Details of Module and its structure 1.

Module Detail			
Subject Name	Geography		
Course Name	Geography 02 (Class XI, Semester - 2)		
Module Name/Title	Natural Vegetation – Forests and Environmental Wellbeing – Part 3		
Module Id	kegy_20503		
Pre-requisites	Basic knowledge about natural vegetation, role of human beings in altering natural habitats		
Objectives	 After going through this module, the learners will be able to know about: Forests and Environmental Wellbeing Forest Cover in India Forest Conservation and Forest Community Rights Social Forestry Farm Forestry Wildlife Conservation National Parks Biosphere Reserved 		
Keywords	Forest Cover, Forest Conservation, Social Forestry, Farm Forestry, Wildlife Conservation, National Parks, Biosphere Reserves.		

Development Team 2.

Role	Name	Affiliation	
National MOOC Coordinator	Prof. Amarendra P. Behera	CIET, NCERT, New Delhi	
Program Coordinator	Dr. Rejaul Karim Barbhuiya	CIET, NCERT, New Delhi	
Course Coordinator (CC) / PI	Prof. Tannu Malik	DESS, NCERT New Delhi	
Course Co-Coordinator / Co-PI	Dr. Nidhi Gusain	CIET, NCERT, New Delhi	
Subject Matter Expert (SME)	Dr. Swagata Basu	SSV (PG) College, Hapur	
Review Team	Prof. B.S Butola	School of Social Sciences,	
		JNU, New Delhi	
Technical Team	Mr. Shobit Saxena	CIET, NCERT, New Delhi	
	Ms. Khushboo Sharma	CIET, NCERT, New Delhi	

Table of Contents:

- 1. Forests and Environmental Wellbeing
- 2. Forest Cover in India
- 3. Forest Conservation and Forest Community Rights
- 4. Social Forestry
- 5. Farm Forestry
- 6. Wildlife Conservation
- 7. National Parks
- 8. Biosphere Reserves

1. Forests and Environmental Wellbeing

The importance of forests cannot be underestimated. We depend on forests for our survival, from the air we breathe to the wood we use. Besides providing habitats for animals and livelihoods for humans, forests also offer watershed protection, prevent soil erosion and mitigate climate change. Yet, despite our dependence on forests, we are still allowing them to disappear. When forests are destroyed, the result is that the essential gets destroyed for the superfluous. It is important to look beyond the narrow human perspective. Forests are home to eighty percent of the world's terrestrial biodiversity, and they also form the source of livelihood for many different human settlements, including sixty million indigenous people. Forests are also the largest storehouse of carbon and provide ecosystem services that are critical to the wellbeing of humans.

Ecosystem: the complex of living organisms, their physical <u>environment</u>, and all their interrelationships in a particular unit of <u>space</u>.

Source: https://www.britannica.com/science/ecosystem

There various ways by which forests help the ecosystem services are listed below. Forests absorb harmful greenhouse gasses that produce climate change. In tropical forests alone, a quarter of a trillion tons of carbon is stored in above and below ground biomass; provide clean water for drinking, bathing, and other household needs; protect watersheds and reducing or slowing the amount of erosion and chemicals that reach waterways; provide food and medicine; serve as a buffer in natural disasters like flood and rainfalls; provide habitat to more than half of the world's land-based species. Not only are the forests beneficial for the wellbeing of all other living beings, depletion of forests lead to untold miseries including soil erosion, water cycle disruption, greenhouse gas emissions and biodiversity losses.

India has a long history of exploitation of forest resources which has led to the depletion of area under forests.

2. Forest Cover in India.

According to the India- State of Forest Report, 2019, published by the Forest Survey of India, the method of calculation of forest cover adopted in India includes considering all tree patches which have canopy density of over 10 percent and are of 1 hectare or more in area; irrespective of their legal status and species composition.

Forest Cover, 2019					
S1.	Туре	Percentage	of		
No.		Geographical Area			
1.	Very Dense Forest	3.02			
	(All lands with tree canopy density > 70 %)				
2. Moderately Dense Forest 9.39					
	(All lands with tree canopy density > $40\% < 70\%$)				
3.	Open Forests	9.26			
	(All lands with tree canopy density $>10 < 40$ %)				
	Total	21.67			
4.	Scrub	1.41			
	(All lands with tree canopy density < 10 %)				
5.	Non Forest	76.92			
	(All lands not included in the above categories, including				
	water)				
Total 100.00					

The report shows the following status of forest cover in India in 2019.

The table above shows that 21.67 percentage of the land in the country is covered by forests. Very dense forests are spread over lesser area compared to Moderately dense forests and open forests.

The percentage of land under forests vary from one state to another in India. Lakshadweep has 90.00 percent area under forests while Andaman and Nicobar Islands have 81.74 percent, Arunachal Pradesh – 79.63 percent and Tripura – 73.68 percent. Among states that have lesser area under forests, Haryana accounts for 3.62 percent of the land area under forests, Punjab has 3.67, Rajasthan has 4.68 and Uttar Pradesh has 6.15 percent of the land area under forests. The states located in the northern plains of India have very less area under forests since large scale agricultural practices has led to the depletion of forest land over time.

The following map shows the Forest Cover in India for 2019



Image 1: Forest Map of India

Source: http://fsi.nic.in/isfr19/vol1/chapter2.pdf

3. Forest Conservation and Forest Community Rights

The need to conserve India's forest wealth was recognized early and the government enacted the Forest Policy in 1952. It was modified in 1988. The salient features of the policy are being presented below apart from making efforts to raise the total land under forest cover to 33 percent.

- i. Maintenance of environmental stability through preservation and restoration of the ecological balance.
- ii. Conservation of natural heritage of the country by preserving the remaining natural heritage of the country by preserving the remaining natural forest and protecting the vast genetic resources to maintain biological diversity.
- iii. Checking soil erosion and denudation in the catchment areas for soil and water conservation irrigation floods, droughts and for the retardation of siltation of reservoirs.
- iv. Checking the extension of sand dunes in deserts areas and along coastal track.
- v. Increasing forest cover through massive afforestation and social forestry programmes.
- vi. Meeting the basic requirements of the people for fuel and fodder.
- vii. Encouraging efficient utilization of forest product and maximizing substitutions of wood.
- viii. Creating a massive people's movement with involvement of women for achieving these objectives and to minimize pressure on the existing forests.

The Forest Rights Act, 2006, recognises and vests the forest rights and occupation in forest land among forest dwelling Scheduled Tribes and other traditional forest dwellers who have

been residing in such forests for generations. The rights include, right to hold and live in the forest land under the individual or common occupation for habitation or for self-cultivation for livelihood by a member or members of a forest dwelling Scheduled Tribe or other traditional forest dwellers; right of ownership, access to collect, use, and dispose of minor forest produce which has been traditionally collected within or outside village boundaries; other community rights of uses or entitlements such as fish and other products of water bodies, grazing (both settled or transhumant) and traditional seasonal resource access of nomadic or pastoralist communities; rights of settlement and conversion of all forest villages, old habitation, unsurveyed villages and other villages in forests, rights to protect, regenerate or conserve or manage any community forest resource which they have been traditionally protecting and conserving for sustainable use; right of access to biodiversity and cultural diversity among other rights.

In order to achieve the goals of the Forest Policies enacted from time to time, complementary initiatives like Social Forestry has been introduced and popularised.

4. Social Forestry

The National Commission on Agriculture the Government of India in 1976, initiated a social forestry project with the aim of reducing the pressure away from the existing forests by planting trees on all fallow land. It is a programme which was designed for the assistance of the villagers in general and the poor or disadvantaged in particular. Social forestry is one such programme which seeks people's participation in formulating and implementing the afforestation schemes based on local needs, potential and availability of inputs.

The objectives of social forestry encouraged by the Government of India included ensuring supply of adequate firewood, timber and fodder for domestic use, encouraging villagers to

A)Environmental Regeneration Aspects:	B) Human Welfare Aspects:
i. Afforestation of degraded forests in the	i. to provide with basic requirements of the
surrounding area of habitations	people such as fuel, fodder, timber.
ii. woodlands on community lands and	ii. Collaboration by the government, panchayat
government wastelands.	and voluntary agencies in the supply of inputs
iii. Mass plantations in tank beds and foreshore	(funds, seedlings, materials and labour)
lands.	iii. income generation from surplus forest
iv. Agro-forestry marginal farm lands am	d products for poverty alleviation
v. Plantation of tress along field boundaries of	iv. Popularise economic tree farming along with
arid and semi-arid zone.	crop farming.
vi. Silvi-pasture development.	v. To deliver amiable environment to the tribes
vii. Tree plantation in urban and industrial	and to assist them to preserve their cultural
areas for artistic purposes, purification of	uniqueness, as their existence and culture is
polluted air and for reducing noise pollution.	closely related to forest.
viii. Effort to reduce water and wind erosion	vi. Create village level self-reliance and self-
by tree and shrub-planting, planting of shelter	management in the production as well as
belts, green belts etc.	dissemination of forest products with social
ix. Strip plantations along road sides' canal	justice and distribution of forest benefits.
banks and rail lines.	
x. Recycling of organic matter and waste of the	
area.	

Types of Social Forestry: Social Forestry is being carried out under different schemes. Some of the schemes are being briefly discussed below.

- i. Farm Forestry: Related to growing trees on farmland for commercial and non-commercial purposes. Farmers meet their domestic needs by getting fuelwood and the plants act as shade trees and wind barrier for the crops. In turn, the plants also prevent soil erosion. The plants may be commercially sold to pulp and paper industry.
- **ii. Community Forestry:** The government helps the community plan such initiatives, help them procure seedlings and fertilizers. The community and panchayats assist in shielding the plants and the benefits of the sale of the timber is distributed among the entire community.
- **iii. Extension Forestry:** The scheme of plantation of trees along roads, railways, canals and wastelands thereby increasing the boundary of forests.
- **iv.** Agro Forestry: assimilated agriculture with forestry by introducing growing leguminous crops, orchard farming and livestock ranching.

All the above schemes have been successful in enhancing livelihood options of rural people in many states of India.

6. Wildlife in India and Wildlife Conservation

Wildlife comprises of animals, birds and insects living in forests. Since India has a great diversity in physiography, climate and edaphic types, forests in India offer a range of habitats that can support a large variety of animals. India boasts of more than 90,000 species of animals which is about 6.5 percent of the entire world's total species. Indian fauna includes 6,500 invertebrates, 5,000 mollusc, 2,546 species of fish, 2,000 species of birds, 458 species of reptiles and 60,000 insects. Over the decades, the habitat of these species have been encroached by humans for their own livelihood requirements. Such drastic changes have let to the extinction of many species and rendering many others as endangered or critically endangered. Such trends can have detrimental effects on the ecological balance. In order to make efforts to stop the loss of wildlife in the country, the Indian Board of Wildlife was constituted in 1952. The board was responsible to make suggestion to the government on creation of national parks, sanctuaries and zoological gardens apart from promoting awareness about protection of wildlife among people. In 1972, the Wildlife Protection Act was enacted to govern wildlife conservation and protection of endangered species. The Wildlife (Protection) Amendment Bill aims to raise penalties for violations of the provisions of the act. In continuation of the process of conservation of wildlife and their habitat, many National Parks and Wildlife Sanctuaries have been demarcated within which the species can live a protected existence.

Wildlife Sanctuary

Any area other than area comprised with any reserve forest or the territorial waters can be notified by the State Government to constitute as a sanctuary if such area is of adequate ecological, faunal, floral, geomorphological, natural. or zoological significance, for the purpose of protecting, propagating or developing wildlife or its environment. Some restricted human activities are allowed inside the Sanctuary area.

National Park

An area, whether within a sanctuary or not, can be notified by the state government to be constituted as a National Park, by reason of its ecological, faunal. floral, geomorphological, or zoological association or importance, needed to for the purpose of protecting & propagating or developing wildlife therein or its environment. No human activity is permitted inside the national park.

7. National Parks

	Numbers	Total Area (km ²)	Percentage of Geographical Area
National Parks (NPs)	104	40501.13	1.23
Wildlife Sanctuaries (WLSs)	551	119775.80	3.64
Conservation Reserves (CRs)	88	4356.49	0.13
Community Reserves	127	525.22	0.02
Protected Areas (PAs)	870	165158.54	5.02

There were 104 National Parks, 551 Wildlife Sanctuaries in the country in July 2019.

Source: <u>http://envis.nic.in</u>

Other than National Parks and Wildlife Sanctuaries, Sites of Conservation Importance Conservation Areas are areas of notable environmental or historical interest or importance which is protected by law against undesirable changes. These areas are conserved by varying levels of legal protection which are given by the policies formulated by the government or global conventions. As on February, 2019, following are the Conservation Sites in India.

Reserves/ Sites	Numbers	Total (in Sq.Kms.)	area
Tiger Reserves	50	71,027.10	
Elephant Reserves	32	69,582.80	
Biosphere Reserves	18	87491.6	
RAMSAR Wetland Sites	27	11121.31	
Natural World Heritage Sites	07	11755.84	
Cultural World Heritage Sites	28		
Mixed World Heritage Sites	01	1784.00	
Important Coastal and Marine Biodiversity Areas	107	10773.07	
Marine Protected Areas	131	9801.13	
Important Bird Areas	467		
Potential Important Bird Areas	96		
Key Biodiversity Areas	531		
Biodiversity Heritage Sites	9		
Biosphere ReservesRAMSAR Wetland SitesNatural World Heritage SitesCultural World Heritage SitesMixed World Heritage SitesImportant Coastal and Marine Biodiversity AreasMarine Protected AreasImportant Bird AreasPotential Important Bird AreasKey Biodiversity AreasBiodiversity Heritage Sites	10 27 07 28 01 107 131 467 96 531 9	37491.0 11121.31 11755.84 1784.00 10773.07 9801.13	

Source: <u>http://envis.nic.in</u>

For detailed understanding of Specie specific conservation, a brief overview of Tiger Reserves and Elephant Reserves are being presented.

Tiger Reserve: Project Tiger was launched by the Government of India in the year 1973 to save the endangered species of tiger in the country. Starting from nine (9) reserves in 1973-2016 the number is grown up to fifty (50). A total area of 71027.10 km² is covered by these project tiger areas.



Image: 2. Map of Tiger Reserves

Soucre:<u>http://wiienvis.nic.in/Database/trd_8222.aspx#Map_showing_Tiger_Reserves_in_Ind</u> ia

The rise in the tiger population in the country through Project Tiger scheme is being presented below.

Tiger Population		
2006	2010	2014
1411	1706	1706

Source: http://wiienvis.nic.in/

Elephant Reserves: The Indian elephant *Elephas maximus* occurs in the central and southern Western Ghats, North-east India, eastern India and northern India and in some parts of southern peninsular India. Elephant Reserves are found in 16 states in the country and is showing an increasing trend across its distributional range. It's population in 2007 was estimated to be in the range from 27,657 to 27,682, whereas in 2012 the population was estimated to be between 27,785 and 31,368.

8. Biosphere Reserve

Biosphere reserves are sites established by countries and recognized under UNESCO's Man and the Biosphere (MAB) Programme to promote sustainable development based on local community efforts and sound science. The programme of Biosphere Reserve was initiated by UNESCO in 1971. The purpose of the formation of the biosphere reserve is to conserve in situ all forms of life, along with its support system, in its totality, so that it could serve as a referral system for monitoring and evaluating changes in natural ecosystems. The first biosphere reserve of the world was established in 1979, since then the network of biosphere reserves has increased to 631 in 119 countries across the world. At present, there are 18 notified biosphere reserves in India. The following table presents a comprehensive list of the Biosphere Reserves in India and their location.

	N71 · ·	01.09.1986	Part of Wayanad, Nagarhole, Bandipur and
			Madumalai, Nilambur, Silent Valley and
1	INIIgiri		Siruvani hills (Tamil Nadu, Kerala and
			Karnataka).
2	2 Nanda Devi	18.01.1988	Part of Chamoli, Pithoragarh, and Bageshwar
			districts (Uttarakhand).
3	Nokrek	01.09.1988	Part of Garo hills (Meghalaya).
	4 Great Nicobar 06.01	06.01.1000	Southern most islands of Andaman and Nicobar
4		00.01.1989	(A&N Islands).
5	5 Culf of Morenau	18 02 1080	Indian part of Gulf of Mannar between India
5 Guil of Mailla	10.02.1909	and Sri Lanka (Tamil Nadu).	
6	Manas	14.03.1989	Part of Kokrajhar, Bongaigaon, Barpeta,
			Nalbari, Kamprup and Darang districts
			(Assam)

Biosphere Reserves in India (as on Dec, 2014)

	1	1	
			Part of delta of Ganges and Brahamaputra river
7	Sunderbans	29.03.1989	system
			(West Bengal).
8	Simlipal	21.06.1994	Part of Mayurbhanj district (Orissa).
9	Dibru-Saikhowa	28.07.1997	Part of Dibrugarh and Tinsukia Districts (Assam)
10	Dehang-Dibang	02.09.1998	Part of Siang and Dibang Valley in Arunachal Pradesh.
11	Pachmarhi	03.03.1999	Parts of Betul, Hoshangabad and Chindwara districts of Madhya Pradesh.
12	Khangchendzonga	07.02.2000	Parts of Khangchendzonga hills and Sikkim.
13	13 Agasthyamalai	12.11.2001	Neyyar, Peppara and Shendurney Wildlife
15			Sanctuaries and their adjoining areas in Kerala.
Achanakamar		Covers parts of Anupur and Dindori districts of	
14	- Amarkantak	30.3.2005	M.P. and parts of Bilaspur districts of
			Chhattishgarh State.
15	15 Kaababb 20.01.2008		Part of Kachchh, Rajkot, Surendra Nagar and
10		29.01.2000	Patan Civil Districts of Gujarat State
			Pin Valley National Park and surroundings;
16	Cold Desert	28.08.2009	Chandratal and Sarchu&Kibber Wildlife
			Sancturary in Himachal Pradesh
			Seshachalam Hill Ranges covering parts of
17	Seshachalam Hills	20.09.2010	Chittoor and Kadapa districts of Andhra
			Pradesh
18	Panna	25 08 2011	Part of Panna and Chhattarpur districts in
10	i umu	23.00.2011	Madhya Pradesh

Source: Wildlife Institute of India

Case Studies of Biosphere Reserves:

Nilgiri Biosphere Reserve: As a part of the concept of Biosphere Reserves initiated by UNESCO, as an international programme the man and Biosphere Committee (MAB); Nilgiri Biosphere Reserve was chosen and declared in September 1986. The Nilgiri Biosphere Reserve encompasses parts of Tamil Nadu, Kerala and Karnataka. The annual rainfall of the reserve

ranges from 500 mm to 7000 mm with temperature ranging from 0°C during winter to 41°C during summer.

The Nilgiri Biosphere Reserve falls under the biogeographic region of the Malabar rain forest. The Mudumalai Wildlife Sanctuary, Wyanaad Wildlife Sanctuary Bandipur National Park, Nagarhole National Park, Mukurthi National Park and Silent Valley are the protected areas present within this reserve.



Image: 3 Nilgiri Biosphere Reserve Sources: <u>https://commons.wikimedia.org/wiki/File:Nilgiris_Biosphere_Reserve.jpg</u>

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 Nilgiri Biosphere Reserve. The genus Baeolepis is exclusively endemic to the Nilgiris. Of the 175 species of orchids found in the Nilgiri Biosphere Reserve, 8 are endemic to the Nilgiri Biosphere Reserve. The fauna of the Nilgiri Biosphere Reserve includes over 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 reptile's endemic to the Western Ghats also occur in the Nilgiri Biosphere Reserve. 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. Apart from preserving biological and cultural diversity, the Nilgiri Biosphere Reserve also provides ecological sustainability to the entire region. Research and monitoring of the management and conservation of the natural wealth of the Nilgiri Biosphere Reserve are being carried out by various government institutions and departments. A commitment to conserve this natural treasure house of resources is the need of the hour. This can be achieved only by the participation and co-operation of the local people in the conservation programmes.

Nanda Devi Biosphere Reserve: Nanda Devi Biosphere Reserve, established in 1982 is a national park situated around the peak of Nanda Devi (7816 m) in Uttarakhand in northern India. The entire park lies at an elevation of more than 3,500 m (11,500 ft) above mean sea level. The National Park was inscribed a World Heritage Site by UNESCO in 1988. Within the National Park lies the Nanda Devi Sanctuary, a glacial basin surrounded by a ring of peaks between 6,000 metres (19,700 ft) and 7,500 m (24,600 ft) high, and drained by the Rishi Ganga. The Forest Research Institute in 1992 recorded 600 species of angiosperms and 30 pteridophytes in the valley and surroundings. Medicinal plants are used by local villages and several species. The Valley of Flowers has many vegetation zones. The valley bottom, river bed, small forests, meadows, eroded, scrubby and stable slopes, moraine, plateau, bogs, stone desert and caves. Nanda Devi Biosphere Reserve is used to "conserve the biodiversity and integrity of plants, animals and micro-organisms". Nanda Devi's insect species add to its vast ecosystem. The Nanda Devi Biosphere Reserve has a variety of many rare kinds of animal species. There are about 83 species of animals that are reported from this reserve. They include Common Langur, Himalayan Black Bear, Himalayan Tahr, Common Leopard, Snow leopard, Mainland Serow, Bharal(Blue Mountain goat), brown bear, Goral, and Himalayan musk deer. There are also a variety of birds because the entire Nanda Devi Biosphere lies within the Western Himalayas Endemic Bird Area. Some of thesespecies include Grosbeak, Rose Finch, Crested Black Tit, Yellow-bellied Fantail Flycatcher, Orange-Flanked Bush Robin, Nutcracker, Ruby Throat etc. (NDNP) The Nanda Devi National Park also includes rich assortments of butterflies. It is said to be around twenty- seven species including the Common Yellow Swallowtail, Queen of Spain, and Indian Tortoiseshell. Man-animal conflict occur when animals damage crops and property; prey on livestock and attack people.



Sundarbans Biosphere Reserves: The biosphere comprises of entire delta region of Sundarbans which is around 9630 sq. km. It was declared as Biosphere reserve in 1989. The area consists of wetlands and islands with mostly mangrove forests. Trees like, Sundri, Hetal, Genwa and Garjan are present. The area supports exotic flora and fauna, from the Royal Bengal tiger, crocodiles, dolphins, sea turtles, snakes and fish. Man-animal conflict in the form of stray tigers killing cattle and human is reported.



Image 5: Tiger in Sundarbans Biosphere Reserve Sources:https://commons.wikimedia.org/wiki/File:Tiger_Sundarbans_Tiger_Reserve_22.0 7.2015.jpg

Gulf of Mannar Biosphere Reserves: The Gulf of Mannar endowed with three distinct Coastal ecosystems namely coral reef, seagrass bed and mangroves is considered one of the world's richest region from a marine biodiversity perspective, is known for its unique biological wealth and is a store house of marine diversity of global significance. The Gulf's 4,223 species of plants and animals representing from primitive to higher forms make it one of the richest coastal regions in India. Most of the islands have luxuriant growth of mangroves on their shorelines and swampy regions. The sea bottom of the inshore area around the islands are carpeted with seagrass beds which serve as ideal feeding ground for Dugong dugon, the endangered herbivorous marine mammal.

Highly productive fringing and patch coral reefs surround the islands and are often referred to as underwater tropical rainforest and treasure house for marine biodiversity, in particular marine ornamental fishes. Occurrence of these specialized ecosystems makes Gulf of Mannar an unique large marine ecosystem in the Indian subcontinent.

Man animal conflicts arise is areas that were zones of traditional marine resource use.



Image 7: Green Turtle in Gulf of Mannar Biosphere Reserve

Sources:<u>https://en.wikipedia.org/wiki/Gulf_of_Mannar_Marine_National_Park#/media/File:</u> <u>Hawaii_turtle_2.JPG</u>