JOURNEY OF INDIAN FORESTRY AND ITS DEVELOPMENT FROM PAST TO MODERN ERA

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ABSTRACT

The history of Indian forest is closely linked with political history. The epics Ramayana and Mahabharata give an attractive description of forests. The Dandakaranya, the Khanadavban and the Nandanvan come from them. Ancient Hindu culture is said to have evolved in Aryans. Literatures are not however scientific treaties. Nevertheless, they give a glimpse into dim and distant past. They are an indication of the level of significance the forests had in the cultural life of people. The dense forests of India have been found to have protected the land in the past, but population grew, the forest began to deplete. However, historically, the people of India have respected forests, and many religious ceremonies focused on trees and plants. Gautama Buddha preached that people should plant trees every five years, and sacred groves were marked around temples. Chandra Gupta Maurya and Ashoka also recognized the importance of forests and implemented polices for their protection and growth. During the British colonial period, the forests were gradually appropriated for revenue generation, but after India gained independence in 1947, a new Forest Policy was established to protect the forests and retain a third of India's land area under forest cover. Forests have been playing a vital role in meeting the demands of domestic and in meeting the demand which ushered in a total mismatch between demand and supply. Over the following years, people's attitudes towards forests changed, leading to significant development in forestry in India. More emphasis is given to conservation and management of forests, which contributes to sustainable development of forestry in India. A large number of forest-based industries were set up, which contributed immensely towards the economic growth of the country.

Keywords: Biodiversity, Ecology, Conservation, Forest Resources and Independence.

INTRODUCTION

Along with other vegetation, including plants that dominate and cover a wide area of landmass, forest is a large area for the growth of trees, while the science that deals with the study of forest conservation management is known as forestry. The word forest is derived from a Latin word "*Foris*" which means outside village boundary and away from the inhabited land. The country's forests have played a crucial role in the growth of all human beings living on the planet; trees are a valuable part of the development of the land. Forests have been considered as an important part of the ecosystem, which provides all sorts of necessary material which has been needed by the people. The trees have been preserved by the people with great care. The people of ancient times considered them as the holy trees and worshipped them (Ormsby and Bhagwat, 2010). They gave more attention to the growth of more and more trees. Development of forestry increased considerably after independence and forestry became economically and ecologically important for growth and development of the country.

IMPORTANCE OF FORESTRY IN INDIAN ECONOMY AND ECOLOGY

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- Forest & tree cover occupies one fourth of country's landmass.
- Forests arehome to 80% of country's biodiversity.
- Provide livelihood support to one-fourth of the population living in 173,000 forest dependent villages
- Provide 40% of energy needs, 30% of fodder supply, and 50% of grazing requirement along with other Non-timber forest products (NTFPs).
- Contributes to sustainable development and meeting sustainable development goals.(Mathur*et al.,* 2021).

ROLE OF FORESTS

1. Productive role

- **Fuel wood-** Wood is used as fuel for thousand years until the advent of coal, oil and gases. Even today more than 50% of the total world consumption of wood is for fuelwood. Approximately 330 million m^3 of wood is used as fuel in India.
- **Timber-** Before timber was supplied from forest. But after 1996 it was restricted to some approved working area and now Tree outside forest (TOF) in the form of agroforestry provide 70% of the timber demands.
- **Non-timber resources-** Forest provide wide range of non-timber products like tamarind, amla, gums, resins, dyes, honey, medicinal plants, etc. 60 percent of country's forestry export comes from NTFP.
- **Fodder-** Forest contributes 30 percent of fodder requirement for the cattle in India.
- **Industrial raw materials-** Forest plays significant role in supplying raw materials to wood based industries like pulp and paper, plywood, vaneer,match, construction industry, etc.
- **Dendro power-** Forest contributes toward energy generation. 1.5 tonnes of wood can generate from 1 MW power.
- **Food-** Fruits, vegetables, mushrooms, berries, etc. are obtained from forest.

2. Protective and ameliorative role

- **Forest and hydrological cycle-** Forest helps in maintaining and regulating water flows and sub-soil water regimes.
- **Forest and ecological security-** The flora and fauna in forest helps to maintain the ecological food chain and maintain the ecosystem sustainable.
- **Forest and ecotourism-** Due to urbanisation and population explosion, ecotourism is promoted. Forest helps to create recreational and aesthetic values.
- **Forest and pollution-** Forest absorb carbon dioxide and releases oxygen which helps in reducing global warming and acid rain.
- **Forest and climate-** Forest intercept solar light and help to augment microclimate, reduces temperature, increases humidity and increases precipitation.
- **Forest and soil-** Forest decreases soil erosion and increases fertility of the soil.
- **Forest and carbon sinks-** 1 tonnes of wood produced is equivalent to 0.5 tonnes of carbon sequestrated. India has potential of sequestrating 175 million tonnes of carbon annually.(Parthiban *et al*., 2019).

FORESTRY IN ANCIENT INDIA

- Evidence of forestry in India date back to 4000-5000 B.C. Wood samples and other materials collected from Indus valley civilization like Mohenzodaro, Harappa and Channudaro shows the complete reliance of people on wood as well as their devotion and affection for trees.
- *Agni purana,* an ancient Hindu scripture written in 2000 BC states that man should protect trees to have material gains and religious blessings.
- Ramayana and Mahabharata, two ancient epics contain excellent account to forest. Forest like Dandakaranya, Khandav Ban, Nandan Ban were mention in the epics.
- In ancient times, our fore-fathers enunciated the basic philosophy of conservation and incorporated it in religious scriptures. The ideas of soil conservation were disseminated in the following hymn of Atharvaveda ,

"Let us protect her with all the care- the soil that produces crops, fruits, and grows trees for us."

"Growing soil leads to the growth and development of a nation."

Similarly, in various Puranas, the importance of tree plantation and wildlife conservation has been highlighted.

"Ten walls are equivalent to the pond; ten ponds are equal to a deep reservoir are equal to a son and ten sons are equivalent to a tree."

- During 500 BC, Buddhism and Jainism had made significant contributions towards forestry and environmental conservation. Gautama Buddha was born under an Ashok tree, received enlightenment under a pipal tree, preached his new religion under a shady banyan tree, and died in a sal grove. Thus, all these trees became sacred and were worshipped by peoples. Gautama Buddha preached that man should plant a tree every five years.
- According to Jainism, the cultivation of soil implies violence against living beings. Therefore Jains adopted the profession of trade and commerce.
- During the reign of Chandra Gupta Maurya in 300 BC, a forest superintendent was appointed to look after the forest.
- Arthashastra of Kautilya classified the forests in four classes, viz.
1. Forests for timber
2. Reserve forests
3. Elephant forests and
4. Forests for searching
- Ashoka was very in support of the non-violence creed and he produced 'Abhayaranya' that we presently termed them as National parks and sanctuaries (Sharma, 2022).

FORESTRY IN MEDIEVAL INDIA

- During the Muslim invasions in 1526, a large number of people had to flee from the attacks and take refuge in the forests.
- Large areas of forests were cut off in the Mughal era, while forests provided a safe place for the many dacoits. All these incidents destroyed forests.

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- However, several forest regions have been declared protected territories which were mainly done for hunting and leisure purposes of the medieval invaders or rulers.
- Babar, Akbar. Jahangir and Shahjahan were all well known for their production of gardens and orchards of various kinds or styles.

- Akbar took a particular interest in planting large numbers of trees along with his regime's canals and highways (Sharma, 2022).

FOREST RESOURCES OF INDIA

Table 1. Different forest classes of India.

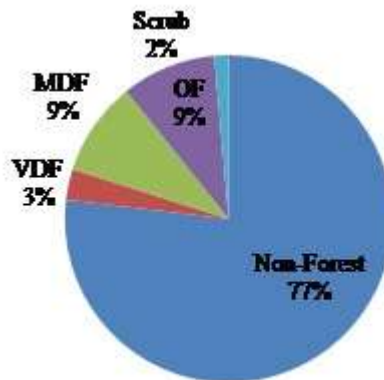| Class	Area (in sq km)	Percentage of Geographical Area
Very Dense Forest	99,779	3.04
Moderately Dense Forest	3,06,890	9.33
Open Forest	3,07,120	9.34
Total Forest Cover	7,13,789	21.71
Scrub	46,539	1.42
Non-Forest	25,27,141	76.87
Total Geographical Area	32,87,469	100.00

Figure 1. Forest classes of India.

FORESTRY IN COLONIAL SYSTEM

- The deterioration of forests in India started due to the arrival of Britishers.
- Valuable timber such as teak and scented wood was exported to European countries.
- In 1800, a commission was appointed to investigate the supply of teak wood in Malabar forests
- In 1806, Captain Watson was appointed as the conservator of forests.
- Royalty rights were declared over teak within the south and its unauthorized felling was prohibited in 1823.

- In 1842, first teak plantation was raised in Nilambar which was established by Conolly, collector of Malabar region.
- In 1864, Dietrich Brandis was appointed as the first Inspector General of Forests.
- The first Indian Forest Act was passed in 1865
- Indian Forest Service started in 1867 to manage the varied forest resources of the vast country.
- A Forest School at Dehradun was started in 1878 to impart education related to forestry.
- The first forest policy of the country was passed in 1894. This policy had two main messages: first, the claims of management were given priority over the

preservation of the forest, and second, the common good was the sole objective of forest management.
- In 1906, Imperial Forest Research Institute was established.
- The Indian Home Rule movement in 1916 and the Non-cooperation movement both challenged British rule in India. There was a general disregard for forest laws and forest damage by fires and unnecessary felling in Bengal, Uttar Pradesh, Orissa and Andhra Pradesh in protest against British rule.
- Indian Forest Act, 1927 was passed mainly to consolidate the existing laws related to forestry.
- The World Wars not only interrupted but reversed the path to scientific forestry. During this period, timber, firewood, charcoal, hay, and other forestry products were needed in large quantities and at short notice to meet the diverse wartime needs. Due to which a large number of forests were cut down which leads to the progress of scientific management of forestry (Sharma, 2022).

FORESTRY IN INDEPENDENT INDIA

- With the partition of India, British officers left and Indian officers took the charge both at the center and in the province.
- Another important policy change was the abolition of zamindari in all Indian states, which resulted in a large proportion of private forests becoming the property of the government.
- Second Forest Policy was passed in 1952. The forest policy stipulated that 1/ 3rd of the country's total land area shoud be kept under forest, with a percentage of 60% in mountainous regions.
- Westoby coined "Social Forestry" in 1968 in World Forest Congress held in India.
- In 1972, Wildlife (Protection) Act was passed for preserving and protecting wildlife in India.
- Chipko movement started by Sunderlal Bahughuna in 1973 in Mandal village of Uttarakhand against government giving a forest land to a sport good company.
- Forest Conservation Act was passed in 1980.

- In 1981, Indian Institute of Forest management was established in Bhopal.
- Environment (Protection) Act was passed in 1986
- Indian Council of Forestry Research and Education (ICFRE) was started in Dehradun in 1987
- Third Forest Policy was enacted in 1988
- Biodiversity Act, 2002 was signed by India (UN convention on biodiversity)
- National Afforestation Programme (NAP) was started in 2002
- Forest Rights Act was passed in 2006
- National Agroforestry Policy was passed in 2014 (Parthiban *et al.*, 2019).

FOREST CONSERVATION AND MANAGEMENT

1. **Sustainable management of forest**
   - Reducing threats to forests
   - Forest fire prevention
   - Enhance quality and productivity of natural forests
   - Increase the productivity of forest plantations
   - Biodiversity conservation
   - Strengthen participatory forest management
   - Management of Non Timber Forest Produce Non-Timber Forest Produce (NTFP)

2. **Management of trees outside forest**
   - Promote agro-forestry and farm forestry
   - Promoting urban forestry

3. **Production Forestry**
   The demand for timber and other forest produce is showing an increasing trend and is likely to continue as the economy grows. The dependence on import has also been increasing drastically over the years. In order to ensure self-sufficiency in timber, the States would be encouraged to further develop their plantation programmes with scientific inputs and genetically improved planting materials.
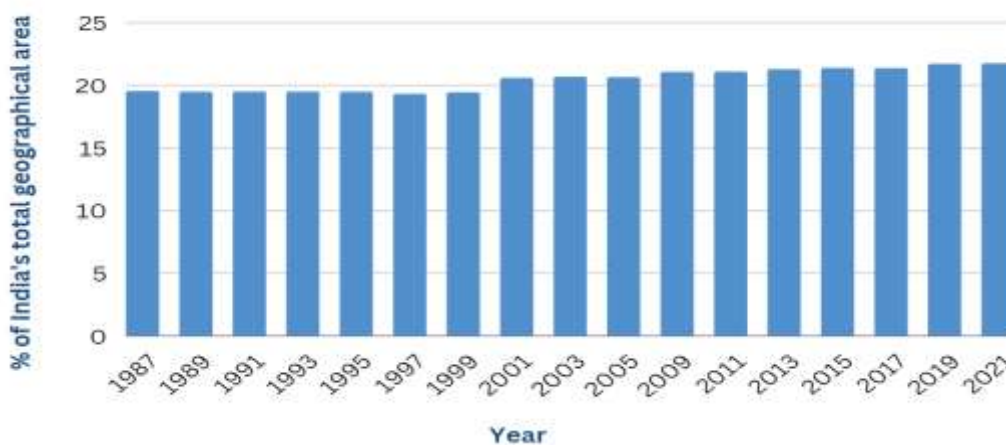

Figure 2. India's forest covers since 1987.

Table 2. Forest types in India.

Type of forest	Area (in square kilometres)	Percentage of total forest
Tropical Wet Evergreen Forests	51,249	8.0
Tropical Semi Evergreen Forests	26,424	4.1
Tropical Moist Deciduous Forests	2,36,794	37.0
Littoral & Swamp Forests	4,046	0.6
Tropical Dry Deciduous Forests	1,86,620	28.6
Tropical Thorn Forests	16,491	2.6
Tropical Dry Evergreen Forests	1,404	0.2
Subtropical Broadleaved Hill Forests	2,781	0.4
Subtropical Pine Forests	42,377	6.6
Subtropical Dry evergreen Forests	12,538	2.5
Montane Wet Temperate Forests	23,365	3.6
Himalayan Moist Temperate Forests	12,012	3.4
Himalayan Dry Temperate Forests	312	0.0
Sub Alpine Forests	18,628	2.9
Total (Forest Cover + Scrub)	7,54,252	98.26
Grass land in different forest type groups (without forest cover)	13,329	1.74
Grand Total	7,67,581	100.00

Table 3. Distribution of forest by States/Union Territories.

State/UT	Forest cover (sq km)	Geographical area (sq km)	Forest cover % (of geographical area)
Andhra Pradesh	29,784	1,62,968	18.28 %
Arunachal Pradesh	66,431	83.743	79.33 %
Assam	28,312	78,438	36.09 %
Bihar	7,381	94,163	7.84 %
Chhattisgarh	55,717	1,35,192	41.21 %
Goa	2,244	3,702	60.62 %
Gujarat	14,926	1,96,244	7.61 %
Haryana	1,603	44,212	3.63 %
Himachal Pradesh	15,443	55,673	27.73 %
Jharkhand	23,721	79,716	29.76 %
Karnataka	38,730	1,91,791	20.19 %
Kerala	21,253	38,852	54.70 %
Madhya Pradesh	77,493	3,08,252	25.14 %
Maharashtra	50,798	3,07,713	16.51 %
Manipur	16,598	22,327	74.34 %
Meghalaya	17,046	22,429	76.00 %
Mizoram	17,820	21,081	84.53 %
Nagaland	12,251	16,579	73.90 %
Odisha	52,156	1,55,707	33.50 %
Punjab	1,847	50,362	3.67 %
Rajasthan	16,655	3,42,239	4.87 %
Sikkim	3,341	7,096	47.08 %
Tamil Nadu	26,419	1,30,060	20.31 %

Telangana	21,214	1,12,077	18.93 %
Tripura	7,722	10,486	73.64 %
Uttar Pradesh	14,818	2,40,928	6.15 %
Uttarakhand	24,305	53,483	45.44 %
West Bengal	16,832	88,752	18.96 %
Andaman and Nicobar Islands	6,744	8,249	81.75 %
Chandigarh	22.88	114	20.07 %
Dadra and Nagar Haveli and Daman and Diu	227.75	602	37.83 %
Delhi	195	1,483	13.15 %
Jammu and Kashmir	21,387	54,624	39.15 %
Lakshadweep	27.10	30	90.33 %
Ladakh	2,272	1,68,055	1.35%
Puducherry	53.30	490	10.88 %

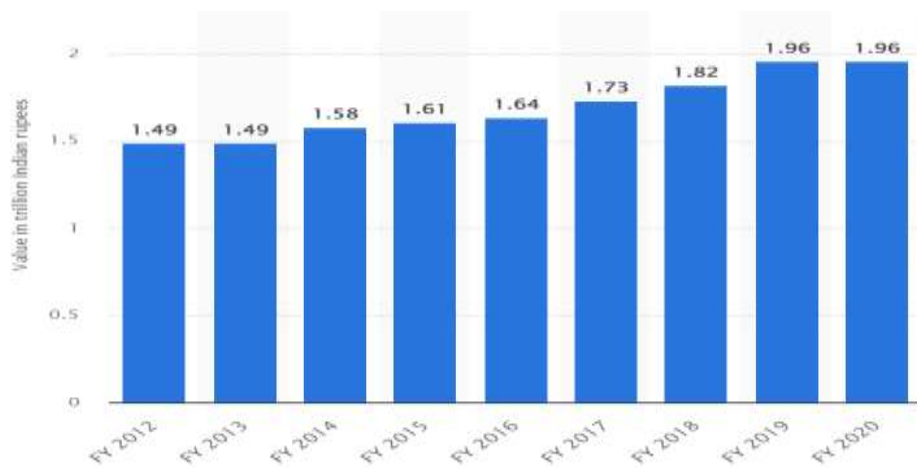**Figure 3**. Annual wood demand in India.

Figure 4. Different sources of wood million m^3.

4. **Forest Certification**

A Credible certification process can provide premium on the products, which can enhance value of forest product harvested sustainably. Adoption of appropriate certification regimes will be encouraged though phase wise adoption of compatible standards and institutional framework in forest management.

5. **Strengthen Wildlife Management**
   - Management of Protected Areas
   - Human wildlife conflicts management
   - Import and trade of exotic species should be regulated
   - Development of ecotourism models

6. **Research and Education**

Scientific research in forestry and wildlife is the back bone of forest management and contributes to understanding of the forest dynamics leading to pragmatic conservation planning.

7. **Extension and awareness**

Conservation and development of forest and related ecosystems cannot be effective without the willing support, involvement and cooperation of the people. It is essential, therefore, to inculcate in the people, a direct interest in forests, in their development and conservation. There is a need to make them conscious of the values of trees, wildlife and nature in general. This can be achieved through active involvement and participation of local governments, schools, colleges, NGOs, community based organizations, Eco- clubs, PSUs, corporate houses, trade unions and other institutions (Umesh and Nautiyal, 2015).

FOREST-BASED INDUSTRIES

- Industries which predominantly use wood and wood residues are considered to be forest or wood based industries.
- Forest based industries contributes 1.5 to 2% to India's GDP
- India consumes 90 million m^3 wood, of which >90% comes from trees outside forests
- The total industrial wood demand for the year 2020 is 153 million m^3.
- Some of the forest-based industries in India are
  - i. Timber and Sawn wood industries
  - ii. Plywood and Panel Industries
  - iii. Pulp and paper industries
  - iv. Dendro biomass power generation industries
  - v. Match industries
  - vi. Furniture and building
  - vii. Value Addition Industries (Parthiban *et al.,* 2019)

CHALLENGES AND THREATS IN INDIAN FOREST

1. **Deforestation**

Deforestation has resulted in a loss of 668,400 hectares of forest cover in India over the period of five years from 2015 to 2020 which is second-highest amount of forest cover loss globally after Brazil (Jha, 2023).This highlights the urgent need for action to address deforestation.

Measures such as implementing sustainable land-use practices, protecting and restoring forests, and reducing the demand for products that contribute to deforestation, such as palm oil and timber should be include. By taking action to address deforestation, India can help to protect its natural environment, support local communities, and mitigate the impacts of climate change. Some of the important missions started by government to mitigate deforestation include National Afforestation Programme (NAP), National Mission for a Green India (GIM) and Van Mahotsav.

2. **Forest fire**

India has reported 345,989 forest fires from November 2020 to June 2021(Pandey, 2022). These fires can have severe impacts on the environment, including habitat destruction, loss of biodiversity, soil degradation, and increased carbon emissions. It's essential to understand the causes of forest fires and take proactive measures to prevent and mitigate them. Efforts to prevent forest fires can include public education campaigns, the enforcement of regulations to prohibit activities that could lead to fires, and the development of early warning systems to detect and respond to fires quickly. Some of the steps taken by government to mitigate forest fire include Forest Fire Prevention & Management Scheme (FFPM) and National Action Plan on Forest Fires (NAPFF).

3. **Wildlife conservation**

Between 2018 and 2020 about 2054 cases were registered for killing or illegal trafficking of wild animals in India (Singh, 2021).These practices are driven by demand from consumers for luxury items and traditional medicines, particularly in countries such as China and Vietnam.To combat the illegal killing and trafficking of wild animals, India has implemented several measures. These include increasing the penalties for wildlife crimes, strengthening law enforcement, and improving international cooperation to combat the illegal wildlife trade. Project Tiger, Project Elephant, Project Snow Leopard and Indian Rhino Vision 2020 are some of the initiative from government for wildlife conservation.

4. **Climate change**

By 2030, 315,667 square kilometres (sq km) or 45 % of India's forest and tree cover are set to emerge as climate hotspots. By 2050, 448,367 sq km or 64% of India's forest and tree cover is likely to face the high severity of climate change (FSRI Report, 2021). The loss of forest and tree cover due to deforestation, fragmentation, and degradation, combined with the impacts of climate change, has the potential to accelerate the loss of biodiversity, undermine the livelihoods of local communities, and exacerbate the impacts of climate change. India has taken several steps to address the threats to its forests and to mitigate the impacts of climate change. These include policies and initiatives to promote sustainable forest management, afforestation, and reforestation. The National Action Plan on Climate Change (NAPCC) is a comprehensive framework developed by the Government of India to address the challenges of climate change. The NAPCC was launched in June 2008, and it

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outlines a range of policies and measures aimed at reducing greenhouse gas emissions, promoting sustainable development, and adapting to the impacts of climate change. The NAPCC is organized into eight national missions which includes National Solar Mission, National Mission for Enhanced Energy Efficiency, National Mission on Sustainable Habitat, National Water Mission, National Mission for Sustaining the Himalayan Ecosystem, National Mission for a Green India and National Mission on Strategic Knowledge for Climate Change.

CONCLUSION

The Indian forestry sector is critical to the country's economic development and environmental sustainability. Indian government has taken initiatives to promote sustainable forest management and conservation, these measures may not be sufficient to effectively address the challenges facing India's forests.Strengthening institutional capacity, promoting eco-tourism, and investing in research and development can further enhance its forestry sector in India. Sustainable forestry practices are crucial for the long-term health and productivity of forests and can provide environmental, economic, and social benefits.

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