

## Conservation of *Biodiversity*: A way forward to sustainable development

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### ABSTRACT

*Biodiversity, an amalgamation of two vital words "bio and diversity" pertaining to the variation of life. Biodiversity typically measures variation in the genetic, the species and the ecosystem level. Biodiversity provides goods and services such as food, fiber, medicine, air, water purification, climate regulation, erosion control and nutrient cycling. Biodiversity also plays an imperative role in economic sectors that drive development, including agriculture, forestry, fisheries, and tourism. More than 3 billion people rely on marine and coastal biodiversity and 1.6 billion people rely on forests and non-timber forest products for their livelihoods. Biodiversity is strongly affected by factors such as human health, security, and culture. Sustainable development is improving the quality of human life while living within the carrying capacity of sustaining ecosystems. Biodiversity conservation and sustainable development are two interrelated branches focusing on social progress, economic growth and environmental protection on one side, and ecosystem conservation on the other. Conservation includes the efforts carried out in protected areas and community reserves, and in other areas with rich and important biodiversity where conservation is not the main focus. Participatory approach policies with locals involved at every stage must be framed as they have experience and a rich knowledge of traditional flora and fauna. Policies should support access of indigenous tribes over sustainable use of natural resources in order to conserve, alleviate poverty and ensure adaptation to climate change.. Biodiversity conservation does not happen in a vacuum. It requires the participation of many different groups of people, working with various conservation mechanisms both in situ and ex-situ. The sacred groves have been reported from different continents of the world such as Africa, Asia, Europe, Austro-pacific region, and America.*

**Key Words: Biodiversity, Conservation, Participatory Approach And Sustainable Development.**

## 1. Introduction

Biological diversity, the variability among living creatures from all sources including, terrestrial, aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of the ecosystems. The most conspicuous feature of the Earth is the continuation of life and most striking essence of life is diversity. Biodiversity is one of the chief livelihood options; it provides at least 13 types of ecosystem services [1]. Biodiversity provides commodities and services such as food, fiber, medicine, air, water purification, climate regulation, erosion control and nutrient cycling. Biodiversity also plays an imperative role in economic sectors that drive development, including agriculture, forestry, fisheries, and tourism. More than 3 billion individuals depend on marine and coastal biodiversity and 1.6 billion individuals depend on forest areas and NTFP'S for their living. Biodiversity is strongly affected by factors such as human health, security, and culture. Sustainable development is improving the quality of human life while living within the carrying capacity of sustaining ecosystems. Sustainable development and Biodiversity conservation are two interrelated branches concentrating on community development, monetary growth and environmental security on one side, and biological community protection on the other. But still, overexploitation and environmental degradation can be seen rising at a disturbing rate. [2] Presently, the rapid loss of species is considered to be around 100 and 1000 times higher than anticipated extinction rate. Significant dangers to environments and biodiversity are natural surroundings misfortune and fracture, over misuse, contamination, attack of outsider species and worldwide environmental change [3] and disruption of community structure. The International Union for Conservation of Nature and Natural Resources [4] has estimated about 10% of the vascular plants of the globe to be under threat. The IUCN Red List of threatened species compiled by IUCN classifies species that have a high probability of extinction in the future as Critically Endangered, Endangered, or Vulnerable. Degradation and fragmentation of 47% of the original habitats placed in the Himalayas are enlisted as *global biodiversity hotspots* whereas only 25% of the original habitats remain unaffected in the Himalayas. The Convention on Biological Diversity Summit in June 1992 signaled global recognition of the alarming loss of biodiversity [5]. The growing awareness regarding the importance and high rates of loss make it imperative to rapidly assess and conserve biodiversity at local, regional and global levels. Since then, various studies have been carried out to explore and identify the threatened plants of the world [6].

Taking into consideration the importance of Biodiversity, the torch of sustainable development can meet the needs of the present without compromising the ability of future generations to meet their own needs.

## 2. The dependency of people on forests around the globe

Almost 350 million of the world's poorest people depend almost entirely for their subsistence and survival on forests. A further 1 billion poor people - about 20% of the world's population - depend on remnant woodlands, on homestead tree gardens, and on agro-forestry systems for their essential fuel wood, food and fodder needs. Indigenous population groups and different communities living in forests ecosystems are estimated to be around approximately 60 million individuals worldwide with 1.6 billion rural communities that are reliant upon natural ecosystems to some degree. In developing nations, around 1.2 billion individuals depend on agroforestry [7].

The 80 percent of the world forests are possessed by public; however proprietorship and administration of forest ecosystems by local community groups, people, and privately owned businesses are on the rise, 30 percent of forests are utilized for the creation of wood and NTFP products. Forests provide shelter to 300 million individuals around the globe [8]. The annual value of wood removed from forests is estimated to be more than \$100 billion [9].

### **2.1. People's dependence on forests in India**

Forests have the second largest area under land use in India after agriculture, covering around 641,130 square kilometers, or 22 percent of the aggregate land base. Approximately, 275 million poor countryside individuals in India accounting 27 percent of the total population depend on forests for portion of their sustenance and occupations which they earn from fuel wood, fodder, poles, and a range of non-timber forest products, such as fruits, flowers, and medicinal plants. 70 percent of India's rural population depends on fuel wood to meet domestic energy needs. Half of India's 89 million tribal community, the most underprivileged segment of society, live in forest regions, and they have a tendency to have close social and monetary connections with the Forests. Around 1.73 lakh towns are situated in and around forests. The evaluations put the figures from 275 million to 400 million individuals relying upon forests [10]. People living in these forest fringe villages depend upon forests for a variety of goods and services.

### **2.2. Characteristics of people depending on forests**

- Forest dwellers that live in the forests. These are tribal and nomads (performing shifting cultivation).
- These people are poor, illiterate and their Human Development Indices are well below the national average.
- They have small average landholdings and have the low productivity of agriculture.
- The limited opportunities to earn nonfarm income from other resources.

### **3. Need for Biodiversity conservation**

Many people conceive interrogative essence with the query "why is biodiversity important?" Firstly, it is important because it represents the almost infinite variety of plant and animal life and the variety of the types of Earth's ecosystems that support life. It facilitates humans to survive in what would otherwise result in adverse conditions [10]. Biodiversity is the very substance that supports the evolution and differentiation of the varying species with the marked distinction between various species and groups within the larger species. Water, wind, and sun produce a significant part of the energy we utilize, and the natural process of the planet that produces substances throughout centuries and produces resources like coal, which is utilized to for burning and producing energy. Energy from wind, water, daylight, and coal warms our homes and provide electrical power, the decomposing of organic matter has, throughout the hundreds of years produced the non-renewable energy sources that make transportation generally simple and helpful [11].

Without biodiversity, there would have been a homogeneous population, with each of us having the same vulnerabilities. This would mean that in case of an epidemic, all would be killed with no biological differences that would enable some of us to survive and adapt. In ancient times various medicinal plants were used as a health system due to presence of phytochemicals. Without these plants, and the great variety of insects that pollinate and cross-pollinate them, humans would be much more vulnerable to diseases.

The biodiversity contained in the environment provides forest locals with daily needs and nourishment, building material, feed, natural medicines and an assortment of different items. Biodiversity additionally gives us timber, rock, and marble and act building materials that are valuable in the foundation of buildings and shelter for local communities

- Once specie gets extinct, there is no second chance which is possible in climatic change [9].
- Pollination is dependent on various agents such as bees or humming bird.
- Different species such as bats, bees, beetles, birds, butterflies, and flies are known to provide these essential pollination services that guarantee the continuation of plants in our croplands, backyard gardens, rangelands, meadows, and forests.
- Human beings have used around 7000 plant species for food over the course of history, and another 70 000 plants are known to have edible parts [13].

#### 4. Approaches to Biodiversity Conservation

In situ conservation	Ex situ conservation
Biosphere Reserve	Home Garden
Sacred groves & lakes	Seed & Gene Bank
National Parks	Cryopreservation
Wildlife Sanctuaries	Botanical Garden
Terrestrial Ecosystem	Zoological Garden
Marine Ecosystem	Aquaria

#### 5. Role of local people in Biodiversity conservation and sustainable development

The Biodiversity Act, 2002 is a federal legislation enacted by the Parliament of India for the preservation of biological diversity, for local people, conservation of biodiversity is not an isolated concept but an integrated part of their lives. Local communities see conservation area as basic, functional part of the places in which they

live. The engagement of nearby individuals in biodiversity preservation causes benefit for both people and the environment. Local people conserve biodiversity and keep up it sustainable through numerous methods and activities, for example, creation and protection of community conserved areas (sacred groves, temple trees), joint forest management etc.

## **6. Community Conserved Areas**

- Community conserved areas (CCAs) are areas administered by local community groups with conservation of biological diversity
- CCAs are forests, wetlands, coastal and marine areas, grasslands, or other ecosystems preserved by local communities
- Like many countries around the world, India has a rich history and diversity of CCAs.

### **6.1. Community conserved areas for forest conservation**

- The Gond innate group (Gadchiroli District, Maharashtra) started assurance and accepted control more than 1800 hectares of timberland more than two decades prior. Villagers have prevented a paper mill from destroying bamboo stocks, stopped forest fires and promoted the sustainable extraction of NTFPs.
- Villagers in Shankar Ghola, Assam are protecting forests that contain the highly threatened Golden Langur [3].
- With help from the NGO, several dozen villages in Alwar district have restored the water regime, regenerated forests and, in one case (Bhaonta Kolyala), declared a "public wildlife sanctuary".
- Community forestry initiatives in several thousand villages of Orissa have regenerated or protected, thousands of hectares of forests, including Dangejheri's forest, managed entirely by women. Elephants are reported to be now using these forests.

### **6.2. CCAs for Wetland and Coastal/ Marine Habitat Conservation**

- Communities in hundreds of villages across India have protected heronries (e.g. Sareli in U.P, Nellapatu in Andhra Pradesh, Chittarangudi in Tamil Nadu).
- Uttar Pradesh is a locus of traditional wetlands conservation. In Amakhera village of Aligarh district lies a wetland used traditionally for irrigation and fishing.
- The wetland hosts a large number of migratory birds, which villagers are careful not to disturb.
- Patna Lake in Etah District is home for up to 100,000 water birds in a favourable season. The lake has been declared a wildlife sanctuary in 1991 and has been protected for centuries as a sacred pond.
- In Tamil Nadu, a classic example is the 700 hectare Chittarangudi tank, built in 1800.
- Chittarangudi attracts storks, ibises, herons, egrets, cormorants and other migratory birds. Villagers do not allow any hunting or stealing of bird eggs.

- Such local conservation initiatives are complemented by heroic collective struggles by fisher communities across India to save coastal and marine ecosystems from destructive development activities.

### **6.3. CCAs for Individual Species Protection**

- Protection of sea turtle eggs, hatchlings and nesting sites by fisher folk communities is taking place at Kolavipaalam, Kerala, Galjibag and Morjim in Goa, and Rushikulya in Orissa.
- At Rushikulya, local fisherfolk used to collect the eggs for consumption or sale. Some youth in the village learned of the threatened status of the Olive Ridley Turtles and the importance of the beach as a nesting site.
- They stopped eating and selling turtle eggs, and educated fellow villagers about the importance of these turtles. They then registered themselves as the Rushikulya Sea Turtle Protection Committee and constructed an interpretation center.
- Youth clubs from the villages around Loktak Lake (Manipur) have formed the Sangai Protection Forum to conserve the greatly endangered Brow-antlered deer, which is endemic to this area.
- They take part in the management of the Keibul Lamjao National Park, which forms the core of the lake.
- There are a few other sites where Blackbuck can be seen grazing freely with domestic livestock. At Buguda village in Ganjam District, Orissa, inhabitants have been protecting Blackbucks for centuries.

### **6.4. Community Conserved Areas around the world**

#### **6.4.1. Sacred groves**

Sacred groves are protected by local participants as their tribal spirits or gods. These forests are secured by nearby local groups, mostly through standard taboos and assents with social and biological ramifications for an area, containing vegetation and different types of life and topographical highlights that are ensured by human social orders under the conviction that to keep them in a generally undisturbed state is articulation of a vital relationship of people to work with nature and not against it.

#### **6.4.2. Distribution of sacred Forests in the World**

- Sacred groves have been reported from different continents of the world such as Africa, Asia, Europe, Austro-pacific region, and Americas.
- Africa: Sierra Leone, Ghana, Ivory Coast, Nigeria, old Calabar, Zimbabwe, Egypt and Kenya
- Asia: India, Korea, Japan, China, Thailand and Indonesia
- Countries like Germany, Britain, Italy, and Finland in Europe had thousands of sacred groves in ancient times.
- The sacred groves are widely known in the Austro-Pacific Region, New Zealand, and Polynesia.



- In America, native people believed that although the whole earth is sacred, in certain places, the spirit power manifests itself more clearly and readily. Many of these places were groves of trees.

## **7. Importance of CCAs**

### **7.1. For conservation, CCAs:**

- Protect critical ecosystems and biodiversity hotspots.
- Form sanctuaries for threatened plant and animal species.
- Provide corridors and linkages for plant and animal movement between officially protected areas.
- Maintain essential environmental benefits and services, especially water flows and quality.
- Facilitate synergistic links between agricultural biodiversity and wildlife.
- Promote sophisticated ecological knowledge systems, often combining traditional and new knowledge.
- Embody indigenous and local communities' resistance to destructive development.
- Offer insights on the integration of customary and statutory laws in conservation systems.
- Provide useful examples for resolving conflicts between protected areas management and local people.

### **7.2. For communities, CCAs:**

- Enhance long-term livelihood security and opportunities.
- Provide economic benefits from the sustainable harvest and sale of aquatic resources and non-timber forest products, and from activities such as eco-tourism.
- Spread awareness and empower villagers to gain control over land, water, and forests; as well as over developmental and other political processes affecting their lives.
- Help build local capacity and access information that communities can use to influence processes affecting their lives.
- Role of local people in Biodiversity conservation & sustainable development.

## **8. Joint Forest Management**

According to the Forest Policy of Government of India in 1988, the participation of local nearby groups living in and around the forest area region is a basic requirement for the preservation and improvement of Forests. Keeping in mind the end goal to actualize this approach, the Government of India issued a reasonable Guideline on first. June 1990 to rehabilitate and conserve degraded forestland under the care of SFDs (State Forest Development) with the assistance of the local tribal populations and local community associations. In the process of implementing these guidelines, states came out with their own resolutions which facilitated the expansion of Joint Forest Management (JFM) in the state

Most of the State Forest Departments notified their resolutions in early 90s and thousands of Joint Forest Management Committees (JFMCs) were constituted all over the country to develop and manage millions of hectares of degraded forestlands. It could get further impetus in the states which were implementing donor assisted forestry projects. In a similar manner, the Government of India through its National Afforestation and Eco-development Board also gave 100% central grant for Forest Development Agency (FDA), which is a federated body of JFMCs and State Forest Development Agency (SFDA), which is the consolidated body of

FDAs in the state. For the management of the Wildlife Protected Areas, Eco Development Committees (EDCs) are also formed to ensure people participation in wildlife conservation [15]. JFM is an approach and program initiated in the context of the National Forest Policy of 1988 wherein state forest departments support local forest dwelling and forest fringe communities to protect and manage forests and share the costs and benefits from the forests with them. Communities organize themselves into a JFM to protect and manage nearby forests, guided by locally prepared bylaws and micro plans. The key element in JFMC is that communities have the power to manage the use of forests by members and also exclude non-members [16]. The benefits to them are direct access and control on the use and sale of most NTFPs and a share in the income from timber as well as other intangible benefits from local ecosystem services – like water recharge, pollination, wildlife habitat etc. Thus the involvement of communities in the conservation of forests and wildlife is of paramount interest.

- JFM is the generic term in India for partnership in forest management involving the state forest department and the local communities.
- The local village committees and the forest department enter into a MoU to manage the forest area jointly and are entitled to get usufructs benefits from the forest area managed under JFM.
- As on March 2011 there were 1,18,213 JFM committees across 29 States and UT of Andaman & Nicobar Islands which are managing 22.94 million ha of forests in the country.
- A total of 14.5 million families are involved all over the country which includes 4.6 million Scheduled Tribe (ST) families and 2.5 million Scheduled Caste (SC) families..
- The JFMCs is one of the overarching institutions in the implementation of the scheme together with other institutions, especially in non-forest areas.
- Encouraged by the success of JFM Indian government has expanded it and nearly 4000 sq. Km. of degraded forests are managed by more than 3500 local communities with Forest Department which includes 5.5% of forest cover in India.
- Involving local communities in the management of forests has led to more effective biodiversity conservation and poverty alleviation in the country.

#### 9. **Role of local women in biodiversity conservation & sustainable development**

- Women groups from many parts of the country have driven successful initiatives to conserve the forest and coastal biodiversity.
- This social revolution started in 2000, with many of the women coming forward and resolving to conserve the adjoining forest areas and other natural resources, including other forms of biodiversity and its sustainable development.
- The Women Committee's patrols the forest and nobody is allowed to collect additional firewood. The regulations established by the Committee are strictly adhered to and respected by the villagers.



- The Committee's had also fixed different levels of fines, as a sort of localized compliance mechanism for the sake of conserving biodiversity and its sustainable development.
- The Women's Committee has also influenced the local youth and children of the villages in the protection natural resources.
- The strong commitment and action of the community members have yielded rapid and positive results, both for biodiversity conservation and it's sustainable development.
- The first recorded instance of such action was in 1604 among the Bishnoi's community in Rajasthan when two Bishnoi women, Karma and Gora, sacrificed their lives in an effort to prevent the felling of Khejri (*Prosopis cineraria*) trees.

#### 10. Sustainable development, World Scenario

- In many parts of the world, such as Ghana, India, China, Zimbabwe, Egypt, Indonesia etc. Various plants are harvested in a limited quantity so, that benefits from these plants can be obtained sustainably over the longer period of time. Such as *Manzanita*, *Pennantiabaylisiana* etc.
- In China, the medicinal herbs are collected by local people only after these had shed their seeds and many people perform sowing operations of seeds of these medicinal herbs in
- In Ghana fishing is delayed for a number of months by many local communities, until all fish's mature and their population is kept in balance. Also, fishing is not allowed during the breeding season. Some examples of these fish species are *Nile tiliapa*, *Black chinned tiliapa*.
- In Zimbabwe, hunting of the birds is not allowed during the period of egg laying. The local people formed the committees to stop the hunting of these birds. Some examples of these bird species are *Cranes*, *Flamingos*, *Pheasants*.

#### 11. Role of tribals in conserving biodiversity

- The knowledge of tribals in biodiversity conservation and sustainable development can be seen in different practices such as collection and management of wood, traditional ethics, norms, and practices for restraint use of forests.
- The Khasi Hills of Meghalaya is characterized by pockets of rich biodiversity that have been protected by the Khasi tribe for a longer period of time.
- The Khasi people believe that those who disturb the forest will die, and that sacred animals such as the tiger bring about prosperity, happiness, and well-being.
- Large areas have been conserved as forest and wildlife reserves in Nagaland by various tribes, with over 100 villages, managing several hundred sq.km of the forest, including the Khonoma Tragopan Wildlife Sanctuary.

The Bishnois, a community in Rajasthan famous for its self-sacrificing defense of wildlife and trees, continue strong traditions of conservation.

- Bishnois have been declared the Abohar Sanctuary in recognition of their wildlife value. At all the Bishnoi sites, Blackbuck and Chinkara are abundant.
- There is a belief that an intimate relationship exists between the totem animals and the tribe. Therefore, the members do not eat, kill or trap these animals.

## 12. Indigenous knowledge for biodiversity conservation

- There is an immense potential of indigenous knowledge to contribute towards conservation of biodiversity all around the world.
- In the Ashanti region of South - Western Ghana, trees which were regarded as housing spirits are not felled without performing rituals. This custom had a protective effect on tree conservation.
- In Africa animals in a particular habitat are regarded as sacred and are therefore protected from hunting such as Black and White colobus (*Colobus polykomos*) and the Mona monkey (*Cercopithecus mona*).
- A similar situation is reported for the bats in the South Eastern part of the country that is said to be conserved by the local community.
- From a biodiversity conservation point of view, traditional farming practices entailed strong elements of long-term land rotation and conservation of indigenous plants.
- Coastal ethnic groups know days when they do not fish. Tuesdays and Fridays are in Ghana often set aside and the ecosystem was expected to rest. This resting period coincides with the period when the fishes lay their eggs.
- In the Fesulaguna, the banned period is during the months of May and June. This period is obviously linked to the procreation of the fishes including the youngsters to mature.
- Various species could not be hunted during certain seasons (such as the breeding season). In this way the communities are able to ensure sustained population growth of their wildlife resources.
- These traditions of local people have positive effects on the conservation of biodiversity and its sustainable development.

## Conclusion

- ✓ Biodiversity conservation and sustainable development are two related branches concentrating on the social advance, monetary development and environmental protection on one side, and ecosystem conservation on the other.
- ✓ Involving local tribal groups in the administrative management of forests and other natural resources can be used in a more effective way for sustainable development of biodiversity.

- ✓ The precious wild animals and plants can be protected; their habitats can be restored if people of all sections, classes, age groups, and organizations wholeheartedly support the conservation of forests and wildlife.
- ✓ Sustainable development relies upon the cooperation of nearby local people and forest department authorities and fundamentally, on the legal and institutional backing of the state.

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