

# Status of Nilgiri Biosphere in 2015

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**Abstract** Biosphere Reserves are representative parts of natural and cultural landscapes extending over large area of terrestrial or coastal or marine ecosystems or a combination there of and representative examples of bio-geographic zones or provinces. These regions of environmental protection roughly correspond to International Union for Conservation of Nature and Natural Resources Category V Protected areas in which one of them is Nilgiri Biosphere Reserve represents a Biodiversity-rich ecosystem in the Western Ghats-a global biodiversity hotspot also provides an ideal habitat for supporting a high degree of endemic flora and fauna. A variety of human cultural diversity can be found in the Nilgiri Biosphere Reserve. Aim of the present study is to highlight the status of Nilgiri Biosphere Reserve in 2015. The objective of the present study is in the increasing population or migration from surrounding areas rather than the population growth of indigenous people in Nilgiri Biosphere Reserve has been enduring human interference for a very long time through development projects such as hydroelectric power projects, agriculture, horticulture, etc., which have brought about substantial change in the ecology of the area. Many environmental problems are noticed in different parts of the Nilgiri Biosphere Reserve. But from the efforts of conservation law the forest cover has no negative change after 1999 which indicates that strict conservation efforts were taken up by state forest departments of Karnataka, Kerala and Tamil Nadu.

**Keywords** Nilgiri Biosphere Reserve, Flora and fauna, Interference, Conservation

The UNESCO has introduced the designation 'Biosphere Reserve' for natural areas to minimize conflict between development and conservation. Biosphere Reserve are nominated by national government which meet a minimal set of criteria and adhere to minimal set of conditions for inclusion in the world network of Biosphere reserves under the Man and Biosphere Reserve Programme of UNESCO.

According to UNESCO, There are total there are 631 biosphere reserves in 119 countries, including 14 Trans boundary sites. They are distributed as follows:

- a) 64 in 28 countries in Africa
- b) 27 in 11 countries in the Arab States
- c) 130 in 23 countries in Asia and the Pacific
- d) 290 in 36 countries in Europe and North America
- e) 120 in 21 countries in Latin America and the Caribbean.

Some facts that decide the feature of Biosphere Reserves:

- a) An area must contain an effectively protected and minimally disturbed core area for nature conservation.
- b) The core area should be a bio-geographical unit and large enough to sustain viable populations representing all trophic levels in the ecosystem.
- c) The management authority to ensure the involvement and cooperation of local communities to bring variety

of knowledge and experiences to link biodiversity conservation and socio-economic development while managing and containing the conflicts.

- d) Areas potential for preservation of traditional tribal and rural modes of living for harmonious use of environment (Mof, 2015)

Structure and functions of BR:

Biosphere reserves are demarcated into following 3 inter-related zones:

**Core Zone:** Core zone must contain suitable habitat for numerous plant and animal species, including higher order predators and may contain centres of endemism. Core areas often conserve the wild relatives of economic species and also represent important genetic reservoirs having exceptional scientific interest. The core area(s) comprises a strictly protected ecosystem that contributes to the conservation of landscapes, ecosystems, species and genetic variation. A core zone being National Park or Sanctuary/protected/regulated mostly under the Wildlife (Protection) Act, 1972. Whilst realizing that perturbation is an ingredient of ecosystem functioning, the core zone is to be kept free from human pressures external to the system.

**Buffer Zone:** The buffer zone adjoins or surrounds core zone, uses and activities are managed in this area in the ways that help in protection of core zone in its natural condition. These uses and activities include restoration, demonstration sites for enhancing value addition to the resources, limited recreation, tourism, fishing, grazing, etc. which are permitted to reduce its effect on core zone. Research and educational

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Published online at <http://journal.sapub.org/ije>

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activities are to be encouraged.

**Transition Zone:** The transition area is the outermost part of a biosphere reserve, includes settlements, crop lands, managed forests and area for intensive recreation and other economic uses characteristics of the region. It is the part of the reserve where the greatest activity is allowed, fostering economic and human development that is socio-culturally and ecologically sustainable.

**Functions of BR:** There are main three functions

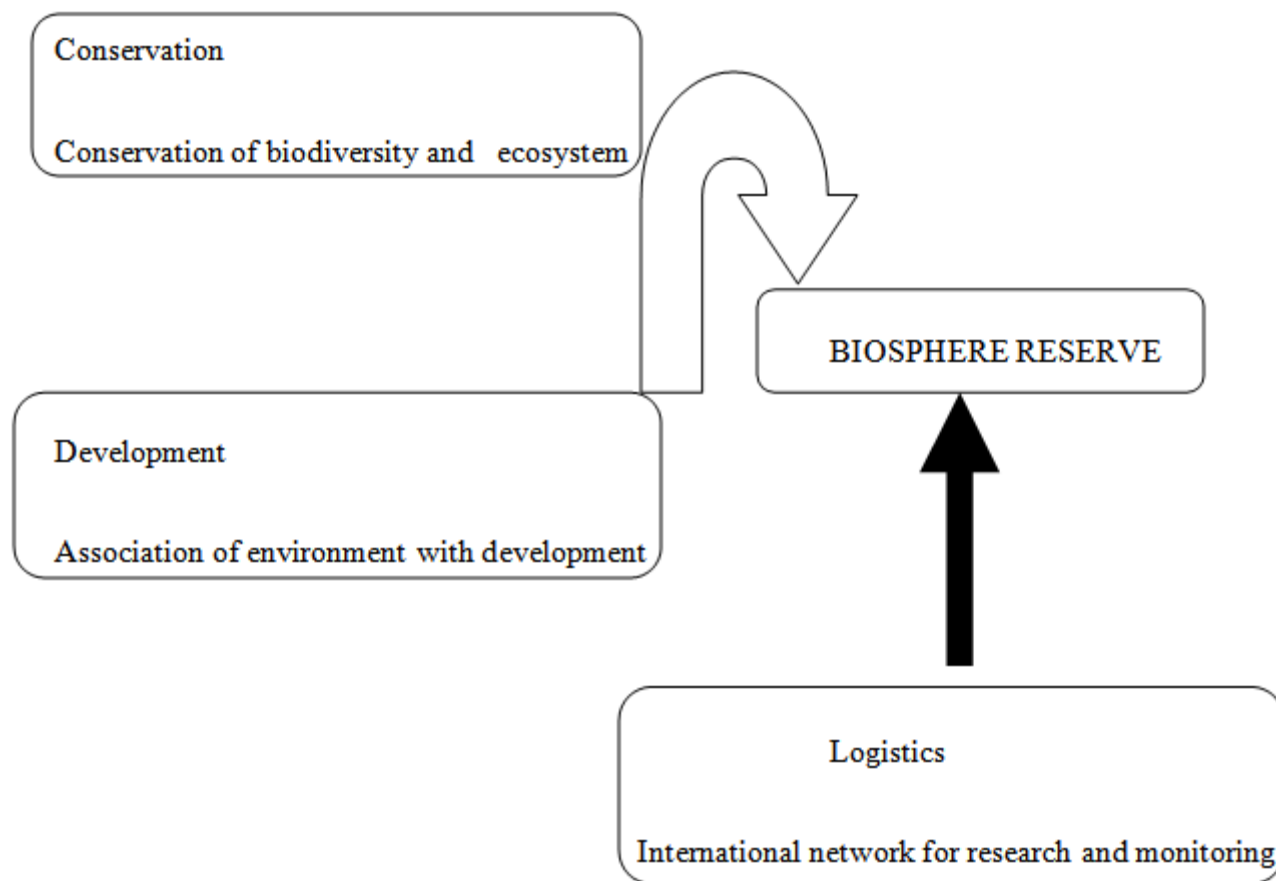
- Conservation
  - Development and
  - Logistic support.
- a) To conserve the diversity and integrity of plants and animals within natural ecosystems
  - b) To safeguard genetic diversity of species on which their continuing evolution depends
  - c) To ensure sustainable use of natural resources through most appropriate technology for improvement of economic well-being of the local people
  - d) To provide areas for multi-faceted research and monitoring
  - e) To provide facilities for education and training

**India's Biosphere Reserves:** India's Biosphere Reserves often include one or more National Parks or sanctuaries along with buffer zones that are open to some economic uses. Protection is granted not only to the flora and fauna of the protected region but also for the human communities who inhabit these regions and their ways of life.

**Nilgiri Biosphere Reserve:**

The Nilgiri Biosphere Reserve was the first biosphere reserve in India established in the year 1986. It is located in the Western Ghats and includes two of the ten biogeographical provinces of India. A wide range of ecosystems and species diversity is found in this region. Thus, it was a natural choice for the premier biosphere reserve of the country. The Nilgiri Biosphere Reserve was established mainly to fulfill the following objectives:

- a) To conserve insitu genetic diversity of species
- b) To restore degraded ecosystems to their natural conditions
- c) To provide baseline data for ecological and environmental research and education
- d) To function as an alternate model for sustainable development.

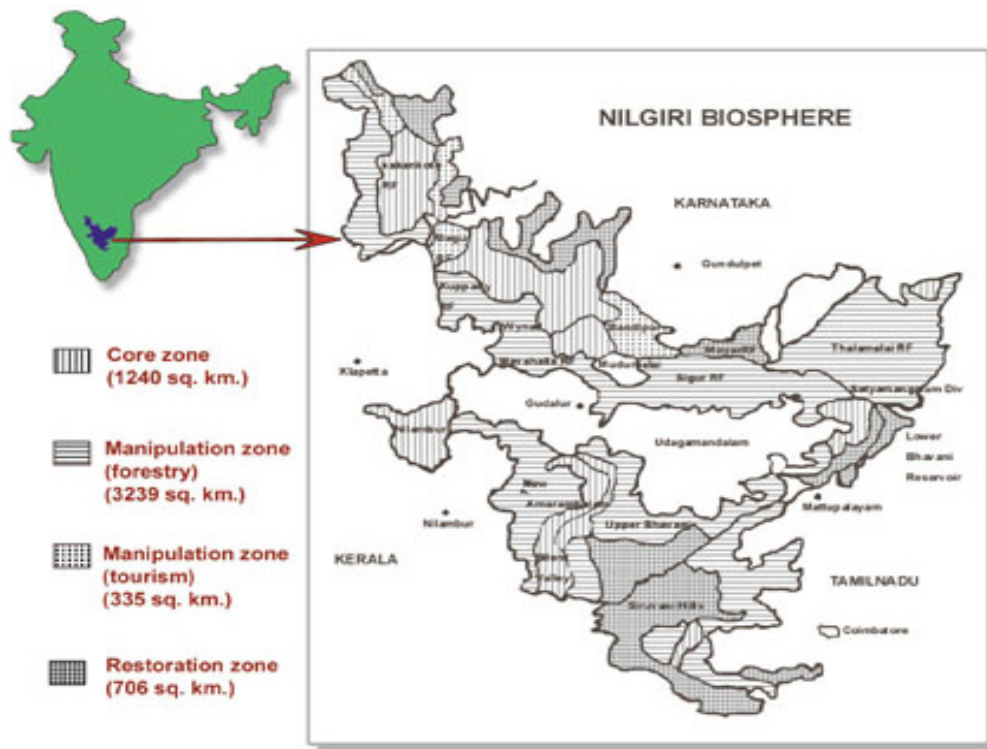


**Figure 1.** Objective of a Biosphere Reserve

**Table 1.** List of Biosphere Reserves in India

S. No.	Name of the Biosphere Reserve total geographical area (Km <sup>2</sup> )	Date of Designation	Location in the State (s)/Union Territory
1	Nilgiri (5520)	01.08.1986	Part of Wynad, Nagarhole, Bandipur and Madumalai, Nilambur, Silent Valley and Siruvani hills in Tamil Nadu, Kerala and Karnataka.
2	Nanda Devi (5860.69)	18.01.1988	Part of Chamoli, Pithoragarh and Almora districts in Uttarakhand.
3	Nokrek (820)	01.09.1988	Part of East, West and South Garo Hill districts in Meghalaya.
4	Manas (2837)	14.03.1989	Part of Kokrajhar, Bongaigaon, Barpeta, Nalbari, Kamrup and Darang districts in Assam.
5	Sunderban (9630)	29.03.1989	Part of delta of Ganges & Brahmaputra river system in West Bengal.
6	Gulf of Mannar (10500)	18.02.1989	India part of Gulf of Mannar extending from Rameswaram island in the North to Kanyakumari in the South of Tamil Nadu.
7	Great Nicobar (885)	06.01.1989	Southern most island of Andaman and Nicobar Islands.
8	Similipal (4374)	21.06.1994	Part of Mayurbhanj district in Orissa.
9	Dibru-Saikhova (765)	28.07.1997	Part of Dibrugarh and Tinsukia districts in Assam
10	Dehang-Dibang (5111.5)	02.09.1998	Part of Upper Siang, West Siang and Dibang Valley districts in Arunachal Pradesh
11	Pachmarhi (4981.72)	03.03.1999	Part of Betul, Hoshangabad and Chhindwara districts in Madhya Pradesh
12	Khangchendzonga (2931.12)	07.02.2000	Part of North and West districts in Sikkim.
13	Agasthyamalai (3500.36)	12.11.2001	Part of Thirunelveli and Kanyakumari districts in Tamil Nadu and Thiruvananthapuram, Kollam and Pathanamthitta districts in Kerala.
14	Achanakmar- Amarkantak (3,835. 51)	30.03.2005	Part of Anuppur and Dindori districts of Madhya Pradesh and Bilaspur district of Chattisgarh
15	Kachchh (12,454)	29.01.2008	Part of Kachchh, Rajkot, Surendranagar and Patan districts in Gujarat.
16	Cold Desert (7,770)	28.08.2009	Pin Valley National Park and surroundings; Chandratat & Sarchu; and Kibber Wildlife sanctuary in Himachal Pradesh.
17	Seshachalam (4755.997)	20.09.2010	Seshachalam hill ranges in Eastern Ghats encompassing part of Chittoor and Kadapa districts in Andhra Pradesh.
18	Panna (2998.98)	25.08.2011	Part of Panna and Chhattarpur districts in Madhya Pradesh

Source: World Network of Biosphere Reserves of UNESCO



Source: UNESCO

**Figure 2.** Location of Nilgiri Biosphere Reserve

### Location and Geography:

The total area of the Nilgiri Biosphere Reserve is 5,520 sq. km. It is located in the Western Ghats between 76°- 77°15'E and 11°15' - 12°15'N. The Nilgiri Biosphere Reserve encompasses parts of Tamil Nadu, Kerala and Karnataka. The annual rainfall of the reserve ranges from 500 to 7,000 mm with mean temperature ranging from 4°C during winter to 41°C during summer (Palni et al. 2012). NBR has various zones such as core, manipulation (forestry), manipulation (tourism) and restoration. The buffer zone is further divided into manipulation zones like forestry, tourism and recreation zones. These zones are located in all the three states of Tamil Nadu, Karnataka and Kerala into which the Nilgiri Biosphere Reserve extends. Most of the plantations are seen only in the manipulation zone.

Topography consists of hill ranges varying in elevation from 300 to 2,655 m. being one of the hotspots of biodiversity; the Nilgiri Biosphere Reserve has some national parks and wildlife sanctuaries within its boundaries. Conservation of wildlife is the main objective of these national parks and wildlife sanctuaries. Some of these areas have been designated by the government as Project Tiger and Project Elephant areas. The protected areas that lie within this reserve include the following: Mudumalai Wildlife Sanctuary, Wayanad Wildlife Sanctuary, Bandipur National

Park, Nagarhole National Park (Rajiv Gandhi National Park), Mukurthi National Park, and Silent Valley National Park.

### Vegetation:

The Nilgiri Biosphere Reserve is very rich in plant diversity; about 3,300 species of flowering plants can be seen here. Of the 3,300 species, 132 are endemic to the reserve. The Nilgiri Biosphere Reserve comprises of substantial unspoilt areas of natural vegetation ranging from dry scrub to evergreen forests and swamps thus contributing to highest biodiversity. The altitude and climatic gradients support and nourish the different vegetation types. The northern part of the Nilgiri Biosphere Reserve (NBRs) has a wide variation of flora ranging from the scrub to evergreen species. About 80% of flowering plants reported from Western Ghats occur in NBRs (UNESCO, 2015). Within a period of 92 years (1920–2012), the forest cover decline was 1,423.6 km<sup>2</sup> i.e. 24.5% of the total forest (Satish et al., 2014).

The Nilgiri Biosphere Reserve possesses different habitat types, unspoilt areas of natural vegetation types with several dry scrubs, dry and moist deciduous, semi- evergreen and wet evergreen forests, evergreen sholas, grasslands and swamps. The flora comprises about 3,500 species of flowering plants. About 80 per cent of the flowering plants reported from the Western Ghats occur in the Nilgiri Biosphere Reserve.

**Table 2.** Show the Protected area of Nilgiri Biosphere reserve

Park Name	Area (sq.km)	Location	Elevation	Vegetation	Fauna
Mukurthi National park	80	Tamil Nadu	2400m	Sholas& grassland	Nilgiri tahr
Bandipur National park	800	Karnataka	800m	Ranges from moist deciduous to scrub	Elephant, gaur, sambar, barking deer, sloth bear, jackal, wildboar, Malabar squirrel, chowsing etc.
Nagarhole or Rajiv Gandhi National Park	572	Karnataka	-	Deciduous forest interspersed with swamps.	Elephant, chital, sambar, munjtac, tiger, leopard and wild dog
Wyanaad Wildlife Sanctuary	344	Kerala	600-1100m	Moist dry deciduous	Elephant, sambar, chital, tiger, wild dog and leopard, freshwater fish like Travancoria, Bhavania and Bargus.
Silent Valley National Park	78	Kerala	2712.42m	Evergreen with grassland	Lion tailed macaque, Nilgiri marten and Nilgiri tahr.

**Table 3.** Vegetation types of the Nilgiri Biosphere Reserve

S. No.	Forest type	Nature of Vegetation	Area of occurrence
1	Moist evergreen	Dense, moist and multi storeyed forest with gigantic trees	In the narrow valleys of Silent Valley
2	Semi evergreen	Moist, deciduous	Nilambur and Palghat division
3	Thorn	Dense	North east part of the Nilgiri district
4	Savannah woodland	Trees scattered amid woodland	Mudumalai and Bandipur
5	Sholas & grasslands	High elevated evergreen with grasslands	South and western catchment area, Mukurthi national park

**Table 4.** Number of Flora

Plant type	No. of species	Plant type	No. of species
Angiosperms	3238	Gymnosperms	
Pteridophytes	134		

#### Tropical Evergreen and Semi Evergreen Forests

These forests are found in the western slope of the Western Ghats; they are found in warm and humid areas with an annual precipitation of over 200 cm and mean annual temperature above 22°C. Tropical evergreen forests are well stratified, with layers closer to the ground and are covered with shrubs and creepers, with short structured trees followed by tall variety of trees. In these forests, trees reach great heights up to 60 m or above. There is no definite time for trees to shed their leaves, flowering and fruition. As such these forests appear green all the year round. Species found in these forests include rosewood, mahogany, aini, ebony, etc. The semi evergreen forests are found in the less rainy parts of these regions. Such forests have a mixture of evergreen and moist deciduous trees. The undergrowing climbers provide an evergreen character to these forests. Main species are white cedar, hollock and kail.

#### Tropical Deciduous Forests

These are the most widespread forests in India. They are also called the monsoon forests. They spread over regions which receive rainfall between 70-200 cm. On the basis of the availability of water, these forests are further divided into moist and dry deciduous. The Moist deciduous forests are more pronounced in the regions which record rainfall between 100-200 cm. These forests are found in the northeastern states along the foothills of Himalayas, eastern slopes of the Western Ghats. Teak, sal, shisham, hurra, mahua, amla, semul, kusum, and sandalwood etc. are the main species of these forests.

The sholas and grasslands play a very important role in retaining water and supplying it to these streams. A drastic decline in the sholas and grasslands is one of the reasons for the recent water scarcity in the Nilgiri Biosphere Reserve.

**Fauna:** The fauna of the Nilgiri Biosphere Reserve includes over 100 species of mammals, 350 species of birds, 80 species of reptiles and amphibians, 300 species of butterflies and innumerable invertebrates. 39 species of fish, 31 amphibians and 60 species of reptiles endemic to the Western Ghats also occur in the Nilgiri Biosphere Reserve (Palni et al. 2012). Fresh water fish such as *Danio neilgheriensis*, *Hypselobarbus dubuis* and *Puntius bovanicus* are restricted to the Nilgiri Biosphere Reserve. The Nilgiri tahr, Nilgiri langur, slender loris, blackbuck, tiger, gaur, Indian elephant and marten are some of the animals found here (UNESCO, 2015). It includes the largest known population of two endangered animal species, namely the Nilgiri Tahr and the Lion-tailed macaque. The largest south Indian population of elephant, tiger, gaur, sambar and chital as well as a good number of endemic and endangered plants are also found in this reserve. The habitat of a number of

tribal groups remarkable for their traditional modes of harmonious use of the environment are also found here.

**Water resources:** The Nilgiri Biosphere Reserve is one of the critical catchment areas of peninsular India. Many of the major tributaries of the river Cauvery like the Bhavani, Moyar, Kabini and other rivers like Chaliyar, Punampuzha, etc., have their source and catchment areas within the reserve boundary. Many hydroelectric power projects are present in the Kundah, Bhavani and Moyar basins.

The Nilgiri Biosphere Reserve is very rich in plant diversity; about 3,300 species of flowering plants can be seen here.

**The people:** A variety of human cultural diversity can be found in the Nilgiri Biosphere Reserve. The increase in population is attributed to migration from surrounding areas rather than the population growth of indigenous people. Tribal groups like the Todas, Kotas, Irullas, Kurumbas, Paniyas, Adiyans, Edanadan Chettis, Cholanaickens, Allar, Malayan, etc., are native to the reserve. Except for Cholanaickens who live exclusively on food gathering, hunting and fishing, all the other tribal groups are involved in their traditional occupation of agriculture.

India is a rich in ethnic diversity and traditional knowledge, having diversified and traditional knowledge, having diversified aboriginal groups of 537 tribe communities and the only country in the world with an unbroken, living vibrant tradition of crafts (Ragupathy S and Newmaster S G, 2009). Some plants used by many communities for consumption, management and valuation of wild plants are central aspects of traditional knowledge. We know about, among potential uses of plants, those related to medicine and foods have central importance because they are essential to human survival (Toledo et al., 2009). Indigenous forest dwelling communities have accumulated a rich knowledge on the uses of various wild forest resource and forest products over the centuries. Their dependence on nature has developed knowledge which ultimately reflects in their traditional culture, religion, belief and folklore. Cleaning of houses and courtyards is a daily activity in most households in the Indian subcontinent and is almost ritualistically followed in many communities. The brooms are traditionally made by plant species as a general practice. It has been used for centuries to sweep caves, cabins and castles. Tree branches and young twigs of herbaceous plants were often used to sweep the floor and clean the ashes from the fireplaces Sometime crude brooms like straw, hay, fine twigs or corn husks were used by tying with thread or plant fibre for easy handling. With modern appliances made of metal and plastics making inroads into daily life the natural brooms are beings replaced. However, in some places, where technology is unavailable or deficient and the bio resource

are easily available the traditional methods are still widely used (Dogan et al., 2008). Broom making is an important forestry enterprise in several parts of country (Saigal S and Bose S, 2003) and also an important source of income and provide rural employment to local communities (Rao R R and Suseela M R, 2002) Ethnobotanical studies on plant materials other than food and medicine are scanty (Bidie G, 1880). However studies on ethano-botany or ethano-taxonomy for food yielding plants and indigenous medicine have been largely conducted in the Nilgiri Biosphere Reserve (Krishnamurthy S, 1953), (Rajan S, 1992), (Udayan et al., 2007), (Rajan S and Sethuraman M, 2008), (Rasingam L and Java S., 2013),

**Problems of the Nilgiri Biosphere Reserve:** The Nilgiri Biosphere Reserve has been enduring human interference for a very long time through development projects such as hydroelectric power projects, agriculture, horticulture, etc., which have brought about substantial change in the ecology of the area. Many environmental problems are noticed in different parts of the Nilgiri Biosphere Reserve.

**Intensive felling:** The increase in influx of population from the surrounding areas has led to deforestation and consequent habitat destruction. Between 1990 – 96 there has been a decrease in the dense forest area. 28.96 sq. km. of dense forests have become open forest and 22.67 sq. km. of dense forests have changed into non-forest areas. Intensive felling has led to multiple problems like destruction, depletion and degradation of the environment and its natural resources. Indiscriminate clearing of forests is destroying the habitat of the several species of animals and birds of the Nilgiris. Some of them like the Nilgiri wood pigeon, Nilgiri pipet and Nilgiri langur that are end emic to this region have hence become highly endangered. Animals like the elephant, tiger and leopard are moving closer to human settlements owing to the shrinking of forest areas.

**Plantations (monoculture):** The Nilgiris, which support a variety of tree species, are threatened by monoculture. The sholas are being destroyed for plantations. Monoculture of eucalyptus, wattle, blue gum, cash crops like tea, coffee, cardamom and food crops like potato have degraded the soil quality along with excessive use of fertilizers. The tea bushes require frequent application of fertilizer, which has made the soil porous. During heavy rain, these slopes are easily washed away resulting in a landslide.

**Grazing:** The sholas were used for grazing cattle. The livestock population inside the Nilgiri Biosphere Reserve is very low but the population in the periphery is very high. Destruction of the sholas has led to disappearance of perennial streams, causing soil erosion and micro climatic changes. Overgrazing has led to degradation of low and high level grasslands, which harbour a large number of endemic species.

**Forest fires:** Forest fires are more common in the sholas and dry deciduous forests. They are both accidental as well as deliberate. The annual fire set off during the summer months for a better pasture in the ensuing monsoon is another manmade threat to the biological diversity.

**Development and construction activity:** Due to developmental activities large areas of forests have been cleared in and around the Nilgiri Biosphere Reserve. More human habitation has resulted in largescale road lying that connects even remote forest areas to the nearest urban centre. Construction activities like road building have unleashed widespread landslides and slope destabilization. Construction of the Kabini reservoir has submerged the valley between Nagarhole and Bandipur.

**Horticultural and agricultural practices:** Extension of agriculture, and use of lands unsuited for agriculture have accelerated soil erosion. Human settlements on the uplands have destroyed the sholas. Soil erosion is severe in the east and southwest areas of the Nilgiris where the monsoons are heavy. In the Mysore plateau region, the extension of irrigation canals from reservoirs has led to a largescale shift in land practices.

**Tourism:** The Nilgiris are an important tourist centre in South India, and attract a large number of tourists. A large number of hotels, clubs, resorts, gardens and roads have emerged rapidly, degrading the natural vegetation. Extensive pollution and water scarcity are the result affecting the entire ecology Nilgiri Biosphere Reserve. The Ooty Lake has been ruined accumulating garbage and disposal of sewage into it.

**Conservation and management of the Nilgiri Biosphere Reserve:** Conservation and management of the Nilgiri Biosphere Reserve depends on the coordination between government agencies and the local people. For effective management, the Nilgiri Biosphere Reserve has been zonalised as core and buffer zone.

During the whole study period, Restoration zone has undergone 38.9% of forest cover loss followed by Manipulation- Forestry zone (27.3%), Manipulation-Tourism zone (15.3%) and Core zone (6%). The reserve has accorded high degree of protection in core zone, manipulation zone as well as restoration zones after declaration as biosphere reserve (Satish et al., 2014).

**Deforestations:** Deforestation in the biosphere reserves, which are key Protected Areas, has negative impacts on biodiversity, climate, carbon fluxes and livelihoods. Deforestation in biosphere reserves is required to assess the impact of the management effectiveness. Changes in forest cover in various zones and protected areas of Nilgiri Biosphere Reserve, the first declared biosphere reserve in India which forms part of Western Ghats-a global biodiversity hotspot. There are some previous study reported about the mapped figure of forests from earliest available topographical Maps and multi-temporal satellite data spanning from 1920 - 2012 period (Satish et al., 2014). The total forest area of biosphere reserve was found to be 5,806.5 km<sup>2</sup> (93.8% of total geographical area) in 1920. Overall loss of forest cover was estimated as 1,423.6 km<sup>2</sup> (24.5% of the total forest) with reference to 1920. Among the six Protected Areas, annual deforestation rate of >0.5 was found in Wayanad wildlife sanctuary during 1920–1973. The deforestation in Nilgiri Biosphere Reserve is mainly attributed to conversion of forests to plantations and

agriculture along with submergence due to construction of dams during 1920 to 1989. The loss of forest cover in Nagarhole and Bandipur is mainly due to construction of dams and agricultural expansion. Annual net rate of deforestation for the period of 1920 to 1973 was calculated as 0.5 followed by 0.1 for 1973 to 1989. Previous study shows that there was large-scale deforestation before the declaration of area as biosphere reserve in 1986; however, the deforestation has drastically reduced after the declaration due to high degree of protection, thus indicating the secure future of reserve in the long term under the current forest management practices. The present review work will conclude all the most assessment on the forest cover of the Nilgiri Biosphere Reserve with immediate applications in monitoring and management of forest biodiversity from previous studies. Tropical forests contain high levels of biodiversity, in terms of both species richness and endemism (Schmitt et al. 2009) (Satish et al., 2014). Human-induced deforestation has been identified as the main environmental problem (Martinez 1998; Williams 2000). Deforestation can be defined as the process of change of land use with depletion of tree crown cover to less than 10% (FAO 2011). Forest conversion into other land use is responsible for loss of biodiversity (Skole and Tucker 1991); affects climate, hydrology and carbon fluxes of ecosystems (Defries et al. 2002; Asner et al. 2005); and provides livelihoods (Naughton-Treves et al. 2005). There was a net decrease in global forest area of 1.7% between 1990 and 2005 at an annual rate of change of 0.11%. The rate of deforestation was reported as 3 Mha per year between 1990 and 2000 and of 6Mha per year between 2000 and 2005 (FAO 2012). In addition to this, the global gross forest cover loss was reported to be 0.6% per year during 2000 to 2005 (Hansen et al. 2010). Worldwide establishment of Protected Areas is an important strategy to control deforestation (Lovejoy 2006). There is a tenfold increase in number of Protected Areas between 1970 and 1997 (Zimmerer et al. 2004). Study on forest cover changes is one of the primary indicators of the conservation effectiveness in Protected Areas. The quantitative analysis on the conservation effectiveness of Protected Areas is inadequate (Liu et al. 2001; CBD 2004). The International Coordination Council (ICC) of UNESCO in its first meeting in Paris held during 9–19 November 1971 introduced the designation “Biosphere Reserve” for natural areas to minimize conflict between development and conservation. The Biosphere Reserves (BRs) are internationally designated landscapes/ seascape units under UNESCO’s flagship program “Man and Biosphere (MAB)”. The Biosphere Reserves represent characteristic ecosystem in different bio-geographic regions and consider human communities as their integral component (UNESCO 1996). The objectives of Biosphere Reserves are to protect ecological integrity of biota within their natural ecosystems; preserve the genetic diversity of species on which their continuing evolution depends; provide areas for multifaceted research, monitoring, education and training; and to ensure the sustainable use of natural resources through the most

appropriate technologies (Rai 2003). There are few studies which deal with deforestation in Western Ghats (Ramesh et al. 1997; Menon and Bawa 1997; Prasad 1998; Jha et al., 2000; Joseph et al. 2009; Panigrahy et al. 2010). Saranya et al. (2014) have carried out decadal time scale analysis for addressing anthropogenic impact of fires on forest ecosystems and identification of fire recurrent areas in Similipal Biosphere Reserve of India. So far, no comprehensive study of deforestation is available for biosphere reserves of India that can be helpful to evaluate the impact of the management effectiveness over time. This article assesses the changes in forest cover in various zones and protected areas of Nilgiri Biosphere Reserve, which is the first declared biosphere reserve and global biodiversity hotspot of India. Hence in this study, we have analyzed the spatial patterns of forest cover from geo-referenced historical topographical maps and multi-temporal satellite data in Nilgiri Biosphere Reserve during 1920 to 2012.

**Conclusions:** Apart from preserving biological and cultural diversity, the Nilgiri Biosphere Reserve also provides ecological sustainability to the entire region. Review are based on the situation or status and conservation of the natural wealth of the Nilgiri Biosphere. We must understand and remember that once the balance of nature is disturbed or destroyed, it is beyond man’s capability or capacity to stop or prevent the disastrous chain reaction that will be triggered off destroying the entire human community. There was 23.5% (1,362.1 km<sup>2</sup>) of reduction in the forest cover between 1920 and 1973. The loss of forest cover during 1973–2012 was estimated at 61.5 km<sup>2</sup>. As elsewhere in the study area, deforestation started mainly after India’s independence due to the development of physical infrastructure, Dam construction and population growth (Reddy et al. 2013). But from the efforts of conservation law The forest cover has no negative change after 1999 which indicates that strict conservation efforts were taken up by state forest departments of Karnataka, Kerala and Tamil Nadu (Satish et al., 2014).

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