributed by lofty trees of <i>Syzygium gardneri</i> and <i>Garcinia talbotii</i>, the latter an endemic species of Western Ghats. Though evergreenness in SG is (96.4%), endemism is high (42.6%) compared to Non-SG. This higher endemism is partly due to the higher protection which favoured important endemics such as <i>Garcinia talbotii</i>, <i>Garcinia gummi-gutta</i>, etc., <i>Hopea ponga</i> and <i>Knema attenuata</i>. The ecosystem services provided by the sacred grove have helped these species to grow in the sacred grove, thus making it native to the district. <p>Government Intervention towards the conservation of the SG:</p> <ul style="list-style-type: none"> • Before 1901, the SGs were owned by the colonial forest department. The historical records suggest that the colonial officers were aware of this local tradition of protecting patches of forest for their religious significance, and, to the extent possible, respected its cultural value. • Most of these posts are elected from the same Kodavu family or clan. People with previous experience with public service may have a greater prominence in the temple committee. • There is no formal government institution involved, and the government will not interfere in the decisions made by the temple committee except on issues of ownership of land. • In most cases temple committees have been formed to manage the forests. Where there are no temple committees, the village councils or village panchayats look after the matters of the SG; laying down rules, solving disputes, organizing festivals and looking into the overall management. <p>Anthropogenic pressures to the SGs:</p> <ul style="list-style-type: none"> • More than 80% of the sacred groves in Kodagu District are less than 2 ha in size with 45.8% of the sacred groves covering less than 0.4 ha. There are only 123 groves (10.1% of the total) that have a recorded area of more than 5 ha. As such, a very large proportion of the sacred groves in the district are small “islands”. • Constant encroachments on the SG land due to pressures of coffee/cardamom plantations, as they form the major income of most Kodavus, is observed, and any fluctuations in coffee prices in the market on the lower side leads to cutting down of trees and selling timber for cash from common property resources, including sometimes from the SGs. • Decline of religious beliefs and lack of awareness about nature conservation traditions amongst the younger generation that is more exposed to modern life-styles. <p>The new immigrants who do not have the same belief system pose a threat to the future of the protected forests.</p> | |
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| | | 'Sanskritisation' of the tradition of nature worship, leading to idol worship and ritualistic beliefs, often bypassing the SG itself. | |
| "Kandanur" | Tamil Nadu | <p>Model of the SG:</p> <ul style="list-style-type: none"> • It is 33 ha in size. It has residing deity and folklore which are undocumented or unwritten rituals and ceremonies associated with it. This sacred grove is dedicated to village god or ancient spirits. • The grove has a large area dedicated to a rituals or a ceremony along with the enshrinement of the deity in the temple inside the grove. <p>Ecological and Biological extent of the SG:</p> <ul style="list-style-type: none"> • The sacred grove harbor a distinctive biodiversity in which species like <i>Eugenia jambolana</i> (jamun), <i>Terminalia arjuna</i> (arjun) remains the dominant species as it is suitable as per the forest type that remains evergreen. The survival of aforementioned species in abundance is the proof of the healthy water body nearby as the species grow only near river banks or ponds etc (http://www.encyclopedia.com/earth-and-environment/ecology-and-environmentalism/environmental-studies/evergreen-forest) • This sacred grove is associated with a traditional water reservoir that helps to meet the water need of the villagers and also becomes useful in drier climate; the water from the reservoir is used for agricultural activities. Presence of trees prevents the topsoil erosion and siltation. <p>Government Intervention towards the conservation of the SG:</p> <ul style="list-style-type: none"> • The groves have not been measured or demarcated by the Forest Department, Revenue Administration, or by the local Panchayats (local government). • This makes the boundary rather flexible and denoted only by the change in vegetation. There was no evidence to show that the groves were maintained for their biodiversity conservation potential or for protecting their natural resource for the future. The preservation of groves is a result of strong ancient beliefs that any damage to the grove would anger the deity who would take revenge on the intruder who desecrates its integrity. • Most groves cannot be entered by local women. Incidentally women are the main resource use collectors in this region and this norm may act as an additional protection against overexploitation of resources within the groves. • Mobilization and Group formation with the support of the respective panchayat, panchayat level sacred groves conservation committee has been formed. • Besides, grove specific sacred grove management committee has also been formed involving representatives of all the stakeholders. • Awareness among the people is being created about the importance of the forest. So that the deforestation and felling forest trees can be prevented it may be implemented through nongovernmental organization by forming self-help group in the villages. <p>Anthropogenic pressures to the SGs:</p> <ul style="list-style-type: none"> • As a repercussion of having a larger area the sacred has faced with lots of pressures in terms of development, urbanization and constructions in the name of management of the groves. | Reference no: 9 |

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| | | <ul style="list-style-type: none"> Such activities have led to the decline in the not only the area of the sacred grove but also the vegetation and ecology have been severely affected. | |
| “Shevro” | Goa | <ul style="list-style-type: none"> Goa is said to possess 93 Sacred Groves. Sacred groves are patches of pristine forest area which are dedicated to local deities or forest spirits in Goa. Tribal communities who first inhabited Goa like the Kunbis and the Gavdas have protected these areas which can range from a small cluster of vegetation to 10 acres of land, seen in places like Keri and Verlem. Traditional worship of these patches as well as of plants and animals has been carried out since ancient times. Shevro is located in Bicholim district, Kharpal. Shevro is associated with a water stream coming from Mandovi river. Most groves are located near water bodies, springs or streams. These trees prevent soil erosion and help in conserving water. It is believed that the waters of these springs have medicinal properties. This sacred grove harbor several rare species of flora and fauna, including numerous medicinal plants. Thus they also have served as a traditional means of conservation of the rich bio-diversity of the forests. Being an evergreen, the forests of Goa enjoys lots of biodiversity inclusive of all the endemic species found in the Western Ghats. In order to pluck the medicinal plants the people of Goa have to perform some rituals to please the forest God. Even today, in the remotest parts of Goa, locals who are still far away from any rural health services, go to these sacred groves for herbal medicines. Species like <i>Occimum basilicum</i>, <i>Curcuma longa</i> etc are used for ethno-botanical purpose. The sacred grove since associated with a water stream has attracted many fish dwellers to utilize the stream for fisheries and has caused lots of concern to its management | http://www.cpreecenviis.nic.in/Data base/Goa_881.aspx |
| “Ashagad” sacred grove | Maharashtra | <ul style="list-style-type: none"> It 4-5 hectare sacred grove present in the Thane district of Maharashtra. Located 40 km from the river narmada. A total of 2820 sacred groves have been documented in Maharashtra (Deshmukh, 1999). Maruti; Vaghoba, Vira, Bhiroba, Khandoba and Shirkai are some of the deities to whom these groves are dedicated. The following species are commonly found in the sacred groves of Maharashtra - Portia tree, <i>Casuarina</i>, silk cotton tree, Indian laurel, Indian elm, bead tree, Indian butter tree, turmeric and Japanese ginger. Evergreen condition of these forest patches is responsible for the survival of aforesaid species even in the dry conditions. The felling of timber and the killing of animals in the sacred groves is taboo. Sacred groves form an important landscape feature in the deforested hill ranges of the Western Ghats of Maharashtra. In the recent years the anthropogenic activities like felling of trees for NTFPs (Non Timber Forest Product) have increased, also cattle grazing on the fringes of these sacred patch of forests is also becoming a matter of grave concern. | Reference no: 10, 11. |
| Himalayan region | | | |

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| "Kandi" sacred grove | Jammu and Kashmir | <p>Model of the SG:</p> <ul style="list-style-type: none"> • It is present in the Samba district of J&K which has been recently formed. "Kandi" is situated on the bank of Basantar river. • Half of the district Samba is rain fed due to which the sacred grove rejoice a hospitable landscape and biodiversity. • Ecological and Biological extent of the SG: • Being the Northern Montane Forest, the forest cover of the groves entertains trees of large canopies and also helps maintaining a microclimate inside the forest the management of the flora and fauna inside the grove. • <i>Eucalyptus citridora</i> is the most dense tree species with density value of 190 trees per hectare followed by <i>Syzygium cumini</i> and <i>Mangifera indica</i> having density of 100 and 80 tree per hectare respectively. • <i>Morus alba</i>, <i>Bombax ceiba</i>, <i>Psidium guajava</i>, <i>Cordia dichotoma</i>, <i>Butea monosperma</i> are the least dense species with density value of 3.33tree/ha each. • <i>Eucalyptus citridora</i> is observed as the most frequent species followed by <i>Ficus religiosa</i> because of the ever-greenness of both the species and also their presence in the grove is the indication of the availability of a water body nearby. <p>Government Intervention towards the conservation of the SG:</p> <ul style="list-style-type: none"> • The Jammu and Kashmir Heritage Conservation and Preservation act, 2010 provide for conservation and preservation of heritage both tangible and intangible, including buildings, structures, monuments, folklores, sacred groves and matter connected therewith or incidental thereto. <p>Anthropogenic pressures to the SG:</p> <ul style="list-style-type: none"> • In the recent years the distribution of plant species has decreased because local users like hunter gatherers, folk healers and priest depend on ecosystem services for their livelihood and cultural lives. | <p>https://rgp.jk.gov.in/gazette.html Reference no: 12, 13, 14</p> |
| "Dev Kothi" | Himachal Pradesh | <p>Model of the SG:</p> <ul style="list-style-type: none"> • In Himachal Pradesh, the local myths and legends associated with sacred groves go a long way in preserving the forests from destruction. • The sacred grove is present in the Shimla district of the state which ranges from 4-5 ha in area. • The sacred grove is surviving nearby the village, fringes of which happens the cultivation of the important medicinal plants which the local healers use to treat many diseases. <p>Ecological and Biological extent of the SG:</p> <ul style="list-style-type: none"> • One is not allowed to cut trees or even carry dry leaves outside the area. Bakhu Nag Devta, Ringarishi Devta (embodiment of an ancient sage) and Devi, are the deities to whom these sacred groves are dedicated. • Being a cold mountain range it caters to the Northern montane forest (boreal forest) with the common species found in the sacred groves are deodar, kail and oak with occasional spruce and silver fir. | <p>http://hpforest.gov.in/ https://www.hpforestco.in/ Reference no: 11</p> |

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| | | <ul style="list-style-type: none"> • The thick forests provide a good habitat for leopards, barking deers, ghorals, black bears, hares, wolves and many more animals. • Sacred groves are maintained with well defined management committees and biradari panchayats (caste councils) and all the major deities in the state have their own groves, hence the state is also called as the land of deities. <p>Government Intervention towards the conservation of the SG:</p> <ul style="list-style-type: none"> • Since Himachal Pradesh yet to report the true picture of the sacred groves hence the government rules and regulations towards the forest management don't reach these sacred patches of forests. <p>Anthropogenic pressures to the SG:</p> <ul style="list-style-type: none"> • Unsustainable extraction of NTFPs from the groves is very common activity that has led these groves to diminish in the recent years. | |
| <p><i>"Nagdev sacred forest"</i></p> | <p>Uttarakhand</p> | <p>Model of the SG:</p> <ul style="list-style-type: none"> • The sacred grove is situated in the Pauri Garhwal district of Uttarakhand (Latitude 30° 8' 30" N and Longitude 78° 46' 25" East). • Pravasi Pavasu Devata is the God to whom the grove is dedicated. • The sacred grove is associated with a temple with a tomb as an indication of mountain dedicated to lord Shiva and a water stream present nearby the temple or in the grove premises. <p>Ecological and Biological extent of the SG:</p> <ul style="list-style-type: none"> • The commonly found plant species are turnip-root chervil, Himalayan cedar, Sanjeevani, Indian barberry, Himalayan firethorn and Indian valerian, which is the indication of pine forest due to their high elevation and upper hill location. It comes under the category of Northern Montane Forest. • The unique features of sacred groves include the sacred Natural Site (SNS), Management system, the taboo system, festivals, dominant vegetation and service provided by the groves. • Considering the present conditions of the groves, they can be used as repositories of endemic plants, soil seed bank, connective corridor for birds and animals in human dominated landscapes. <p>Government Intervention towards the conservation of the SG:</p> <ul style="list-style-type: none"> • Lack of awareness in terms of long-term future benefit has resulted in the destruction of SGs. • No legislative protection has been implemented so far in India. This has caused considerable ecological damage. • Sacred groves have become the victims of deteriorating faith. Such religiously protected areas provide a comprehensive and rich ecological niche as repositories of genetic diversity. <p>Anthropogenic pressures to the SG:</p> <ul style="list-style-type: none"> • The increased threats to SGs can be related to the lack of an in-built conservation effort, higher demands for NTFPs, fuel wood collection, and decrease in the religious faiths along with the reduced commitment of the present generation toward such natural sacred places. | <p>Reference no: 11, 15, 16</p> |

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| | | <ul style="list-style-type: none"> • Encroachments of SGs areas by various government departments for different developmental projects, as well as migration and immigration of people, also have contributed to the extinction of SGs. • It therefore requires combined and holistic approach to conserve the grove tradition in nearby villages which is creating a pressure on the grove due to extended human intervention for the livelihood and other commercial activities such as ethno-botanical usage of the herbs of the forest. | |
| <p>“Kabi sacred grove”</p> | <p>Sikkim</p> | <p>Model of SG:</p> <ul style="list-style-type: none"> • It is existing in North Sikkim occupying an area of 3 km² and is bounded by households and degraded forests. • The grove is associated with a monolith (single great stone) which is being worshipped by the local communities. • This grove is situated about 22 km north of Gangtok along the Gangtok–Chungthang BRO highway, at an elevation of 1950 m mean sea level. <p>Ecological and Biological extent of the SG:</p> <ul style="list-style-type: none"> • The sacred grove revealed altogether 241 species of plants. The species come under 183 genera and 84 families. The Pteridophytic (leaflets bearing ferns) flora comprise of 13 families, 21 genera and 30 species and the Angiospermic (fruit and seed bearing plants) flora represents 70 families, 161 genera and 210 species, while gymnosperms (naked seed bearing without flower and fruits) are represented by a solitary species, <i>Cryptomeria japonica</i>. • The sacred grove also contains 41 species of medicinal plants which are used in abundance by the local communities for various local remedies to cure diseases. • Government Intervention towards the conservation of the SG: • Government has shown their interest by making some management practices towards the conservation of the sacred groves. • Participation of the local village representatives in tree plantation every month in the premises of the sacred grove. • No felling or cutting of the trees from the groves. Grazing of cattle is strictly prohibited even on the fringes of the sacred groves and has allotted some space of land as pastureland for grazing and livestock activities. <p>Anthropogenic pressures to the SG:</p> <ul style="list-style-type: none"> • The present status of the grove is of concern, as it is gradually declining under constant anthropogenic pressure. • Spiritual sentiments of the people are attached with the erected stones (stones of brotherhood), but not with the plant diversity of the area. • This exposes the biodiversity for exploitation. People’s rural appraisal (PRA) study revealed that different non-timber forest produces (NTFPs) are being collected often by the local people. • Due to the fast changing society framework and mindset of the younger generation, the spiritual concept behind the grove has been diluted. • Moreover, activities inside the grove are restricted to some auspicious occasions once or twice a year; otherwise it remains nothing more than a neglected forest patch. | <p>Referenc e no: 11, 17</p> |

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| | | <ul style="list-style-type: none"> It is clear that this sacred grove cannot be preserved based only on spiritual belief. The area adjacent to the grove may be developed as supply reserve forest, which can supply the biomass need of the people. In turn, it would also reduce anthropogenic pressure on the sacred grove. | |
| <p>“Gompa Forest Area”(GFAs)</p> | <p>Arunachal Pradesh</p> | <p>Model of SG:</p> <ul style="list-style-type: none"> GFAs were reported from these two districts and a few sacred groves from Lower Subansiri and Siang district of the state. The sacred groves are managed by Lamas and the Mompa tribe, are attached to the Buddhist monasteries. These sacred groves are dedicated to local deities such as Ubro or Ubram and Thouw-gew. Various ethnic groups of north-eastern India have preserved and protected several forest patches and even individual trees or animals due to their traditional beliefs and respect for nature. <p>Ecological and Biological extent of the SG:</p> <ul style="list-style-type: none"> Tropical evergreen forests consists of some of the species commonly found in the sacred groves of Arunachal Pradesh are banyan, pipal, ashoka, bela and harada. These trees are used by the tribes for the treatment of various diseases by using the medicinal plants and these medicinal plants are grown in their lawns and backyards of the house. The sacred groves provide a repository of many endemic flora and fauna of the state which responsible for the management of the ecological balance and also provide varied ecosystem services in terms of maintaining the biodiversity, soil formation and maintenance of soil nutrients. <p>Government Intervention towards the conservation of the SG:</p> <ul style="list-style-type: none"> Government of Arunachal Pradesh has been extra concerned towards these traditionally conserved forests. It has started with the restoration of vegetative cover for soil and water conservation which can further be used for rejuvenation of the degraded lands potent to be called as sacred groves. Survey and documentation of the medicinal plants used by the local priests and healers which they use in the remedy for various rampant diseases. Social Forestry programs through distribution of seedlings of commercially or locally used medicinal plants and creation of Apnavan through the involvement of the local community residing near the sacred grove. <p>Anthropogenic pressures to the SG:</p> <ul style="list-style-type: none"> Population explosion has created lots of pressure on the natural resources of the sacred groves the tribes are heavily dependent of these naturally available resources. Tribal community hence seeks for some rehabilitation mechanism from the government. | <p>https://arunachalforests.nic.in/</p> <p>http://arpenvis.org.in/Contact/contact.aspx</p> <p>http://arunachalpradesh.gov.in/</p> <p>Reference no.: 11</p> |
| <p>“Dikhos”</p> | <p>Assam</p> | <p>Model of SG:</p> <ul style="list-style-type: none"> These are the sacred groves managed and preserved by the Dimasa community of North Cachar Hills district recently renamed as Dima Hasao district of Assam, India. This sacred grove has a temple inside the forest premises which is associated with some deity or some legends. The Dimasas, also known as Dimasa Kacharies, constitute the largest ethnic group in North Cachar Hills and linguistically belongs to the Tibeto-Burman group. | <p>https://forest.assam.gov.in/</p> <p>https://environment</p> |

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| | | <p>Ecological and Biological extent of the SG:</p> <ul style="list-style-type: none"> • Located strategically, these sacred groves provide several important ecological services to the people of the district. In addition to the sacred groves the plants considered to be sacred by them are also included. • <i>Areca catechu</i>, <i>Emblica officinalis</i> and <i>Smilax perfoliata</i> are the most common species found in the sacred groves and are utilized by the local people. • The intimate association of the Dimasas with the nature is not only confined to the use of natural resources and conservation of forests through belief alone but also provide sanctions to a number of individual plants by incorporating in their religious rites, social customs or even as part of their social structures as names of villages or names of clans. • The Sacred Groves have been playing an important role in conservation of biodiversity as these forest areas are experiencing least or without human interferences like <i>Jhum</i> cultivation, cutting of trees for fuel and/or for timber, etc. Therefore, these forests are usually rich in biodiversity which have been conserved through community participation. • Sacred groves represent the dense vegetation of an area, and in most cases the vegetation formed a sharp boundary with the adjacent degraded forests. From the locations of the sacred groves maintained by the Dimasas at the catchment areas of major rivers or rivulet or at the point of origin of perennial streams, it is evident that the sacred groves provide such important ecosystem services as conserving soil, protecting water sources and catchment areas and helping to maintain downstream water quality. <p>Government Intervention towards the conservation of the SG:</p> <ul style="list-style-type: none"> • “<i>Dikhos</i>” are maintained by the local priest (member of a Dimasa society) with less or negligible intervention of the government. • In Dimasa society an administrative hierarchy has been followed from highest ranked priest to the common people of different clans. The authority of a Jonthai (the selected individual as the concerned person for the SG) is undisputed and he performs his duties as per the instruction of a head priest or Jonthaima of all the <i>Dikhos</i>. • There is also a principal priest or chief priest, known as Gisia, at the top of the hierarchy. The person selected for Jonthaiship is baptised by the Gisia by sprinkling holy water or Dithar. <p>Anthropogenic pressure to the SG:</p> <ul style="list-style-type: none"> • “<i>Dikhos</i>” enjoys proper attention and care from its people and hence face no or negligible threats. | <p>entandfo rest.assa m.gov.in/</p> |
| <p>“<i>Gramthan</i>”</p> | <p>West Bengal</p> | <p>Model of the SG:</p> <ul style="list-style-type: none"> • In West Bengal, “<i>Gramthan</i>” SGs are found in the southwestern districts where the tribal populations are the largest, and where industrial development has not expanded enough to expunge indigenous cultural traditions. • The lack of industrial growth in the region seems to have facilitated the survival of such institutions. Furthermore, most of the forests in the region belong to the Protected Forest category, allowing villagers virtually free access to a wide range of non-timber forest products (NTFP). • This relative freedom of the villagers in these districts to harvest and use NTFP seems to have indirectly allowed the local forest-based cultural traditions to persist, in which SGs occupy a significant space. | <p>Referenc e no: 18</p> |

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| | | <ul style="list-style-type: none"> • The sacred grove generally has a temple grove which is worshipped as antidote to various evil spirits or evil eye effect to the nearby village. <p>Ecological and Biological extent of the SG:</p> <ul style="list-style-type: none"> • Protected over centuries, SGs are remnants of pristine forests in climax formation which are the final outcome of ecological succession in the development of vegetation area. • Indigenous flora, non-native trees like guava (<i>Psidium guajava</i>), <i>Acacia auriculiformes</i>, <i>Ervatamia divaricata</i> and <i>Polyalthia longifolia</i> also occur in the SGs. This indicates that these trees are often planted in the SGs to replace dead trees in the stand, and therefore the biotic composition of SGs is not necessarily pristine, but is a result of continuous human intervention and management. • Conservation of biodiversity in SGs is a consequence of the sacred physical space of the SG, which is communally shared as commons, and used to observe important social ceremonies in indigenous societies. Several cultural festivals are performed in the SG, which also provide a meeting place on various occasions including social gatherings, marriage, after death rituals, etc. • These make up a unique social means to prevent intra-group conflicts and violation of the traditional ethos by infringements by outsiders. The sacred grove represents the unique fragments of the respective species gene pool. <p>Government intervention towards the conservation of the sacred groves:</p> <ul style="list-style-type: none"> • As per the government rules the sacred groves are supposed to be left pristine and no commercial activities should take place in any way. • Violator shall be punished with six months of imprisonment and heavy fine. <p>Anthropogenic pressures to the SG:</p> <ul style="list-style-type: none"> • Many times cultural rituals in the sacred grove are performed unsustainable which leads to the devastation of these local patches of virgin forests. • Land encroachment in the name of development and management of the grove is also a serious threat and a matter of concern. | |
| Thar Desert | | | |
| "Deora" | Rajasthan | <p>Model of SG:</p> <ul style="list-style-type: none"> • This sacred is located in Alwar district of the state. Garvaji, Bharthariji, Naraini Mata, Peerbaba, Hanumanji and Naharsakti Mata are the deities to whom these groves are dedicated. • The density of the trees of the grove is huge and should be associated with temples of traditional style made of mud. • The sacred groves are associated with trees in terms of its cultural beliefs by local people and considered as sacred. <p>Ecological and Biological extent of the SG:</p> <ul style="list-style-type: none"> • The state covers the arid biogeographic province of India, the Thar Desert which is responsible for tropical thorn forest and species with thorns. | Referenc es no.: 11, 19. |

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| | | <ul style="list-style-type: none"> • The commonly found plant species are Cutch tree, Indian mesquite, mukul myrrh tree, salvia leaved cross berry, Indian tree of heaven, neem, Indian plum, banyan and pipal. • Ecologically the leaves of these trees have modified into spines like thorns in order to store water so as to survive the water scarcity which is rampant in the state. • People do not cut wood for personal use. Only dead and fallen trees are removed for religious work such as the repair of the temple or funerals. • Community protection of sacred groves has resulted in several large sized trees. For example, there is a large tree of Churail (<i>Holoptelia integrifolia</i>) growing in the sacred grove. • This is the largest tree of this species in India, having a height more than 33 metres, and its girth is 6.91 metres. Usually, only fallen and ripe fruits are collected from the grove. Wood from mature trees is used to repair religious places. <p>Government intervention towards the conservation of the sacred groves:</p> <ul style="list-style-type: none"> • Conservation of the sacred groves in the state is purely based on communities participation but government intervene in terms of forming groups of willing workers who can support the management protocols set up by the government. • The management protocols include the training of the village representatives in the methods of sustainable utilization of the natural resources. • It is the local community organized and registered as village forest protection and management committee that will ultimately carry out the restoration work of the groves. Their aspiration and vision would be a major guiding factor to restore the groves. <p>Anthropogenic pressures to the SG:</p> <ul style="list-style-type: none"> • Sacred groves currently face various threats like submergence, clear felling, mining, quarry, encroachment and other depletive factors. • The sacred grove is threatened because of increasing pressure from population and livestock. Several encroachments have taken place, and worse, they have been regularized by the Governments. Area and legal status of this sacred grove has not been clearly defined. Unfortunately, the land has not even been declared as forest lands, hence effective legislation is not applied in the case of offenders. | |
| Sacred groves | Haryana | <p>Model of SG:</p> <ul style="list-style-type: none"> • In Haryana, unlike in many other states, there is no generic name for sacred groves although the sites are protected for similar reasons. • Most of the sacred groves are located in Mahendergarh district of Haryana which covers almost 50 known sacred groves and there are many sacred groves which existing but remain undocumented. • There is a lack of data regarding the number of sacred groves. Khetanath, Jairamdas, Shiv, Bala Sundari, Nao Gaja and Mani Goga Peer are the some of the deities to whom these sacred groves are dedicated. | Reference no. 11, 20 |

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| | | <ul style="list-style-type: none"> • Sacred groves here are associated with nearby village and a temple with a water stream which serves as a reservoir for the village. <p>Ecological and Biological extent of the SG:</p> <ul style="list-style-type: none"> • The common species found in these sacred groves are white pear, Mandarin, Bruisewort, garden violet, lac tree, elm, pipal, banyan and flame of the forest. The sandy soil and salinity and aridity in the soil support the sustenance of the aforesaid vegetation as they huge evergreen trees which can survive in the extreme ecological condition. • The groves act as a repository for medicine and as a source of honey, fruits and water. <p>Government Intervention towards the conservation of the SG:</p> <ul style="list-style-type: none"> • The government of Haryana is very protective about the areas considered as protected, conserved and also about the sacred groves. • The rules are framed under which no commercial activities such as development or mining can happen nearby the grove area and also encroachment in any form is strictly prohibited and will attract imprisonment. • Anthropogenic pressures to the SG: • In Mahendergarh district the sacred groves face lots of threats from increased anthropogenic pressure in terms of industrialization, urbanization, developmental activities and population explosion leading high demand of the resources that has led to unsustainable utilization of the available natural resources. | |
| Sacred Groves | Punjab | <p>Model of SG:</p> <ul style="list-style-type: none"> • In Punjab, Chatpat Nath Ji and Chatpat Bani are the deities to whom the sacred groves are dedicated. • The sacred groves are basically the embodiment of the rituals and cultural beliefs that are associated with any trees or temple inside the grove. • Ecological and Biological extent of the SG: • Sacred groves in Punjab have species of native trees along with thick under storey vegetation comprising of several medicinal plants, herbs and grasses. • Since the ecological condition in Punjab is fairly well, it has led to the surviving many sacred patches of forests. • The traditional farmers utilize even a very small patch of land for the cultivation of commercially important plants that has increased over the years and has created lots of threat the existing sacred groves. <p>Government Intervention towards the conservation of the SG:</p> <ul style="list-style-type: none"> • The State Government in consultation with local bodies has notified in the official gazette, areas of biodiversity importance as Biodiversity Heritage Sites (BHS). • The State Government in consultation with the Central Government has framed rules for the management and conservation of BHS and also the State Governments has framed schemes for compensating or rehabilitating any person or section of people economically affected by such notification. • Areas which have already been designated identified or notified (for example as protected area, biosphere reserve, etc.) under other Acts or program may not be considered under this provision. The idea is to identify | Reference number: 11, 21 |

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| | | <p>those areas important from Biodiversity point of view which do not enjoy protection/support under any other Act or program.</p> <p>Anthropogenic Pressures to the SG:</p> <ul style="list-style-type: none"> • In Punjab the pressures on biodiversity are of various kinds. The sacred groves of Punjab are under pressure due to several reasons such as encroachment, land reclamation and soil erosion. The introduction of exotics is also affecting Punjab's natural fish populations. • The wild flora and fauna are threatened due to loss of habitats and due to destructive harvesting of the species. • There has been an increasing pressure on the commercially valuable biological resources such as timber and medicinal plants. Many medicinal plant species are threatened due to over harvesting. | |
| <p><i>Oran Mata Sadhay Pir</i></p> | <p>Gujarat</p> | <p>Model of the SG:</p> <ul style="list-style-type: none"> • A total of 42 sacred groves have been documented so far (Patel, and Patel, 2012). Khodiyar mata, Oran Mata, Jhalai mata, Panch Krishna, Mahadev are some of the deities to whom these sacred groves are dedicated. • This sacred grove is associated with 150 years old trees surviving till date, which are worshipped by the local people. • “<i>Sadhay Pir</i>” is a Muslim sacred grove which is worshipped for the sacred grave of Muslim God. <p>Ecological and Biological extent of the SG:</p> <ul style="list-style-type: none"> • The vegetation in the groves is highly varied viz. mangroves, fresh water swamps, or other tropical forest types. Cotton tree, Bengal quince, neem, mango, flame of the forest, sissoo, thorny staff tree, banyan and pipal are some of the most commonly found species in these groves. • Sacred groves thus play an important role in the conservation of biodiversity, recharge of aquifers and soil conservation. It is strictly prohibited to cut or climb the trees and remove dead wood (Patel, 2004). • The vegetation covers tropical thorn forest which represents the trees with needle like thorns as a mechanism to store water in order to store water during water scarcity condition especially in Kachchh district that consists of Southern part of Thar Desert. • Gujarat comes in the zone 3A as per the classification given by Rodgers and Panwar, 1988 which describes the region as an arid region; hence Gujarat represents an arid biogeographic province of India. <p>Government Intervention towards the conservation of the SG:</p> <ul style="list-style-type: none"> • Gujarat being associated with arid environment has rampant invasive species <i>Prosopis juliflora</i> which is a major cause of degradation many native forest species and also has created lots of threats to the existing forests and even the sacred groves. • For <i>Oran Mata</i> and <i>Sadhay Pir</i> , since these sacred groves are owned by government , the government has passed regulations regarding the clearing of the forest from this invasive species so as to stop the degradation of the sacred groves. | <p>Referenc e no: 22, 23, 24, 11, 25</p> |

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| | | <ul style="list-style-type: none"> • Also, illegal utilization of the any NTFPs, fuel wood and timber has also been legalized by assigning severe punishments and in major cases imprisonment to the violator. <p>Anthropogenic pressures to the SG:</p> <ul style="list-style-type: none"> • After the epidemic earthquake in Bhuj in 2001, the state has witnessed a rapid increment in the agriculture that has led to clearing of many forests and sacred groves are many of them. • The area of the groves has shrunk over the years due to increased anthropogenic activities such as grazing of cattle, agriculture, livestock activities. | |
| North-East India | | | |
| "Kabi sacred grove" | Sikkim | <p>Model of SG:</p> <ul style="list-style-type: none"> • It is existing in North Sikkim occupying an area of 3 km² and is bounded by households and degraded forests. • The grove is associated with a monolith (single great stone) which is being worshipped by the local communities. • This grove is situated about 22 km north of Gangtok along the Gangtok–Chungthang BRO highway, at an elevation of 1950 m mean sea level. <p>Ecological and Biological extent of the SG:</p> <ul style="list-style-type: none"> • The sacred grove revealed altogether 241 species of plants. The species come under 183 genera and 84 families. The Pteridophytic (leaflets bearing ferns) flora comprise of 13 families, 21 genera and 30 species and the Angiospermic (fruit and seed bearing plants) flora represents 70 families, 161 genera and 210 species, while gymnosperms (naked seed bearing without flower and fruits) are represented by a solitary species, <i>Cryptomeria japonica</i>. • The sacred grove also contains 41 species of medicinal plants which are used in abundance by the local communities for various local remedies to cure diseases. <p>Government Intervention towards the conservation of the SG:</p> <ul style="list-style-type: none"> • Government has shown their interest by making some management practices towards the conservation of the sacred groves. • Participation of the local village representatives in tree plantation every month in the premises of the sacred grove. • No felling or cutting of the trees from the groves. Grazing of cattle is strictly prohibited even on the fringes of the sacred groves and has allotted some space of land as pastureland for grazing and livestock activities. <p>Anthropogenic pressures to the SG:</p> <ul style="list-style-type: none"> • The present status of the grove is of concern, as it is gradually declining under constant anthropogenic pressure. • Spiritual sentiments of the people are attached with the erected stones (stones of brotherhood), but not with the plant diversity of the area. • This exposes the biodiversity for exploitation. People’s rural appraisal (PRA) study revealed that different non-timber forest produces (NTFPs) are being collected often by the local people. | Reference no: 26 |

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| | | <ul style="list-style-type: none"> • Due to the fast changing society framework and mindset of the younger generation, the spiritual concept behind the grove has been diluted. • Moreover, activities inside the grove are restricted to some auspicious occasions once or twice a year; otherwise it remains nothing more than a neglected forest patch. • It is clear that this sacred grove cannot be preserved based only on spiritual belief. The area adjacent to the grove may be developed as supply reserve forest, which can supply the biomass need of the people. In turn, it would also reduce anthropogenic pressure on the sacred grove. | |
| <p><i>“Gompa Forest Area”(GFAs)</i></p> | <p>Arunachal Pradesh</p> | <p>Model of SG:</p> <ul style="list-style-type: none"> • GFAs were reported from these two districts and a few sacred groves from Lower Subansiri and Siang district of the state. • The sacred groves are managed by Lamas and the Mompa tribe, are attached to the Buddhist monasteries. • These sacred groves are dedicated to local deities such as Ubro or Ubram and Thouw-gew. Various ethnic groups of north-eastern India have preserved and protected several forest patches and even individual trees or animals due to their traditional beliefs and respect for nature. <p>Ecological and Biological extent of the SG:</p> <ul style="list-style-type: none"> • Tropical evergreen forests consists of some of the species commonly found in the sacred groves of Arunachal Pradesh are banyan, pipal, ashoka, bela and harada. • These trees are used by the tribes for the treatment of various diseases by using the medicinal plants and these medicinal plants are grown in their lawns and backyards of the house. • The sacred groves provide a repository of many endemic flora and fauna of the state which responsible for the management of the ecological balance and also provide varied ecosystem services in terms of maintaining the biodiversity, soil formation and maintenance of soil nutrients. <p>Government Intervention towards the conservation of the SG:</p> <ul style="list-style-type: none"> • Government of Arunachal Pradesh has been extra concerned towards these traditionally conserved forests. It has started with the restoration of vegetative cover for soil and water conservation which can further be used for rejuvenation of the degraded lands potent to be called as sacred groves. • Survey and documentation of the medicinal plants used by the local priests and healers which they use in the remedy for various rampant diseases. • Social Forestry programs through distribution of seedlings of commercially or locally used medicinal plants and creation of Apnavan through the involvement of the local community residing near the sacred grove. • Anthropogenic pressures to the SG: • Population explosion has created lots of pressure on the natural resources of the sacred groves the tribes are heavily dependent of these naturally available resources. Tribal community hence seeks for some rehabilitation mechanism from the government. | <p>Reference no: 27</p> <p>https://arunachalforests.nic.in/</p> <p>http://arpenvis.org.in/Contact/contact.aspx</p> <p>https://arunachalpradesh.gov.in/</p> <p>https://appsc.gov.in/Index/institute_home/institutes/RECINS001</p> |

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| <p>"Dikhos"</p> | <p>Assam</p> | <p>Model of SG:</p> <ul style="list-style-type: none"> • These are the sacred groves managed and preserved by the Dimasa community of North Cachar Hills district recently renamed as Dima Hasao district of Assam, India. This sacred grove has a temple inside the forest premises which is associated with some deity or some legends. • The Dimasas, also known as Dimasa Kacharies, constitute the largest ethnic group in North Cachar Hills and linguistically belongs to the Tibeto-Burman group. <p>Ecological and Biological extent of the SG:</p> <ul style="list-style-type: none"> • Located strategically, these sacred groves provide several important ecological services to the people of the district. In addition to the sacred groves the plants considered to be sacred by them are also included. • <i>Areca catechu</i>, <i>Embllica officinalis</i> and <i>Smilax perfoliata</i> are the most common species found in the sacred groves and are utilized by the local people. • The intimate association of the Dimasas with the nature is not only confined to the use of natural resources and conservation of forests through belief alone but also provide sanctions to a number of individual plants by incorporating in their religious rites, social customs or even as part of their social structures as names of villages or names of clans. • The Sacred Groves have been playing an important role in conservation of biodiversity as these forest areas are experiencing least or without human interferences like <i>Jhum</i> cultivation, cutting of trees for fuel and/or for timber, etc. Therefore, these forests are usually rich in biodiversity which have been conserved through community participation. • Sacred groves represent the dense vegetation of an area, and in most cases the vegetation formed a sharp boundary with the adjacent degraded forests. From the locations of the sacred groves maintained by the Dimasas at the catchment areas of major rivers or rivulet or at the point of origin of perennial streams, it is evident that the sacred groves provide such important ecosystem services as conserving soil, protecting water sources and catchment areas and helping to maintain downstream water quality. <p>Government Intervention towards the conservation of the SG:</p> <ul style="list-style-type: none"> • "Dikhos" are maintained by the local priest (member of a Dimasa society) with less or negligible intervention of the government. • In Dimasa society an administrative hierarchy has been followed from highest ranked priest to the common people of different clans. The authority of a Jonthai (the selected individual as the concerned person for the SG) is undisputed and he performs his duties as per the instruction of a head priest or Jonthaima of all the Dikhos. • There is also a principal priest or chief priest, known as Gisia, at the top of the hierarchy. The person selected for Jonthaiship is baptised by the Gisia by sprinkling holy water or Dithar. <p>Anthropogenic pressure to the SG:</p> <ul style="list-style-type: none"> • "Dikhos" enjoys proper attention and care from its people and hence face no or negligible threats. | <p>Referenc e no: 26</p> |
| <p>"Law Lyngdoh"</p> | <p>Meghalaya</p> | <p>Model of SG:</p> | <p>Referenc e: 27, 26</p> |

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| | | <ul style="list-style-type: none"> • Ryngkew, Basa, labasa are some of the deities to whom the groves are dedicated. The sacred groves are associated here with the forest provided under traditional land tenure system in which the entire land is dedicated to some cultural beliefs, taboos or totem (Emblem consisting of an object such as an animal or plant; serves as the symbol of a family or clan). <p>Ecological and Biological extent of the SG:</p> <ul style="list-style-type: none"> • Meghalaya has a rich biodiversity due its healthy ecological status which has led the state to covers the healthiest vegetation in India. It covers tropical moist deciduous forest type (Champion and Seth, 1968). • The commonly found plant species are bamboo, needle wood, Indian birch, white pear, royal robe, balsum of peru, phurse champ, lac tree and plot's elm. A number of perennial streams originate from 58 of these groves. • These groves are considered as one of the most biodiversity rich areas. Ancestral worship is traditionally performed in the sacred groves. In forested areas, the focus of worship is on ancient monoliths (a single great stone that is worshipped) (Tiwari et.al., 1999). • The sacred groves provide safe sites for the reproduction of a variety of floral and faunal species. They help maintain the viable population of pollinators and predators, conserve germplasm and serve as potential source required for colonization of wastelands and fallows. <p>Government Intervention towards the conservation of the SG:</p> <ul style="list-style-type: none"> • Unlike other parts of the country, sacred groves of Meghalaya enjoy adequate legal support as these are covered under the UnitedKhasi-Jaintia Hills Autonomous District Management and Control of Forests Act, 1961. • As per the law the Government has passed strict notification about the utilization of the natural resources specially for "<i>Law Lyngdoh</i>", it states that no trees shall be felled in these forests without the previous sanction of the Chief Forest Officer of the district, no trees shall removed except for purpose connected with religious functions or ceremonies recognized and sanctioned by the Lyngdoh or concerned person with it. <p>Anthropogenic pressures to the SG:</p> <ul style="list-style-type: none"> • Due to several socio-cultural economic reasons, the traditional beliefs which were hitherto central to sacred groves conservation are now considered mere superstitions. • The traditional values of the groves are gradually being lost with the advent of modernity and education, road communication to once inaccessible sacred grove. • The judicial authorities of traditional institutions responsible for the management of the grove have considerably diminished due to establishment of administration judiciary institutions by the government. • Economic constraints caused by smaller land holdings have resulted in the encroachment of sacred grove area for agriculture. | |
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4. Conclusion

The literary review of the landscape aesthetics, cultural heritage, outdoor recreation and cultural significance supports the cause of intimate interconnection of these services with the ecosystem thereby fitting into the ES framework. Some specific opportunities and challenges along the path of further development of cultural ES are briefly discussed below:

4.1. Integration of Scientific Epistemologies

Various concepts, hypothesis, permutations and combinations and methods in the discipline of ecology and social sciences are not sufficient to define the interrelated nature of ES. A range of transdisciplinary approaches that incorporate public involvement can be used to promote more effective understanding of cultural ES that arise from complex socio-ecological systems. People draw on multiple forms of knowledge to interpret problems and possibilities within their environment, from scientific or institutional to highly contextual local or traditional knowledge forms. To include these multiple types of knowledge within and across multiple scales, approaches that do not assume scientific primacy or exclude alternative epistemologies are more likely to be successful.

4.2. Assessing and Modeling Interdependent Socio-ecological Systems

In order to address the ecological drivers of the social behavior, a consortium of qualitative and quantitative technique is ideal. Qualitative technique would use strategies like focus group discussions, people's participation in planning etc. whereas quantitative would include formal surveys, economic valuation techniques. It works on determining a specific ecosystem service, its association with the cultural service and the biophysical variables influencing it. This helps in the proper explanation of the interdependence of the cultural services with ecosystem.

4.3. Defining the Spatial Dimension of Cultural ES

Using spatially explicit models to evaluate the connection between nature and culture is indeed an innovative extent but GIS (Geographical Information System) is not sufficient to describe all the interactions happening in an ecosystem. Though mapping the area with GPS (Global Positioning System) coordinates help the researcher get a fairer idea about the location and the area of the site yet it is not possible to get the scientific factors that are the reason behind any biophysical phenomena that the site is witnessing or has witnessed over the years.

4.4. Addressing Tradeoffs and Synergies Across Multiple Value Systems

The multiple services provided by the ecosystem can never be estimated if some values are unknown or ignored while in-situ data collection. Because of lack of information or data deficiency many interactions in the ecosystem still remains undocumented which leaves a major gap to be filled in order to complete the documentation and estimation of cultural services. Visualizations can facilitate communication and improve reliability and validity of monetary valuations. GIS-based 3D representations of planned ecosystem changes have supported assessments of stakeholder preferences for different management strategies. The combination of valid and intuitively accessible representations of environmental options with participatory deliberative decision methods, including citizen juries, value construction and multi-criterion decision analysis, offers proven tools for negotiating across preferences of multiple stakeholders and multiple scales without requiring the monetization of what many regard as intrinsically nonmonetary values.

Compliance with ethical standards

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