

Study the Causes of Biodiversity Degradation and their impacts on Wildlife in a Sacred Grove Nai-Ka-Nath, Bassi, Jaipur Rajasthan

Vijay Choudhary (Research Scholar, JECRC University, Jaipur, Rajasthan)

Varsha Gupta (Assistant Professor, Department of Microbiology, JECRC University, Jaipur, Rajasthan)

Abstract — Biodiversity is the variety of all species on our planet. It includes different plants, animals, birds and micro-organisms, their genes, their habitats and all the ecosystems (forests, grass-lands, lakes, ponds, rivers, wet-lands etc.). Sacred groves are the fine example of in-situ conservation of biodiversity. Sacred groves are forest fragments, which are protected by religious communities, and have a significant religious connotation for the protecting community. Sacred groves are lost due to, anthropogenic interventions like shifting cultivation, overexploitation of forest produce, cattle grazing and changes in land use by converting forests to monoculture plantations agricultural lands and dwelling sites. Nai-Ka-Nath sacred grove situated in Jaipur district of the state of Rajasthan. The sacred grove has rich biodiversity. Several plants and animals that are threatened in the nearby areas are still well conserved in this grove. A historical temple of Bhagwan Shiva is situated in Nai-Ka-Nath grove and surrounded by hills. Due to anthropogenic activities like grazing, herb collection, timber and firewood collection, mining, pollution etc. the grove is facing the problem of degradation. These activities have been continuing ever since man started cultivation and exploitation of natural resources for livelihood. Due to these activities floral species like *Gloriosa superba*, *Tinospora cordifolia*, *Ganoderma lucidum*, *Sida cordifolia*, *Commiphora wightii*, *Tribulus terrestris*, *Asparagus racemosus* etc. and faunal species like *Canis aureus*, *Hyaena hyaena*, *Canis lupus pallipes*, *Vulpes bengalensis*, *Hystrix indica*, *Naja naja*, *Psittacula cyanocephala*, *Coracias benghalensis*, *Pitta brachyura* etc. are verge of extinction in Nai-Ka-Nath area. In this research we are trying to find the problems of the area, causes of biodiversity loss and their effects on wildlife.

Keywords — Biodiversity, Sacred Grove, Traditional, Sacredness, Degradation, Wildlife, Anthropogenic Interventions, Pollution.

1 INTRODUCTION

1.1 Biodiversity

Biodiversity is the variety of all species on our planet. It includes different plants, animals, birds and micro-organisms, their genes, their habitats and all the ecosystems (forests, grass-lands, lakes, ponds, rivers, wet-lands etc.). The term "biological diversity" was first used by Lovejoy (1980) and is most commonly used to describe the number of species. Recognizing that conventional methods of determining, and separating, species were inadequate, others elaborated the definition by including the variety and variability of living organisms. "Biological diversity" means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems. (Lovejoy, 1980)

E. O. Wilson first used the term "biodiversity" in the literature in 1988, the concept of biological diversity from which it arose had been developing since the nineteenth century and continues to be widely used. Biodiversity encompasses the variety of life, at all levels of organization, classified both by evolutionary and ecological criteria. (Wilson, 1988)

Types of biodiversity

1. Ecosystem or ecological diversity
2. Species diversity
3. Genetic diversity

1.2 Sacred Groves

Sacred groves are the fine example of in-situ conservation. Sacred groves are forest fragments, which are protected by religious communities, and have a significant religious connotation for the protecting community. These are the mini-forests with rich diversity. Around 15000 sacred groves have been reported from different parts of India. Hunting and logging are usually prohibited in these groves. Developmental activities are also restricted within these patches. These groves are mostly associated with temples/monasteries / shrines or with cremation grounds, and occur in many parts of India, particularly where the indigenous communities live. These are also culturally important; various cultural and religious festivals are often arranged by local people within these patches. Sacred groves contain various ecosystems and various food chains and food webs are present in Sacred Groves. (Gadgil and Vartak, 1975), (Gadgil and Vartak, 1976)

Sacred groves are not only the sacred ecosystems functioning as a rich repository of nature's unique biodiversity, but also a product of the socio-ecological philosophy our fore-fathers have been cherishing since olden days. Sacred groves do not just help conserve valuable biodiversity, soil and water, but are also critical in regulating weather and climate. Many valuable medicinal plants and wild relatives of cultivated species are present in the groves which may have definite role to play in the future programmes. These groves are often the last refuge for endemic and endangered plant and animal species. They are storehouses

of medicinal plants valuable to village communities as well as modern pharmacopoeia, and they contain wild relatives of crop species that can help to improve cultivated varieties. Sacred groves also help in soil and water conservation, besides preserving biodiversity. The ponds and streams adjoining the groves are perennial water sources, and are often the only source for many of the animals and birds that make them their habitat, especially during summer. Sacred groves are extremely rich in floral and faunal elements. The species content in these sacred groves is very high. Some of the endangered taxa are to be found only in the sacred groves. (Ramakrishnan, 1998), (Ramakrishnan, 2001)

Human interventions in natural systems have resulted in large changes in vegetation composition and distribution patterns. Sacred groves are lost due to, anthropogenic interventions like shifting cultivation, overexploitation of forest produce, cattle grazing and changes in land use by converting forests to monoculture plantations agricultural lands and dwelling sites. These activities have been continuing ever since man started cultivation and exploitation of natural resources for livelihood. But, these isolated undisturbed forest patches have been protected by the society in the name of worship of deities which has resulted in the conservation and management of these micro ecosystems designated as sacred groves. Having left undisturbed and unexploited for years, these sacred groves even now remains a treasure of biodiversity and gene pool conserving many endemic and endangered plants and animals of economic and scientific importance which does not exist elsewhere. Due to anthropogenic activities and consequent disturbances and changes in the microclimate of sacred groves.

1.3 Study Area

Nai-Ka-Nath sacred grove situated in Jaipur district of the state of Rajasthan. Nai-Ka-Nath is 45 Km away from Jaipur (Ajmeri gate), and about 14 Km away from Bassi. Nai-Ka-Nath temple is located 8 km away from Banskho station. Coordinates are - 26°49'12"N 76°8'15"E. A historical temple of Bhagwan Shiva is situated in Nai-Ka-Nath grove and surrounded by hills. One discovers a temple which is famous for historical interest in harmony with the local landscape. The temple is a place where visitors from all over Rajasthan and nearby villages come and offer prayers.

There are 11 villages include in Nai-Ka-Nath grove, named Jhar (310-84 bigha), Khori (115-02 bigha), Banskho (905-17 bigha), Nimora (180-19 bigha), Chitodi (393-03 bigha), Techchandpura (193-13 bigha), Charangarh (233-14 bigha), Kishanpura (515-02 bigha), Gudhameena (185-06 bigha), Charanwas (208-15 bigha) and Nai-Ka-Mahadev (1831-10 bigha). Total area of the grove is 5073-18 bigha. Every Monday a fair is held near the temple and a fair of grand scale is there on Maha shivratri people from nearby villages come in thousands by buses, camels, cycles, cars and whatever mode of transport is available to offer their prayers to Shiva.

Methodology

1. Field Survey with the help of the map of the area.
2. Field Observation.
3. Interviews of forest staff, officers and randomly selected local peoples.
4. Focus on group Interviews.
5. Identify core problems.
6. Secondary data collection from related government offices.

2 Causes of Biodiversity Degradation and their impacts

2.1 Hunting and Poaching

Hunting is Capturing, killing, poisoning, sharing, trapping, chasing, attracting, and pursuing any wild life at their natural habitat or outside their natural habitat. (Michael, 2001) Hunting means chasing, driving, flushing, attracting, pursuing, worrying, following or on the trail of, shooting at, stalking, or lying in wait for any wildlife whether or not such wildlife is then subsequently captured, killed, taken or wounded. (IDAHO Department of Fish and Game, Walnut, Boise) Poaching is the illegal hunting, killing and capturing of wild animals. People poach animals for their products, such as hide, ivory, horn, teeth and bone.

Hunting according to wildlife protection act. 1972

"Hunting", with its grammatical variations and cognate expressions, includes,

- (A) Capturing, killing, poisoning, snaring, and trapping or any wild animal and every attempt to do so,
- (B) Driving any wild animal for any of purposes specified in sub clause,
- (C) Injuring or destroying or taking any part of the body of any such animal, or in the case of wild birds or reptiles, damaging the eggs of such birds or reptiles, or disturbing the eggs or nests of such birds or reptiles. (The wildlife (Protection) Act, 1972)

Hunting selectively affects the targeted species, as well as plant and animal species whose populations are subsequently affected either negatively or positively, and so it has important implications for the management of natural resources. (Tripathi et. al., 1995) Some of the hunting is done for subsistence purposes by villagers; some by farmers, miners and loggers, who live in the forest and use forest animals as a major food source; some by commercial hunters to supply urban markets. (Tiwari et. al, 1988), (Malhotra, 1998).

The area of the Nai-Ka-Nath is scattered and most of the area is open for grazing (not officially). Hence there is no restriction on the movement and entry of the local peoples or strangers into the area. Tribal families constantly engrossed in wildlife poaching activities. In past, hunting and logging are usually strictly prohibited in this area. Many animals are mainly hunted for meat, but also for skins or medicinal/chemical properties.

Local communities like Bagariya, Sansi, Saatyra, Regar, and Harijan are responsible for most of the hunting activities in the

area. These communities are hunted many faunal species like Siyar (*Canis aureus*), Bhediya (*Canis lupus pallipes*), Lomdi (*Vulpes bengalensis*), Cats, Monkeys, Jhavamusa (*Hemiechinus collaris*), Nevala (*Herpestes edwardsii*), Sahi (*Hystrix indica*), Khargosh (*Lepus nigricollis*), Gilheri (*Funambulus pennantii*), Titer (*Perdix perdix*), Kabutar (*Columba livia*), Mor (*Pavo cristatus*), Kankhajura (*Scolopendra cingulata*), Common Indian toad, Snakes for meat and other commercial purposes. Many other species of birds, reptiles, and mammals are also hunted by hunters for many commercial and non-commercial purposes. (Fig. 1 & 2)

Many animals are trapped for the pet trade (birds, reptiles, monkeys) or for zoos or medical research. Other animals are trapped for their hides or furs, and some are killed because they live too close to human habitation and impinge on human activities. Many animals are hunted mercilessly for their value in traditional Asian medicines. Turtles are heavily harvested for meat and their eggs are collected for food. Snakes, and many other animals are near extinction in many places because of this trade. Hunting is a major source of income for many rural communities.



Fig. 1 Snake killed near temple Fig. 2 Snake captured

2.2 Degradation of Religious beliefs and Sacredness

Religious belief and taboos are the constructive tools for conserving the sacred groves, and erosion of belief and taboos has led to deterioration of groves. It has been seen that religious beliefs and taboos that were central to the protection of sacred groves are being eroded over the years due to various reasons and thus the present status of sacred groves is rather precarious. (Chandran, 1997) Due to degradation of religious beliefs and taboos, the world loses an accumulated wealth of millennia of human experience and adaptation. Moreover, the advent of Hinduism during the reign of kings also contributed to the erosion of traditional beliefs of the Meitei's. On the other hand, the influence of Christianity added a new dimension in religion and culture which also acted as an important factor in causing the degradation of sacred groves. One unfortunate factor that hinders the conservation of sacred grove is that the village people living

near the sacred groves are poor and less educated. (Singh and Saxena, 1998), (Kulkarni and Nipunage, 2010)

A historical temple of Bhagwan Shiva is situated in Nai-Ka-Nath sacred grove. The temple is a place where visitors from all over Rajasthan and nearby villages come and offer prayers. Every Monday a fair is held near the temple and a fair of grand scale is there on Mahashivratri people from all over Rajasthan come in thousands by buses, camels, cycles, cars and whatever mode of transport is available to offer their prayers to Shiva. Religious beliefs and myths are associated with this grove, which used to be followed strictly in earlier days, have been eroded during the last few decades and the grove no longer enjoy the same status and privilege as they used to in the past. The grove is also culturally important. Various cultural and religious festivals are often arranged by local peoples within the temples of the sacred grove. The sacredness, religious beliefs and taboos play a significant role in promoting sustainable utilization and conservation of flora and fauna of the region. The erosion of religious beliefs and taboos are influencing the communities to discard the community-oriented protection to these groves and they are now being exploited.

In past, peoples do not harm the grove mainly because of socio-religious traditions and fear of the unknown, believing that those who cut or use an axe in grove may be harmed by the presiding deity. (Fig. 3) The tradition of protecting Peepal, Gular and Bargad trees is also found in the grove. Hunting and logging are usually strictly prohibited in the grove. Resources that are traditionally obtained from trees and plants located in the grove include fodder, fruits, dry fallen wood, seeds and ethno-medicine. In recent years peoples are looking at this sacred grove as a picnic spot. They harm the biodiversity of the grove, by many illegal activities. They pollute the environment of the grove by many activities. (Fig.4) At the present time local peoples utilized the sacred plants like Peepal, Gular, Bargad, Tulsi etc. for their personal uses. In past, these plants are utilized by peoples only in worships of god. Peoples are utilized the medicinal plants of the grove for commercial purposes. It has been found that cultural changes among the young people are so rapid that they no longer believe in the methods their ancestors followed to maintain the precious ecosystem. The grove becoming degraded due to change in peoples' attitude towards conservation of biodiversity. Traditional ways of resource management are becoming nonfunctional due to direct conflict between ever increasing human population and limited natural resources. Due to degradation of sacredness, and religious beliefs, many activities like Hunting and poaching, Herb collection, Over grazing, Mining, Over exploitation of natural forest products, Firewood and timber collection, Deforestation, Many types of pollution, Encroachment, Forest fragmentation, Commercial utilization of natural resources etc. are rapidly growing in the grove, and harms the natural ecosystems of the area.



Fig. 3 Sacred place at the top of hill **Fig. 4** Degradation of sacredness

2.3 Habitat Degradation

Habitat refers to the range of resources that a species needs to maintain a viable population including sufficient territory, necessary food and water, and required physical features such as tree cover, rocky hills or water pools, soils, forest canopy, as well as the organisms and ecosystem disturbances that must be present for it to complete its life cycle. (Kulkarni and Nipunage, 2010), (Somvanshi and Dhupper, 2013) Habitat destruction is the major cause of the loss of biodiversity and is directly related to human population growth. Many species are widely distributed and thus, initially, habitat destruction may only reduce local population numbers. The division of continuous patches into smaller pieces which are partly or fully disconnected from one another by infrastructure, agricultural fields or human settlements – can have similar outcomes for biodiversity as outright habitat losses. Some species (local, endemic) have specialized habitats, since once their particular habitat is degraded or converted for human activity, they will disappear. Most of the habitats being destroyed are those which contain the highest levels of biodiversity, such as sacred groves. (Sala et. al, 2000)

In last few years Nai-Ka-Nath sacred grove has facing the problem of habitat degradation, due to many anthropogenic activities like, conversion of forest patches to croplands, over grazing, timber and firewood collection, soil mining, stone mining, deforestation, herb collection, population growth, forest fragmentation, encroachment etc. Mining of soil and stone by local peoples is growing for commercial and non-commercial uses in last few years. Grazing is the major cause of habitat degradation in the area. Many peoples from nearby villages come here with their livestock and utilized the grove as a pasture. They also reaches in the core (sensitive zone for wildlife) area of the grove. Many local peoples especially women's are uses axe on green and dry plants for firewood collection. They also cut down the trees to collect the timber for making homes or other commercial furniture. (Fig. 5) Soil and wood also utilized for making and decorating homes. The outer boundary of the grove is

used for farming by the local peoples. The encroachment activities are also growing near the shiv temple. By these activities the natural habitats of many mammals, reptiles, and birds are destroying rapidly. Due to habitat degradation the natural ecosystems are imbalanced and the total population of wildlife is decreasing. Natural calamities also a major cause of habitat destruction. (Fig. 6)



Fig. 5 Habitat degraded by heavy rainfall **Fig. 6** Birds habitat destroyed

4 – Environmental Illiteracy and Poverty

One of the fundamental barriers to affecting change is the lack of environmental literacy, which is necessary to make informed decisions and address the problems currently facing the planet (Jordan et al., 2009). True environmental literacy goes beyond awareness and rote learning but involves critical thinking, integrating principles, and using acquired skills to turn knowledge into action (St. Clair, 2003), (Coyle, 2005). One of the ways we can get beyond this when engaging various sectors of society is to localize issues and build upon people's personal experience to show why they should care about the environment. (St. Clair, 2003)

In recent times, biodiversity has become easy targets for human over-exploitation due to burgeoning human populations and the quest for a "better life" through improvements in science and technology. Biodiversity, therefore, is being exploited at much faster rates than ever before with negative implications for sustainable human livelihood. (Turner et al., 1990)

Poverty is lack of income and productive resources sufficient to ensure sustainable livelihoods, hunger and malnutrition, ill health, limited or lack of access to education and other basic services, increased morbidity and mortality from illness, homelessness and inadequate housing, unsafe environments, social discrimination and exclusion, characterized by lack of participation in decision-making and in civil, social and cultural rights. Absolute poverty is a condition characterized by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and

information. It depends not only on income but also on access to social services. Relative poverty is seen as poverty that is partly determined by the society in which a person lives. (United Nations), (UNDP International Poverty Centre Poverty in Focus)

Environmental illiteracy and poverty is the major problems to biodiversity conservation in the region (Nai-Ka-Nath). Our life is depends on environment. We depend on it for the air we breathe, the food we eat, and the water we drink. Local peoples are responsible for the exploitation of the grove. They utilized natural forest products in unsustainable manner, and destroying natural ecosystems by their harmful activities like grazing, mining, hunting, timber and firewood collection, and herb collection. Because of environmental illiteracy, they don't know the importance of biodiversity for the present and future generations. Mostly local peoples are unknown about the role of forests in maintaining ecological balance, providing CO₂, maintaining hydrological cycle, reduce global warming, acid rain and many other. Due to poverty, they are mostly depends on this environment to reaches their basic requirements of food, fodder, and timber. They don't know about sustainable utilization of forest products. Many peoples also utilize these forest products for economic benefits. They don't aware about the importance of biodiversity conservation in the area. (Fig. 7 & 8)



Fig. 7 Stalls by poor peoples Fig. 8 Teenage girls with their livestock

2.5 Herb Collection

In recent years, there has been an increasing awareness that the significance of medical plant studies goes beyond mere anthropological curiosity. The study of indigenous herbal medicine can, therefore, serve to validate and enhance existing local uses, and to provide clues to remedies having worldwide potential. Many traditional societies have accumulated a whole lot of empirical knowledge on the basis of their experience dealing with nature and natural resources. It is also observed that more than 35,000 plant species are being used around the world for medicinal purposes. More than 8,000 plants are used in our country especially for their medicinal values by the rural people. Only 15% of pharmaceutical drugs are consumed in developing

countries, and relatively more affluent people take a large proportion of it. It is due to extinction less availability of some of the rare plant species and partly due to poor recognition of the traditional knowledge. (Bickmann, 1984), (Pandey and Kumar, 2006) Sacred groves are the refugia for many medicinal, rare, endemic, threatened, timber and fuel wood yielding plants. These species were observed to be rich in the production of wild tubers, fruits and medicines. About 60% plants present in these groves are medicinal, of which 18% serve as folk medicines. In the recent past, partly because of depletion of sacred grove resources and partly as a consequence of human developmental activities, the usage of wild resources of ethno botanical value has been declining. Ethno botanically, the area remains unexplored and no comprehensive account of local tradition is available. The present scale of commercial cultivation & production of medicinal plants is way below the raw material demand of the industry and large-scale illegal harvesting from the sacred groves is resorted to in order to meet the demand-supply gap. (Toledo, 1995), (Kumar et. al., 2007)

The population of the area is growing rapidly, but the sources of medicinal plants are limited. In past, local peoples are utilize the medicinal sources of the grove in sustainable manner. Indigenous communities are lived in harmony with the nature and conserved its valuable biodiversity. In present scenario these sources are utilize for commercial purposes. (Fig. 9 & 10) The trading in plant medicine currently remains the major occupation of the local communities. Many medicinal plants like *Gloriosa superba*, *Tinospora cordifolia*, *Ganoderma lucidum*, *Datura inoxia*, *Euphorbia hirta*, *Sida cordifolia*, *Eclipta alba*, *Plantago Ovata*, *Rauwolfia serpentina*, *Commiphora wightii*, *Tribulus terrestris*, *Tridax procumbens*, *Asparagus racemosus*, *Citrullus colocynthis*, *Ficus benghalensis*, *Ficus religiosa*, *Ficus racemosa* are near extinction, due to Unsustainable extraction and commercial utilization.



Fig. 9 Selling of medicinal plants by Jogi Fig. 10 Extraction of the Roots of *Asparagus racemosus*

2.6 Mining

The activity, occupation, or industry concerned with the

extraction of minerals is called mining. Mining has a number of common stages or activities, each of which has potentially-adverse impacts on the natural environment, society and cultural heritage, the health and safety of mine workers, and communities based in close proximity to operations. (Kitula, 2006) Mining is a lucrative activity promoting development booms which may attract population growth with consequent deforestation. The deforestation rate due to mining activities in Guyana from 2000 to 2008 increased 2.77 times according to an assessment by the World Wildlife Fund-Guianas. Roads constructed to support the mining operations will open up the area to shifting agriculturists, permanent farmers, ranchers, land speculators and infrastructure developers. If wood is used as fuel in mining operations and it is sources from plantations established for the purpose, it can cause serious deforestation in the region. On the other hand, mining can be labour intensive and take labour away from clearing forest. (Pandey, 1998)

Mining is very intensive and very destructive for the grove. Local peoples are responsible for the mining in the area. It is found on the basis of field observation during the last 3-4 years mining activities are running in Jhar, Khori, Banskho, Chitodi, Techchandpura, Nai-Ka-Nath, Charangarh, Kishanpura, and Charanwas Village areas. Mining activities of soil and building stone is growing in these areas. (Fig. 11 & 12) Mortality rate of wildlife is increasing due to mining activities. Due to improper management of government local peoples are complete their requirements of soil and building stone from the grove. A mining plant is also established near the grove, for the production of road and building material.



Fig. 11 Soil mining from the grove Fig. 12 Building stone mining

2.7 Deforestation

Deforestation is the conversion of forest to another land use or the long-term reduction of the tree canopy cover. Forest degradation concerns the changes within the forest class which affect the forest stand, quality or site negatively. Reduction of the tree canopy above the original threshold of 10 % is classified as forest degradation. Forest decline can be defined as the two processes of deforestation and forest degradation, which have both common and specific drivers, and which may or may not be spatially and

temporally interrelated and will differ between regions. Annually, the rate of global deforestation is around 13 million hectares, most of which occurs in the developing world. Forest loss in Africa is particularly troubling, however: Deforestation is the conversion of forest to an alternative permanent non-forested land use such as agriculture, grazing or urban development. (Food and Agriculture Organization of the United Nations, Rome)

The agents of deforestation in the area of Nai-Ka-Nath are over grazing, mining, firewood and timber collection, herb collection, population growth, poverty, forest fragmentation, pollution, global warming, encroachment, and drought. Over grazing, collection of firewood and timber collection, herb collection and population growth are the main causes of deforestation in the area. Local peoples mostly women's are collect the dry wood from the area, they also cut down the green plants. (Fig. 13 & 14) When these plants are dried they took them outside the area for their personal and commercial use. The mining of soil and building stone is also cause deforestation. There are lot of illegal grazing activities are present in the area. The livestock of local peoples and stray animals are present all of the year in the grove for grazing.



Fig. 13 Firewood collection



Fig. 14 Forest cutters with their equipment's and forest staff

2.8 Over Exploitation of Natural Resources

Population boom, lack of religious beliefs, poverty, and greediness are the main causes of over exploitation of natural resources. Due to increase in the population of the area the gap between demand and supply of natural forest products is increasing. In present scenario the overexploitation of these products is growing in the area to meet the gap between demand and supply. Many local peoples are depend on this area for meet their daily requirements of food, fodder, firewood, timber, and ethno medicines. (Fig. 15 & 16) In past, peoples are easily fulfil their basic and necessary requirements form the area without harming the resources. At that time religious beliefs of peoples are attached with this grove and they also are aware about the importance of biodiversity conservation. At present new generations are not aware about the importance of biodiversity. They utilize these resources in unsustainable manner, and play a

big role in the degradation of the natural resource of the area.



Fig. 15 Camel grazing (< 200 camels) Fig. 16 Over grazing

2.9 – Population Growth

Population growth has become a major force behind sacred groves degradation in many rural and urban environments. Environmental degradation is a situation where the environment loses its natural equilibrium. Population has been a chief agent of environmental degradation in most cities of the world. Population growth lead to increasing environmental problems such as loss of plant and animal species, pollution, air population, soil infertility among others. Groves are destroyed as human populations grow and require more space for habitation and farming, and more fuel for cooking. (Tripathi et. al., 1995) Demand for forest products from non-agricultural sectors (industries, mining etc., including through export channels). The role of population growth as a determinant of growth in demand is even weaker in this case; technological change and policies can carry far greater weight than demographic change. Previously undisturbed areas (which may or may not be suitable for the purposes to which they are constrained) are being transformed into agricultural or pasture land, stripped of wood, or mined for resources to support the energy needs of an ever-growing human population. (Ramakrishnan, 2001), (Malhotra, 1998)

Nai-Ka-Nath is also facing deforestation and environmental degradation as the population grows, and with it the demand for space and resources. The area of grove being encroached upon as demand for space and resources increases. Demand for cultivable land, fuel wood and other forest products, for the needs of a growing population. The sources are limited of the area, but the requirement for these products is very high. Due to population growth the requirement of food, fodder, timber and medicinal plants is grown in the area. This demand is clearly population-driven - and, as we have seen, it often is the predominant factor of deforestation. (Fig. 17 & 18)



Fig. 17 Population at the time of Fair Fig. 18 Constriction of Dharamshalas and shops around the temple due to Population growth

10 – Firewood and Timber Collection

Firewood and the timber collection is a serious problem all over the world. In the process large stretches of forests are damaged and the system which could have provided resources worth much more to the local people is disrupted. Ironically the profits from timber trade are enjoyed by Governments, large companies or affluent contractors. Local people get a tiny share in the benefits while axing their own resource base. In many places logging operations have been observed to lead to a permanent loss of forest cover. Loggers after removing a select group of trees move on to other areas. They are usually followed by others who move into the cut over area hoping to start farming and put down roots. The remaining vegetation is slashed and burned and agriculture is attempted. When cultivation fails it is replaced by cattle ranching or by useless tenacious grasses. The practice of cutting down larger trees, of the selected species, leaving behind younger ones which can grow into fresh stock to be harvested later may appear rational. In theory such patch should become ready for re-harvesting within thirty to forty years. However, in practice none of the loggers leaves the required number of younger trees and the notion that the woodland shall be ready for another valuable timber harvest in forty years appears to be a wistful thinking at its best. (Malhotra, 1998), (Tripathi et. al., 1995)

Firewood and the timber collection is main cause of the degradation of biodiversity in the area of Nai-Ka-Nath. In past, timber is collected from sacred grove only for repairing of the temple (which is located in the grove). Tree cutting for personal and commercial purpose is restricted in this area. Only dead wood collection is allowed for cooking food. In present, people use this grove for commercial purpose. This is the main occupation for some local peoples, Logging or felling of forest trees for obtaining timber is an important cause of deforestation. They collect timber and firewood for sell-out in market, many industries reedy to pay for it. (Fig. 19 & 20) To majority of rural population and a large number of people living in small area, the only fuel is wood which is burned to cook food and to provide heat in chilly winters. Firewood collection contributes much to the

depletion of this sacred grove. The grove usually produce a lot of combustible material in the form of dead twigs, leaves etc. There is hardly any need of cutting down live trees in densely wooded localities, but the pressure of demand is usually higher. However, deadwood is actually manufactured, trees are axed, and their barks girdled and live trees become personal head loads to find their way to local markets. If the present trend continues, within few years the grove will become treeless. Cutting of live trees to meet firewood and charcoal requirement is common in the area.



Fig. 19 & 20 Firewood Collection from the grove

2.11 Forest Fragmentation

The fragmentations of sacred forest patches are general consequence of the haphazard logging and agricultural land conversion which is occurring everywhere, but especially in tropical forests. When these patches are cut into smaller and smaller pieces, there are many consequences, some of which may be unanticipated. Most tropical trees are pollinated by animals, and therefore the maintenance of adequate pollinator population levels is essential for forest health. When a forest becomes fragmented, trees of many species are isolated because their pollinators cannot cross the unfrosted areas. Under these conditions, the trees in the fragments will then become inbred and lose genetic variability and vigor. Other species, which have more wide-ranging pollinators, may suffer less from fragmentation. (Karunakran et. al., 2004) (Sukumaran et. al., 2008) Many species cannot maintain themselves in small fragmented forests. Many large mammals have huge ranges and require extensive areas of intact forest to obtain sufficient food, or to find suitable nesting sites. Species extinctions occur more rapidly in fragments, for these reasons, and also because species depend upon each other. The absence of large predator species leads to imbalances in prey populations, and, since many of the prey species are seed-eaters, to declines in the population levels of many plant species. When sacred patches are cut down or burned, the resulting gaps are too large to be filled in by the normal regeneration processes. The cutting of forest into fragments creates many "edges" where previously there was deep forest. Edges are lighter, warmer and windier than the forest interior. These changes in microclimate alter plant reproduction, animal distribution, the biological structure and many other features of the forest. Tree mortality is much greater near edges, and climax species will be replaced by pioneer species. (Gadgil and Vartak, 1981)

Fragmentation is one of the major factors which has been causing the isolation and degradation of Nai-Ka-Nath grove. Fragmentation stems from population pressure, biomass and

agricultural requirement. Local peoples are make many routes in area for their convenience. (Fig. 21) Both buffer and core areas of the grove are fragmented by these routes. Fragmentation decreases habitat simply through loss of land area, reducing the probability of maintaining effective reproductive units of plant and animal populations. Due to this fragmentation the natural ecosystems are affected, and the food chains and food webs of these ecosystems are uncompleted. Many species cannot maintain themselves in small fragmented forests. Many mammals have huge ranges and require extensive areas of intact forest to obtain sufficient food, or to find suitable nesting sites. These animals are also much more susceptible to hunting in forest fragments, which accounts for much of the decline in animal populations. Species extinctions occur more rapidly in fragments, for these reasons, and also because species depend upon each other. Construction of many dharamshalas near the temple and mining also cause fragmentation. (Fig. 22)



Fig. 21 Routes for convenience
Fig. 22 Mining

2.12 Grazing

Unrestricted grazing is seen by varying sizes of herbs of domesticated animals in Nai-Ka-Nath. The herbs are composed of mainly goats, sheep, cattle, camels etc. Herbs of goats and cattle on all parts of grove are indicating grazing without restriction. The grazing by goats and cattle has adversely affected the regeneration of grasses in the grove which is stressing on the wildlife of the area. The major livestock of the grove is goat which is highest in number than cattle and sheep are compose second and third highest livestock of the sanctuary which putting pressure on grove ecosystem. (Fig. 23 & 24) At present there is no control over grazing, all parts of the grove are extensively used for grazing. Cattle of villagers and stray animals are depend on the grove area for the fodder. Local people's mainly teenage girls and women's are come with their livestock. There is no female guard in the area. They don't follow the instruction of forest staff, if forest guards spotted these peoples with their livestock and other illegal activities in the area, than they argue with forest staff and in many cases they (teenage girls and women's) also misbehave with staff. Few relatives of forest staff are also involve in these illegal activities. Peoples cut down the green plants for

grazing, they also cut green plants and grass for commercial purposes. There is very possibility of spread of communicable diseases in the wild animals and illegal wood cutting goes on



with the illegal grazing.



Fig. 24 Herb of Goats

Fig. 23 Grazing by livestock

2.13 Encroachment

Encroachment is the fastly growing problem of biodiversity conservation of the area. The Eastern and Southern part of the sanctuary is comparatively highly affected by encroachment. The encroachment in the area is for agriculture, dharamshalas, temples, shops and houses. (Fig. 25 & 26) Changing social structure plays an important role in gradual declension of the grove. The grove have already been replaced by temples/solid structures in the name of modernization. Once the god/goddess has been shifted to the temple, the surrounding places become irrelevant to the people, thus immediately converted for other usage. As a result, the local shelter for plants and animals as well as ecosystem functioning has been completely lost. Similarly, once the maintenance of the grove is neglected grove condition becomes vulnerable due to various factors. The encroachment occurs because the demarcations is not clear and at several locations the boundary pillars are missing. The field staffs are not well versed with the boundaries and they pay very little attention on it. No proper land records are being maintained at ranger, forester or naka level. Adequate survey staff is not available, for resolving the disputes. The encroachment cases are at present get the last priority. The disposal of the cases is very slow and ineffective.



Fig. 25 Encroachment around the temple
Fig. 26 Encroachment by shopkeepers around the temple

2.14 Pollution

An undesirable change in the physical, chemical and biological characteristics of any component of the environment (water, soil, air) that can cause harmful effect on various forms of life and poverty is called pollution. (Somvanshi and Dhupper, 2013) Pollution is also a serious problem of the grove. The level of noise and land pollution is very high in the area. Every Monday a fair is held near the temple and a fair of grand scale is there on Maha shivratri people from nearby villages come in thousands by buses, camels, cycles, cars and other transport. Various cultural and religious festivals (like savamani, bhajan, ratri jagran) are often arranged by local people within the temple and dharamshalas of the grove. The use of loudspeakers by peoples in these events cause a harmful effect on the wildlife of the area. Loud music is also used in yatra, ratri jagran and bhajan of bhagwan shiva. Savamani bhoj also arranged by the peoples. Leftover food and other waste material of savamani bhoj like pattal, doone etc. not destroyed properly, and thrown away in the open area of the grove.

There are no policy for waste management. Waste water and other waste material of dharamshalas and temples is left over in the open areas of the grove without any primary treatment. Water resources are also polluted by these peoples. The grove utilized as a picnic place by many peoples and they pollute the environment by illegal activities. The west of building material is also caused pollution. Nearby established industries (mainly brick and stone crushing industries) also pollute the environment of the grove. Visitors are looking at the area as a picnic spot, not as a sacred grove. All these activities are pollute the environment of the grove, and harm the wildlife of the area. Other activities like habitat degradation, herb collection, mining, deforestation, population growth, firewood and timber collection, forest fragmentation, grazing etc. are also cause serious pollution in the environment of the grove. (Fig. 27 & 28)





Fig. 27 Land and Water Pollution around the temple Fig. 28 Air and Land Pollution inside the temple



2.15 Water Scarcity

Water is the important alimnt for all living organisms to survive on earth. Mostly parts of Rajasthan always facing the problem of water, Nai-Ka-Nath sacred grove is one of them. The grove is situated in semi-arid zone receiving less rainfall. It receives only about 572 mm (Average of last 10 years) of rainfall and the numbers of rainy months are restricted to 2-3. The summers are very harsh and intense because little rain water collected in the low lying areas get evaporated very easily. (Fig. 29) There are only 11 anicut points, where the rain water stored. 10 handpumps and 3 tubevales are supping the water to all area. There are 7 artificial water ponds are also available in the area, water is available all over year in 5 ponds out of these 7 for the wildlife of the area. Maximum amount of water from these ponds is utilized by stray animals and local livestock. These water points are also polluted by stray animals. 5 Nalas are present in the grove. Water is available all of year at only one nala, which is present near the forest office. Combining with low rainfall the geomorphological features allow very less retention of water in the sub soil. Droughts are also frequent which make the water situation still worse. These features make the area devoid of water and make the water as the limiting factor for the full potential growth of the grove. Shortage of water, results in the wild animals to come out the grove area in the search of water and are killed in accidents or poached by hunters or villagers. (Fig. 30)

Table 1 - Rainfall of Bassi block 2006 to 2015

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Rainfall (mm)	293	487	578	344	933	621	497	782	750	435

Source – Central Ground Water Board, Jaipur Rajasthan.

Table 2 - Ground Water Level (MBGL) of Bassi block 2006 to 2015

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
WL (May)	26.93	-	-	32.30	33.15	34.21	35.55	45.95	39.25	-
WL (Nov.)	28.87	29.70	31.05	-	32.60	-	35.47	36.53	37.57	37.80

Source – Central Ground Water Board, Jaipur Rajasthan.

Fig. 29 Trying to collect drinking water Fig. 30 Rhesus macaque trying to drink water

2.16 Improper Tourism Management

Sacred groves, National parks and sanctuaries beyond doubt protect the forests, but improper opening of these areas to the public for tourism is damaging. Unfortunately, the national governments adopt tourism for easy way of making money sacrificing the stringent management strategies. Further, many companies and resorts who advertise themselves as eco-tourist establishments are in fact exploiting the forests for profit. (Rai, 1997), (Swamy, 1998)

A historical temple of Bhagwan Shiva is situated in Nai-Ka-Nath grove. The temple is famous for historical interest in harmony with the local landscape. The temple is a sacred place where visitors from all over Rajasthan and nearby villages come and offer prayers. Every Monday a fair is held near the temple and a fair of grand scale is there on Maha shivratri people from all over Rajasthan and nearby villages come in thousands by buses, camels, cycles, cars and whatever mode of transport is available to offer their prayers to lord shiva. Due to this rush, the problem of pollution (air, water, land and noise pollution) is reaches at high levels. Loud music is used by the shraddhalus in yatra. Loud speakers are also used by the peoples in ratri jagran and bhajan. Various cultural and religious festivals (like savamani, bhajan, ratri jagran) are often arranged by local people within the temple and dharamshalas of the grove. Leftover food and other waste material like pattal, doone are not destroyed properly, and thrown away in the open area of the grove. The water resources are also used in unsustainable manner. Visitors are looking at the area as a picnic spot, not as a sacred grove. All these activities are pollute the environment of the grove, and harm the wildlife of the area. (Fig 31 & 32)





Fig. 31 Water and Land Pollution **Fig. 32** Rush of peoples harms the natural Environment

2.17 Staff Related Issues

- Insufficient staff & Absence of female staff
- Lack of team work in staff
- Lack of seriousness in staff for conservation
- Lack of regularity in staff
- Lack of regular patrolling of the area
- Staff relatives are also involve in illegal activities
- Unofficially behavior of staff with local peoples
- Improper management of government officers
- Insufficient weapon facilities of staff
- Insufficient residence facilities for staff
- Staff of wildlife department not supporting
- No vehicle facility for patrolling of the area
- Local police not supporting



Fig. 33 & 34 Teenage girls and women's are arguing and misbehaving with forest staff.

Conclusion

Biodiversity act as life support system of our planet. It provides us the air to breathe, the water to drink, and the food to eat. Biodiversity is essential for our existence on Earth. Wetlands filter pollutants from water, trees and plants reduce global warming by absorbing carbon-di-oxide and micro-organism fertilize the soil. Medicines originating from various wild species, which saved millions of lives. Sacred Groves in urban areas act as "lungs" to the city. SGs reduce the pollution level of rural and even urban areas. Rare, endangered, threatened and endemic species are abundant in sacred groves. These areas also protect species that have become extinct in neighboring areas. Sacred groves act as natural habitat, a laboratory, a gene bank, and a store-house of various-

species. Sacred Groves are the ideal center for biodiversity conservation. Various plants and animals that are threatened in the forest are well conserved within these patches. The area of Nai-Ka-Nath provide habitat, water and nest-sites for many species of wildlife and birds. Ayurvedic and general medicinal plants that are not to be found in the forest are often concentrated in this area. The grove also provide vital ecosystem services to local people. Resources that are traditionally obtained from flora and fauna located in sacred groves include fodder, fruits, dry fallen wood, seeds, soil fertilizer and Ayurvedic and general medicine.

The area is full with rich biodiversity and harbor many rare species of plants and animals. The grove also protecting various plant and animal genes to protect the present and future of natural ecosystems and ecological balance. The grove play a significant role in the conservation of biodiversity of the area. Due to some anthropogenic interventions like grazing, mining, deforestation, poaching, herb collection, firewood collection, timber collection, encroachment, pollution and degradation of sacredness and religious beliefs, the biodiversity of the area is degraded. Many faunal species of the area which also include in schedule I and II (According to The Wildlife (Protection) Act, 1972) like *Canis aureus*, *Canis lupus pallipes*, *Vulpes bengalensis*, *Herpestes edwardsii*, *Pavo cristatus*, *Ptyas mucosa*, *Naja naja*, *Pteropus giganteus* etc. and many floral species (which have unique medicinal properties) like *Gloriosa superba*, *Tinospora cordifolia*, *Ganoderma lucidum*, *Sida cordifolia*, *Commiphora wightii*, *Tribulus terrestris*, *Asparagus racemosus* are verge of extinction. We need to conserve the valuable biodiversity of the grove to save the future of the natural ecosystems of the area.

References

1. Bickmann W., "Traditional medicine and healthcare in Africa", *Development and co-operation*, **3(9)**, 9-11, (1984)
2. Chandran M.D.S., and Hughes J.D., "The sacred groves of South India: Ecology, Traditional communities and Religious change", *Social Compass*, **44 (3)**, 411-425 (1997)
3. Coyle, K., "Environmental Literacy in America", *The National Environmental & Training Foundation, Washington, DC*, 1 (2005)
4. Gadgil M. and Vartak V.D., "Sacred groves of India: A plea for continued conservation", *Journal of Bombay Natural History Society*, **72(2)**, 314- 320, (1975)
5. Gadgil M., and Vartak V. D., "Sacred groves of Maharashtra: An inventory", (Eds. Jain S. K.), *Glimpses of Ethno botany*, Bombay, 279-294, (1981)
6. Gadgil M. and Vartak V.D., "Sacred Groves of the Western Ghats in India", *Economic Botany*, **30**, 152-160, (1976)
7. IDAHO Department of Fish and Game, Walnut, Boise, <https://fishandgame.idaho.gov/public/docs/rules/bgLaws.pdf>
8. International Academy of Education, http://www.iaoed.org/files/10_finalweb.pdf
9. Jordan, R., Singer, F., Vaughan, J., Berkowitz, A., "What should every citizen know about ecology?", *Frontiers in Ecology and The Environment*, **7(9)**, 495-500, (2009)
10. Karunakran P.V., Balasubramanian M. and Ramesh B.R., "Conservation and Management of Sacred Groves in Kerala

- as Community Reserves", (Eds. Kunhi Kannan C. and Gurudev Singh B.), *Strategy for Conservation of Sacred Groves*, Institute of Forests Genetics and Tree Breeding, Coimbatore, 1 (2004)
11. Kitula A.G.N., "The environmental and socio-economic impacts of mining on local livelihoods in Tanzania: A case study of Geita District", *Journal of Cleaner Production* 14(3-4), 405-414, (2006)
 12. Kumar P., Channabasappa K.S. and Hanchinal S.N., "Sacred Groves: Increasing Disturbance - Declining Diversity of Medicinal Plants", *My Forest*, 43(3), 423-433, (2007)
 13. Lovejoy T. E., "The Global 2000 Report to the President", *The Technical Report*, Penguin, New York, 2, 327-332, (1980)
 14. Malhotra K.C., "Anthropological dimensions of sacred groves in India: An overview", (Eds. Ramakrishnan P.S., Saxena K.G., & Chandrashekara U.M.), *Conserving the Sacred for Biodiversity Management*, 423-438, (1998)
 15. Michael R., "Effect of Hunting and Trapping on Wildlife Damage", *Wildlife Society Bulletin*, 29(2), 521-532, (2001)
 16. Nipunage D. S. and Kulkarni D. K., "Deo-rahati: An Ancient Concept of Biodiversity Conservation", *Asian Agri-History*, 14(2), 185-196, (2010)
 17. Pandey D.N., "Sacred Forestry: The Case of Rajasthan", *Sustainable Developments International*, India, 1-6, (1998)
 18. Pandey R. S. and Kumar A., "An ethnobotanical study in the Vindhyan region, Uttar Pradesh", *Indian Forest*, 29 (3), 389-394, (2006)
 19. Rai S.C. and Sundriyal R.C., "Tourism and biodiversity conservation: The Sikkim Himalaya", *Ambio*, 26(4), 235-242, (1997)
 20. Ramakrishnan P.S., "Conserving the sacred for biodiversity: the conceptual framework", (Eds. Ramakrishnan P.S., Saxena K.G. and Chandrashekara U.M.), *Conserving the sacred for biodiversity management*, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India, 3-15, (1998)
 21. Ramakrishnan P.S., "Increasing population and declining biological resources in the context of global change and globalization", *Journal of Bioscience*, 26(4), 465-479, (2001)
 22. Sala O.E., Chapin F.S., Armesto J.J., Berlow E., Bloomfield J., Dirzo R., Huber-Sanwald E., Huenneke L.F., Jackson R.B., Kinzig A., Leemans R., Lodge D.M., Mooney H.A., Oesterheld M., Poff N.L., Sykes M.T., Walker B.H., Walker M. and Wall D.H., "Global biodiversity scenarios for the year 2100", *Science*, 287, 1770-74, (2000)
 23. Singh G.S. and Saxena K.G., "Sacred groves in the rural landscape: A case study of Shekhala village in Rajasthan", (Eds. Ramakrishnan P.S., Saxena K.G. and Chandrashekara U.M.), *Conserving the Sacred for Biodiversity Management*, Oxford and IBH Publishing Co. Pvt. Ltd., 277-288, (1998)
 24. Somvanshi S. and Dhupper R., "Fundamentals of Environmental Studies", S.K. Karaia & Sons, New Delhi, India, First Edition, 56 (2013)
 25. St. Clair, R., "Words for the world: creating critical environmental literacy for adults", *New Directions for Adult and Continuing Education*, (2003)99, 69-78, (2003)
 26. Sukumaran S., Jeeva S., Sobhana Raj A.D. and Kannan D., "Floristic diversity, Conservation status and economic value of miniature sacred groves in Kanyakumari District, Tamil Nadu, Southern Peninsular India", *Turk J. Bot.*, 32, (2008)
 27. Swamy P.S., Sundarpandian S.M. and Chandrasekharan S., "Sacred Groves of Tamil Nadu", (Eds. Ramakrishnan P.S., Saxena K.G. and Chandrashekara U.M.), *Conserving the Sacred for Biodiversity Management*, Oxford and IBH Publishing Co. Pvt. Ltd., 357-361, (1998)
 28. Tiwari B.K., Barik S.K., and Tripathi R.S., "Biodiversity Value, Status and Strategies for Conservation of Sacred Groves of Meghalaya", *Ecosystem Health*, 4(1) 20-32, (1998)
 29. Toledo V. M., "New paradigms for a new ethnobotany reflection on the case of Mexico", (Eds. Schultes R.E. and Von Resi S.), *Ethnobotany: Evolution of a discipline*, Chapman and Hall, London, 75, (1995)
 30. Tripathi R.S., Tiwari B.K. and Barik S.K., "Sacred Groves of Meghalaya: Status and Strategy for Their Conservation", NAEB, NEHU, Shillong, 112-125, (1995)
 31. Turner B. L., Clark W. C., Kates R. W., Richards J. F., Matthews J. T. and Meyers W. B., "The earth as transformed by human action: Global and Regional Changes in the Biosphere over the Past 300 Years", *Geological Journal*, 28(2), (1990)
 32. UNDP International Poverty Centre Poverty in Focus, <http://www.ipcundp.org/pub/IPCPovertyInFocus9.pdf>
 33. United Nations, "Report of the World Summit for Social Development, 1995", <http://www.un.org/documents/ga/conf166/aconf166-9.htm>
 34. Wilson E. O. and Peter F. M., "Biodiversity", National Academy Press, Washington, D.C., First Edition, 521, (1988)